

Green Growth in Practice

Lessons from Country Experiences

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About the Green Growth Best Practice Initiative

Green growth is a relatively young field of public policy practice. The Green Growth Best Practice (GGBP) initiative was set up to accelerate learning and to inform design of green growth programs, by undertaking an analysis of early experiences. For this report, GGBP engaged 75 authors in evaluating practices and lessons from green growth programs in all regions of the world. GGBP is also conducting a broad array of activities to build awareness and support countries in applying results of the findings to their national and sub-national programs, such as by presenting results through seminars and dialogues requested by government agencies and partnering with others on policy dialogue workshops, e-learning and peer learning programs.

GGBP is supported by the European Climate Foundation, Climate and Development Knowledge Network, and the Global Green Growth Institute, and is governed by a steering committee with representatives from the following organizations: Children's Investment Fund Foundation; Climate and Development Knowledge Network; European Climate Foundation; Global Green Growth Institute; International Climate Initiative of the German Federal Ministry of Environment, Nature, Conservation, and Nuclear Safety; LEADS Global Partnership; Organisation for Economic Co-operation and Development; United Nations Development Programme; United Nations Economic and Social Commission for Asia and the Pacific; United Nations Economic Commission for Latin America and the Caribbean; United Nations Environment Programme; and the World Bank. GGBP is also working in close collaboration with various other regional and global partners and green growth experts.

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Preface

Green growth is the opportunity of our time. Today, governments have a choice. They can chart new, more sustainable pathways toward a prosperous, inclusive and climate resilient future. Or, they can back conventional forms of development that deepen today's environmental and social problems, and create ecological debts for the future. On the first path lies the promise and potential of green growth.

Fulfilling the promise of green growth takes vision, courage and a different way of doing things. Over the past several years, countries, regions, and cities around the world have designed and tested a range of policies that aim, simultaneously, to deliver economic development, poverty reduction, environmental protection, and action on climate change. Decision-makers – together with the millions of business strategists, project managers, civil servants, community organizers, and others responsible for delivering these policies – have built up an important body of experience. These come, equally, from some of the least developed countries in the world, and from some of the richest; from small states and territories to the world's largest countries.

The scale of the world's environmental challenge means there is no time to waste in sharing these valuable lessons within and across borders. That's why our organizations –

the Climate and Development Knowledge Network, the European Climate Foundation and the Global Green Growth Institute – supported the Green Growth Best Practices (GGBP) initiative.

The initiative has produced this volume, Green Growth in Practice: Lessons from Country Experiences, which documents and assesses a wide range of green growth experiences. It draws on the expertise of a broad range of policy makers, practitioners, researchers, international organizations, and development agencies from around the world.

We hope this report will become a valuable tool for experts, advisers and policymakers in pursuing effective green growth policies and practices and achieving climate compatible development, and so inspire readers to choose a more sustainable future for humanity.



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Foreword

Governments today face challenges in advancing economic and social development in light of resource constraints and risks posed by climate change and environmental degradation. Green growth – a path towards an inclusive green economy that achieves resource efficient and climate resilient economic development and poverty reduction – is now a necessity rather than a choice.

A growing number of countries and sub-national governments around the world are demonstrating the value of green growth in achieving economic, environmental and social development and are designing and implementing appropriate green growth policies and strategies. Recent seminal studies – from UNEP, OECD, World Bank, UNDP, UNESCAP, UNECLAC, ADB, AfDB, IDB and others – have shaped our understanding of green growth principles for both developing and developed countries. Yet, there remains an unfulfilled demand for a practical assessment of effective approaches and lessons on green growth design and implementation.

This report on *Green Growth in Practice: Lessons from Country Experiences*, produced by the Green Growth Best Practice (GGBP) initiative in which our respective institutions participate, responds to this demand by providing the first comprehensive global assessment of good practices and lessons in green growth planning, analysis and implementation. It showcases inspiring examples of green growth leadership around the world in order to motivate others and create momentum to facilitate a transition towards more sustainable economies. The GGBP assessment demonstrates the substantial benefits that governments are realizing through green growth implementation and provides guidance on

strategies to capture these benefits and achieve impact across all segments of society. The report also identifies key challenges and limitations that create obstacles for green growth implementation, providing lessons on how governments have addressed or could address them.

We encourage all leaders, experts, and stakeholders engaged in green growth planning and implementation to read this report and learn from the wealth of experiences it presents. The GGBP initiative also makes a vital contribution to peer-to-peer learning and knowledge sharing. Only through such co-operation across governments, institutions and stakeholders can we promote green growth policies with the urgency needed to effectively curb environmental degradation and support sustainable and inclusive development.

Our organizations are committed to advancing green growth and we have been pleased to partner with GGBP in conducting this assessment. We will continue to work together to foster broad awareness and use of the findings and to assist capacity development of governments and other partners around the world in conducting successful green growth programs.



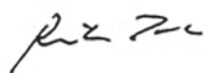
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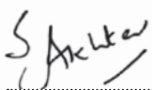
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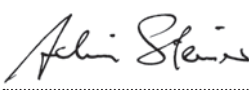
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Acknowledgements

The views and information expressed in this report result from the collective research of the authors and is not necessarily endorsed by their organizations. Organizations are only mentioned for identification purposes.

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Funding organizations

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Thanks also to partners including:

Asian Development Bank; African Development Bank; Deutsche Gesellschaft für Internationale Zusammenarbeit – GIZ; European Commission; International Labor Organization; International Center for Climate Governance; United Nations Institute for Training and Research; World Economic Forum; World Bank Institute; Renewable Energy and Energy Efficiency Partnership; Global Green Growth Forum, Green Growth Knowledge Platform; LEDS Global Partnership.

Design and layout

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Abbreviations

APEC	Asia Pacific Economic Cooperation
C2C	City to City Cooperation
C40	C40 Cities Climate Leadership Group
CBA	Cost Benefit Analysis
CC	Climate Change
CDM	Clean Development Mechanism
CGE	Computable General Equilibrium
CLUE	Conversion of Land Use and its Effects
CO₂	Carbon Dioxide
CO₂e	Carbon Dioxide Equivalent
COP	Conference of the Parties to the United Nations Framework Convention on Climate Change
CPEIRs	Climate Public Expenditure and Institutional Reviews
CPI	Climate Policy Initiative
CSP	Concentrated Solar Power
DEA	Data Envelopment Analysis
E3MG	Energy Environment Economy Model at the Global level
EE	Energy Efficiency
EF	Ecological Footprint
EFFECT	Energy Forecasting Framework and Emissions Consensus Tool
EFOM	the Energy Flow Optimization Model
EnEV	Energy Conservation Ordinance (Germany)
EU	European Union
EU ETS	European Union Emissions Trading System
FAO	Food and Agriculture Organization
FONAFIFO	National Forestry Financing Fund (Costa Rica)
GDP	Gross Domestic Product
GGGI	Global Green Growth Institute

GGKP	Green Growth Knowledge Platform
GHG	greenhouse gas emissions
GIS	Geographic Information System
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German Society for International Cooperation)
GNI	Gross National Income
GPI	Genuine Progress Indicator
GS	Genuine Savings
GW	Gigawatt
GWM&E	Government Wide Monitoring and Evaluation System
ICLEI	Local Governments for Sustainability
IDCOL	Infrastructure Development Company Ltd (Bangladesh)
IEA	International Energy Agency
IFC	International Finance Corporation
ILO	International Labor Organization
IMF	International Monetary Fund
I-O model	Input-Output model
IPCC	Intergovernmental Panel on Climate Change
KfW	KfW Entwicklungsbank (German development bank)
LCD	Low Carbon Development
LCDS	Low Carbon Development Strategies
LCOE	Levelized Cost of Electricity
LDC	Least Developed Country
LEDs	Low Emission Development Strategies
LEPS	Long-range Energy Alternative Planning
M&E	Monitoring and Evaluation
MAC Curve	Marginal Abatement Cost Curve
MAPS	Mitigation Action Plans and Scenarios

MASEN	Moroccan Agency for Solar Energy
MCA	Multi-criteria analysis
MDGs	Millennium Development Goals
MESSAGE	Model for Energy Supply Systems And their General Environmental Impact
MIGA	Multilateral Investment Guarantee Agency
MRV	Monitoring, Reporting and Verification
NGO	Non-Governmental Organization
NRG4SD	Network of Regional Government for Sustainable Development
OECD	Organisation for Economic Co-operation and Development
OPIC	Overseas Private Investment Corporation
PES	Payment for Ecosystem Services
PIER	Public Interest Energy Research (California)
POLES	Prospective Outlook on Long-term Energy Systems
PPA	Power Purchasing Agreement
PPP	Public Private Partnership
PRI	Policy risk insurance
R&D, R&DD	Research and Development; Research, Development and Demonstration
R20	Regions of Climate Action

RE	Renewable Energy
REDD+	Reduced Emissions from Deforestation and Forest Degradation
SME	Small and Medium Sized Enterprise
TA	Technical Assistance
TCG	The Climate Group
tCO₂	Tonnes of CO ₂
TEEB	The Economics of Ecosystems and Biodiversity
UCLG	United Cities and Local Government
UN	United Nations
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
USD	United States Dollars
WASP	Wind Atlas Analysis and Application Program
WRI	World Resources Institute

Executive summary

Green growth is becoming an attractive opportunity for countries around the world to achieve poverty reduction, environmental protection, resource efficiency and economic growth in an integrated way. Green growth strategies generate policies and programs that deliver these goals simultaneously. They accelerate investment in resource efficient technologies and new industries, while managing costs and risks to domestic taxpayers, businesses, communities and consumers.

The Future We Want, the outcome of the Rio+20 Sustainable Development Summit, recognizes the vital role for green growth strategies, which “*should contribute to eradicating poverty as well as sustained economic growth, enhancing social inclusion, improving human welfare and creating opportunities for employment and decent work for all, while maintaining the healthy functioning of the earth’s ecosystems*” (UNCSD, 2012).

Green growth strategies are, in part, a response to the serious risk now posed to the global economy by increasing pressure on the environment. Resource scarcity is increasing and water, land, biodiversity, and other natural resources have become degraded. Therefore, transforming economic activity to improve efficiency and management of natural resources is vital to the stability and sustainability of the future economy – a green economy. Reducing environmental liabilities and risks is critical as well. Pollution of the air, water and land, biodiversity losses, and climate-related hazards can endanger economic and social development if not proactively addressed. But this is not the only reason why green growth strategies are becoming increasingly popular among governments and reaching a new stage of maturity – green growth can unlock substantial economic, social and environmental benefits for societies and enable synergies between them.

- **Green growth can enhance efficiency and productivity.** Green, resource efficient technologies and practices often save resources and money compared to conventional alternatives. They enhance competitiveness over the long term, and sometimes in the short term.

- **Green growth can underpin industrial policy and macroeconomic goals.** Growing demand for green technologies, products and services – domestically and internationally – offers countries opportunities for developing new industries and markets.
- **Green growth can improve quality of life and, if designed and implemented well, can address social equity issues.** By reducing environmental degradation and conserving vital natural resources, governments can enhance the quality of life for citizens, especially the poor who are particularly vulnerable to natural resource limits and environmental damage.

While further evaluation of long-term impacts is required, there is emerging evidence that green growth works. Growing numbers of national and subnational governments in all regions are achieving results in implementing plans, policies, and programs that accelerate private sector green investment and changes in consumer behavior. These programs are most effective where they respond to trade-offs associated with green growth and invest in initiatives to mitigate the risks and costs of a transition to green development.

Some prominent examples of government leadership on green growth are presented in Box A. Many of these and other countries have carried forward their visions into implementation programs that are achieving concrete results, while others are still at the early stages that have not yet realized impacts.

Box A

Examples of governments adopting green growth strategies

Chile launched the National Green Growth Strategy in December 2013 outlining a set of actions over the short, medium, and long term (2014-2022). Actions include implementing environmental management instruments, promoting the market for environmental goods and services, and monitoring and measuring progress (Government of Chile, 2013).

China has committed to green growth in its 12th Five Year Plan. Actions include investing in natural resource management, with the aim of creating one million new forestry jobs and reducing rural poverty (OECD, 2013).

Germany's green growth policies have been an important engine for environmental innovation, enabling the development of an internationally competitive environmental goods and services sector particularly focused on renewable energy.

Korea has adopted a green growth strategy to drive economic competitiveness through development and use of advanced technologies. The government is investing in innovation and deployment programs for 27 priority

technologies guided by a Green Technology Roadmap with the goal of becoming the world's 7th largest economy by 2020 (Young et al., 2013) and a more recent emphasis on a 'creative economy' as the vision for green growth.

Mozambique launched the Green Economy Roadmap at the Rio+20 Conference on Sustainable Development, setting out its vision to become an inclusive, middle income country by 2030. In October 2013 the government approved the Plan of Action for 2013/2014 laying out the actions over the period of one year on the road to a green economy and is in process of linking the Roadmap to the long-term National Development Strategy 2015-2035 (WWF, 2013).

Rwanda released the Green Growth and Climate Resilience National Strategy for Climate Change and Low Carbon Development in October 2011. It aims to be a developed climate-resilient, low carbon economy by 2050, through the achievement of three key strategic objectives: energy security and a low carbon energy supply; sustainable land use and water resource management; and social protection and disaster risk reduction (Republic of Rwanda, 2011).

About this assessment

Initial reviews of green growth, green economy, low emission, low carbon and climate resilient development plans by the OECD (2011 and 2013), UNEP (2011), the World Bank (2012), UNESCAP (2012a), ADB (2013), AfDB (2012 and 2013), and UN et al. (2013) confirm that there is no single approach to green growth. They highlight common features and elements in the way that countries are developing their strategies, policies and measures for green growth.

This report, *Green Growth in Practice: Lessons from Country Experiences*, carried out by the Green Growth Best Practice (GGBP) initiative, is the first comprehensive international assessment of lessons from experiences of pursuing green growth across all levels of government and all regions. It engaged 75 authors in evaluating more than 60 programs around the world.

The report focuses on nine interlinked elements that are commonly used by governments in green growth analysis, planning, implementation, and monitoring, as illustrated in Figure A. These elements are not a linear, step-by-step process which has to be followed. Governments may choose different entry points or initiate several elements in parallel depending on the domestic context.

The authors identified specific good practices and lessons for each of these nine key elements. In the following section, we summarize these practices and lessons with supporting examples from countries, states and cities around the world. The full analysis is available in the subsequent chapters of this report.

Figure A:
Green growth topics addressed by GGBP



Effective practices for green growth

I.

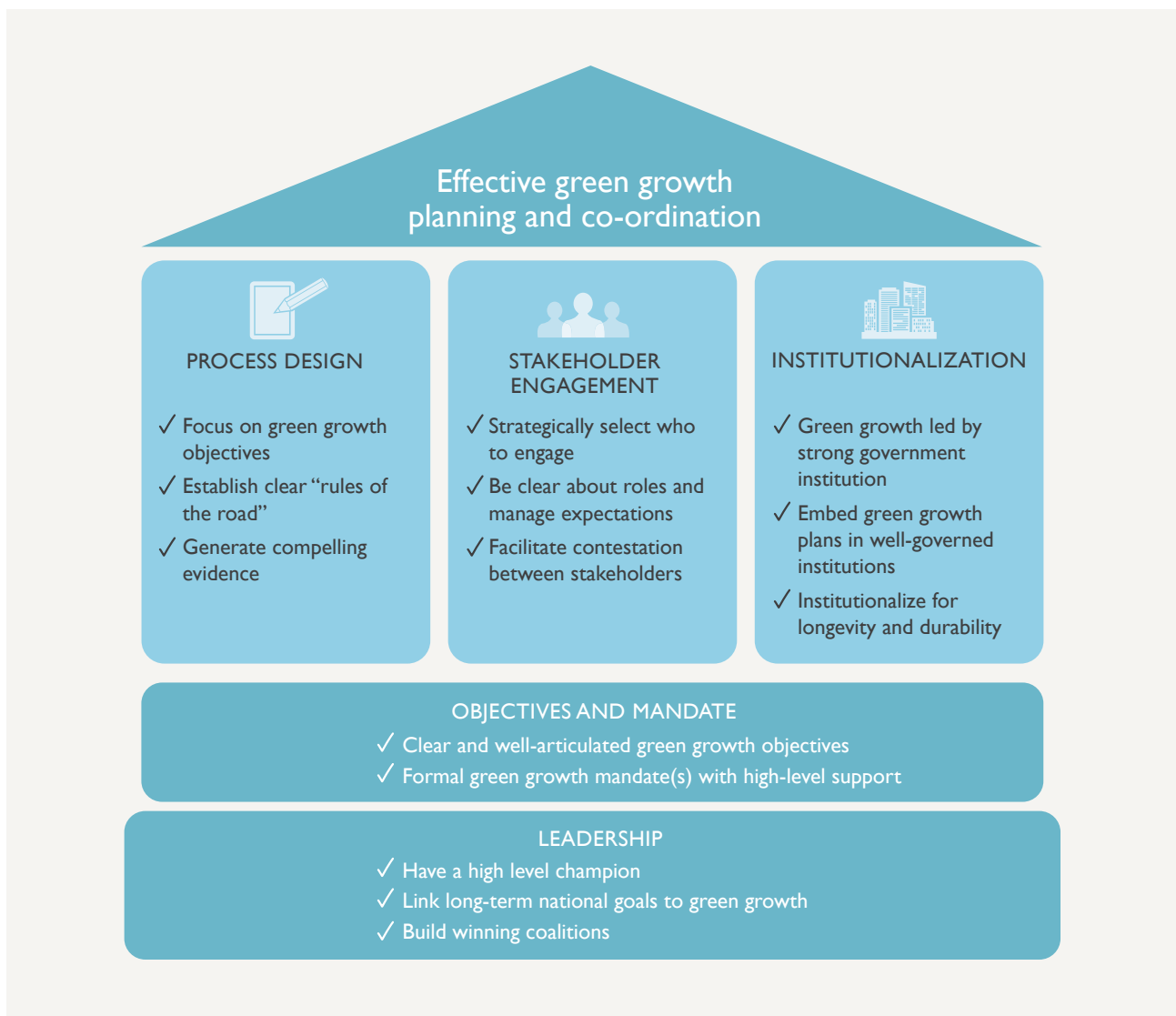
Employ well designed planning and co-ordination processes

Planning processes driven by high level government leaders, with strong mandates and objectives, and which employ deliberate stakeholder engagement, sound institutional governance, and credible analysis are of utmost importance in establishing enduring green growth programs. While governments have employed a wide variety of approaches to green growth planning and no one size fits all, the most successful ones are characterized by:

- Strong, high-level leadership, which links long-term national goals with environmental risks and opportunities and builds winning coalitions. The development of robust coalitions can also ensure that this high level support is maintained during political transitions and overcomes conflicting interests when the leadership changes (such as in South Korea and Mexico, Case 1).
- Clear economic, environmental, and social objectives reflected in formal outcome-based mandates which can range from presidential or inter-ministerial decrees, legislation or high level policy documents and are supported by strong institutional governance.

Figure 1:

Foundations for green growth planning and co-ordination



Case 1:**Examples of leaderships for green growth**

In **South Korea**, strong leadership from the President's office, followed by ministerial representation on the Presidential Committee for Green Growth, sent a strong message throughout the government that green growth planning and implementation was a priority (UNESCAP, 2012b). President Lee Myung-bak noted *"the challenge for Korea going forward is to recognize that we are entering a new stage in our development that will no longer permit us to conduct 'business as usual', without regard to the toll our economic activities are taking on the environment and, indeed, on future generations. ... It is imperative that we fundamentally change our economic strategy"* (Lee, 2009). The new Korean government since

2013 has continued to support green growth, with shifted emphasis on the 'creative economy' as the vision that achieves green growth (Yonhap News, 2013).

In **Mexico**, President Felipe Calderon played a key role in driving the process of creating a national plan of action and legislation on climate change. His personal strong personal and political commitment to the environment and addressing climate change was reinforced by the experience of natural events, such as flooding in the south of the country that led to public demands for action and increased political sensitivity to the issue.

- Robust and adequately resourced planning and co-ordination process, designed to generate compelling evidence and overcome barriers. These processes should be designed as a sequence of steps and rules of the road, while allowing for adjustments along the way.
- Active processes of stakeholder engagement with clear roles and procedures to manage and resolve conflicting interests and contestation.
- Well-governed institutions able to manage a predictable long-term cycle of planning, implementation and review, aligning green growth policies with national development and protecting against political volatility and interference by interest groups.

2.**Establish clear visions, targets, and baselines**

Governments achieve greatest success when they define their green growth objectives in terms of a 'vision' for a desired end-state, at the end of an ambitious and long-term pathway of transformative change. This is usually accompanied by more concrete short and medium term goals related to economic growth, poverty reduction, employment, emission abatement, industrial growth, and natural resource protection. In many cases 'business-as-usual' scenarios are used as a baseline against which these stories about the future can be told. Examples of high level visions established by Cambodia, Guyana, and Japan are shown in Case 2.

Governments have achieved greatest success with use of visions, targets, and baselines for green growth when they:

- Establish a vision for long-term green growth transformation driven by support from high-level political leadership and supported through consensus building processes across stakeholder groups to achieve ownership.
- Establish integrated performance targets aligned with domestic economic, environmental, and social priorities, such as economic output, poverty reduction, employment, emission reductions, industrial growth, and natural resource protection.
- Establish both long and short-term economy wide targets, and short-term sector specific targets including for multidimensional poverty reduction and related social dimensions. Use long-term targets to ensure strategic direction and short-term targets to guide concrete actions and achieve immediate benefits.
- Underpin visions and targets with objective baselines where necessary. As part of the design and monitoring of integrated, coherent policy responses, it is important for these baselines to reflect as much as possible the linkages between key social, environmental, and growth indicators. Special attention is often required to identify green growth targets and baselines for poverty reduction and related social dimensions efforts to ensure green growth does not overlook social development objectives.
- Build close links between the vision and targets and the allocation of budgetary resources and policy mandates needed to achieve targets.
- Use metrics and methodologies that balance purpose with practical considerations related to cost, data availability, and capacity.

Case 2

Examples of high level green growth visions

Cambodia’s National Green Growth Roadmap.

“In Cambodia, green growth aims to unify development and environment objectives by means of implementing policies tailored to address the needs of all, including the most disadvantaged, to create jobs, to increase the resilience of the environment and of the population to adverse impacts, thus sustaining economic growth and human and environmental well-being in the long term. This Roadmap is also intended to promote women’s status for the realization of a gender-equal society.” (Kingdom of Cambodia, 2009)

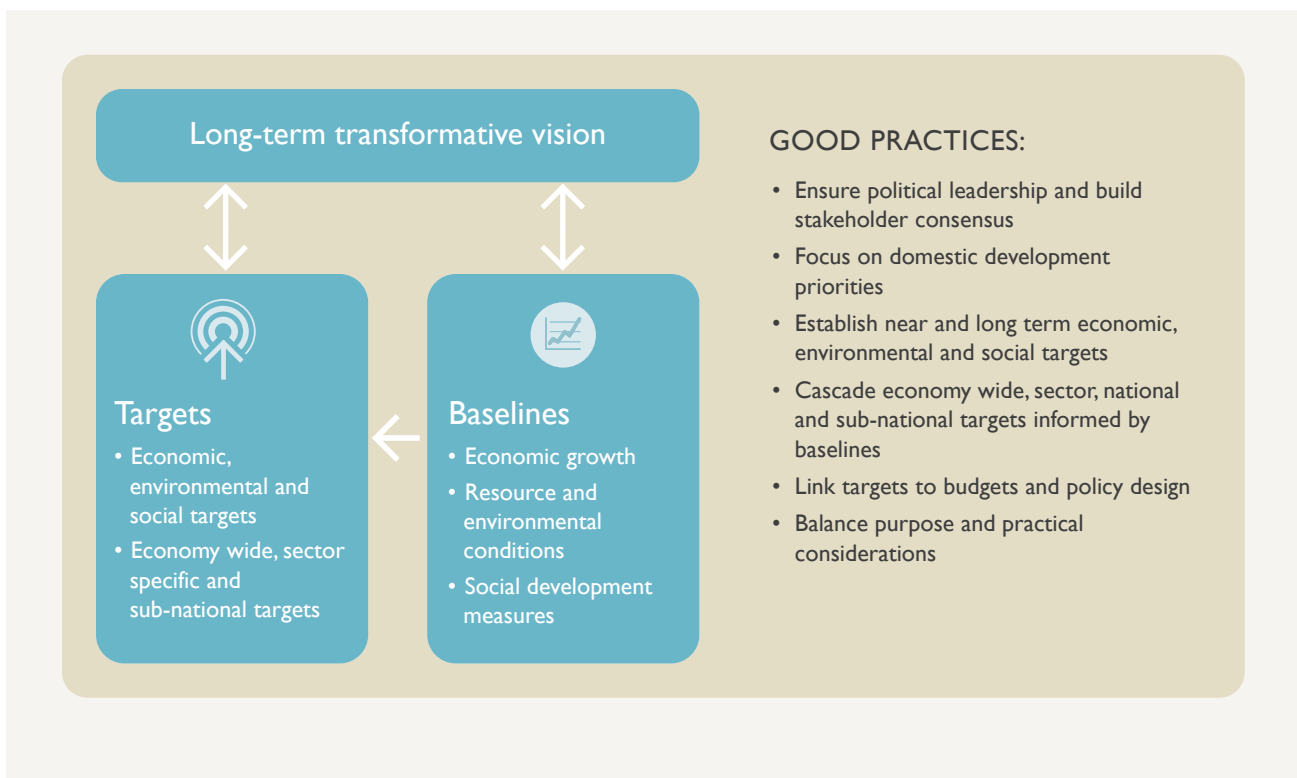
Guyana’s Low Carbon Development Strategy. The key focus areas of the strategy are investments in low carbon economic infrastructure; investments in high-potential low-carbon

sectors; expanding access to services and new economic opportunities for indigenous, forest communities; improving social services and economic opportunities for the wider Guyanese population; and investments in climate change adaptation infrastructure. (Republic of Guyana, 2010)

Japan’s Comprehensive Strategy. Four key policy areas of the strategy are ‘Green’, ‘Life’, Agriculture’, and ‘SMEs’. The philosophy is to *“construct a resilient and adaptable socio-economy and demonstrate model solutions to the world by addressing energy constraints and an aging society; and build local communities driven by individuals and entrepreneurs supported by local agriculture to reap the benefits of a new kind of growth.”* (Government of Japan, 2012)

Figure 2:

Vision, baselines and targets as part of green growth planning



3. Undertake robust analysis and balanced communication of the benefits of green growth

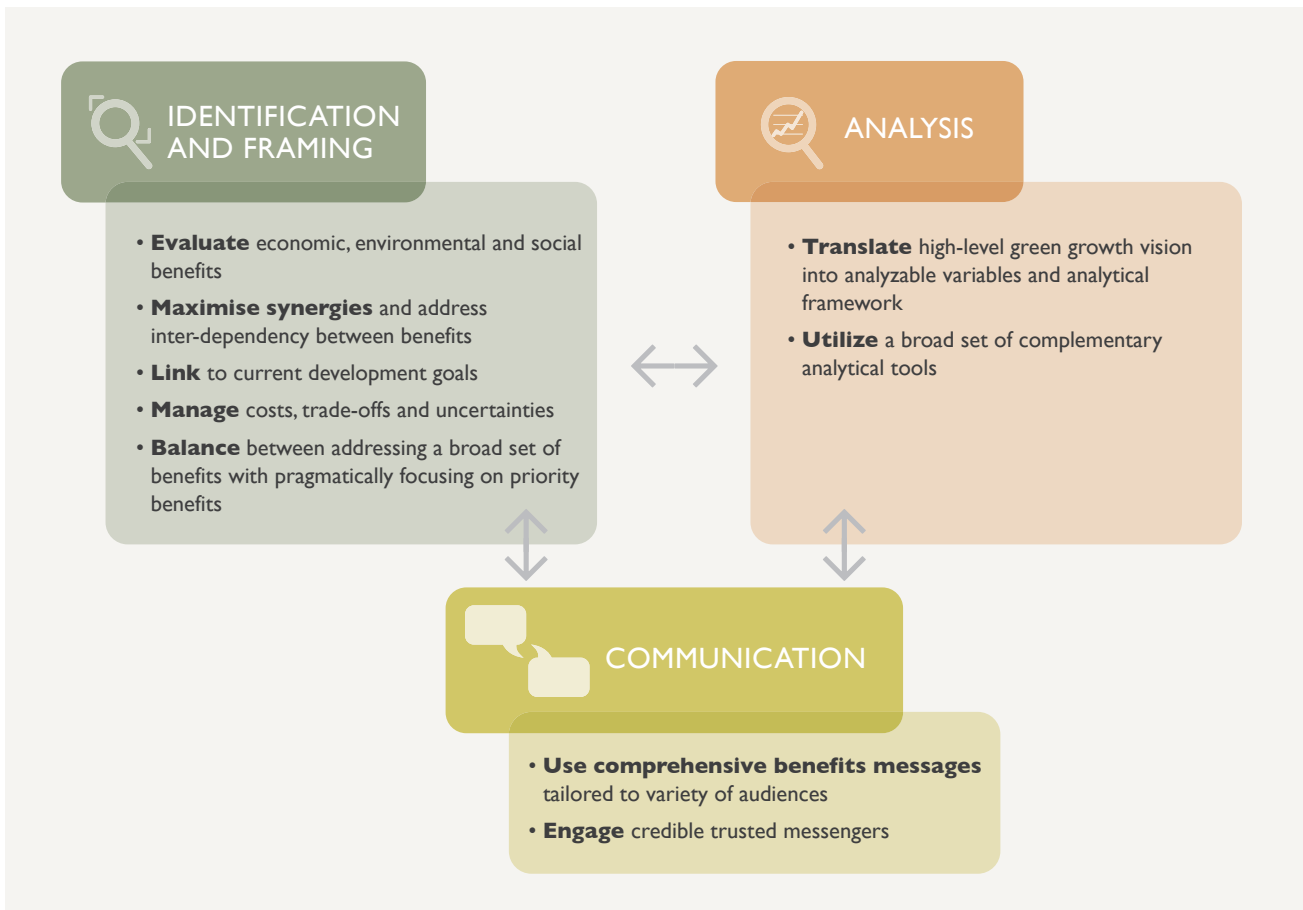
A green growth development pathway can offer a broad range of economic, environmental, and social benefits. Governments that are successful in pursuing green growth focus on leveraging the synergies between these three dimensions, while managing the trade-offs efficiently and seeking to facilitate transformational change, especially the de-coupling of growth from natural resource depletion and improving climate resilience.

There is no uniform model of green growth, nor a set of universal aims or benefits. The appeal of green growth will be stronger in some countries than others and must be defined locally based on domestic preferences and circumstances. Governments need to conduct credible analysis of priority benefits to build a strong case for green growth and

communicate these benefits in a comprehensive, robust and balanced way. Key lessons from experiences of identifying, assessing and communicating the benefits of green growth are:

- Evaluate a range of economic, environmental and social benefits in a manner that addresses their inter-dependency and links these benefits to current development goals and plans.
- Seek to maximize synergies (such as attracting investment in innovation, creating green jobs and industries, conserving natural capital, advancing sustainable rural livelihoods, etc.) between development outcomes and manage the costs, trade-offs and uncertainties.
- Balance the value of addressing a broad set of benefits and associated synergies, costs, and trade-offs, with the pragmatic value of focusing on a key sub-set of priority benefits and identifying and communicating short-term benefits along with longer term ones.

Figure 3: Identification, analysis, and communication of benefits



Case 3:**Benefits identified in Ethiopia's Climate Resilient Green Economy (CRGE) Strategy**

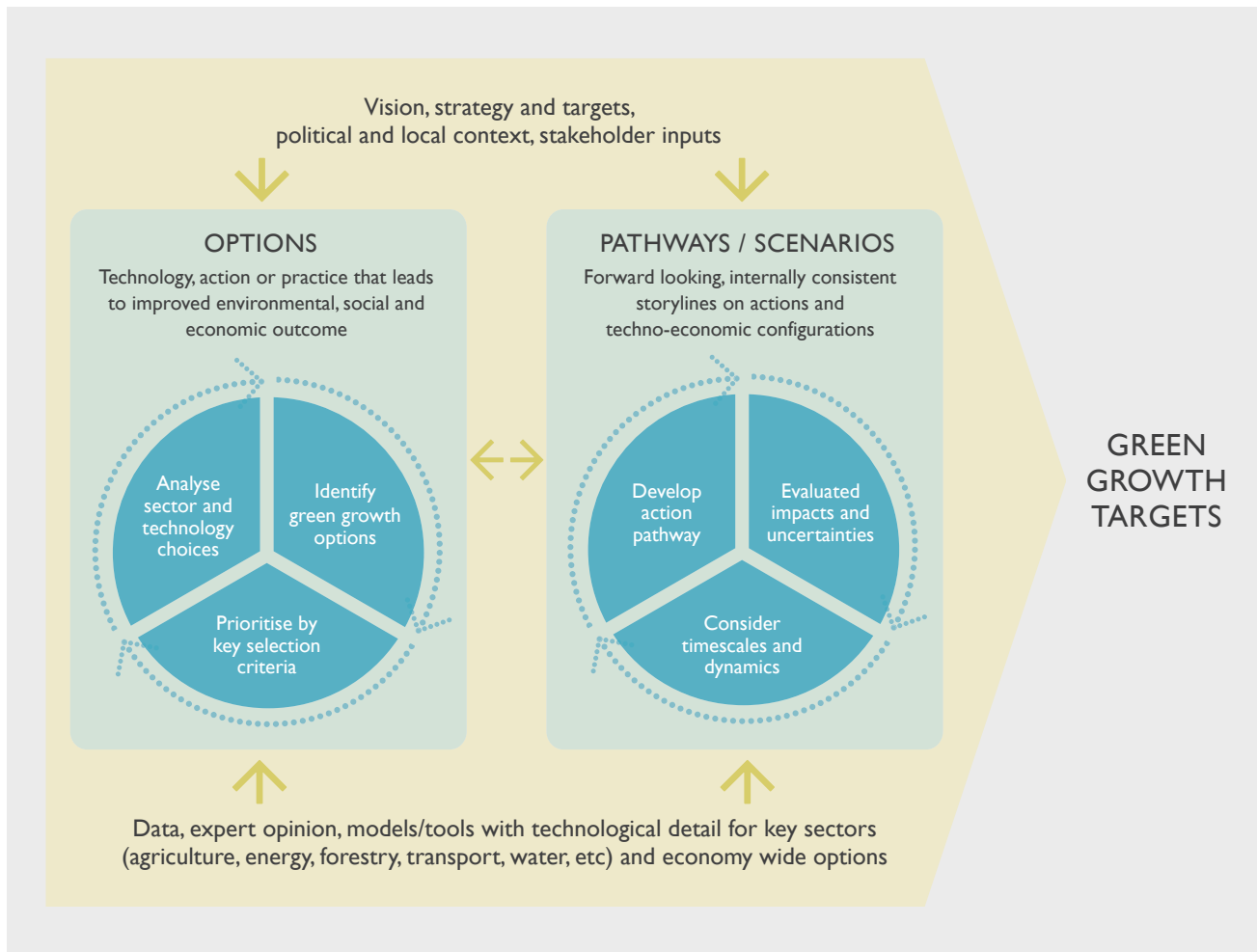
Ethiopia's main framework for green growth focuses on how climate change resilience and greenhouse gas mitigation is crucial to achieving its economic and social goals of becoming a middle-income country by 2025. It considers synergies between economic development, poverty reduction, climate change mitigation and resilience across all sectors of the economy (Federal Democratic Republic of Ethiopia, 2011). Agriculture, energy and water are key sectors. In agriculture benefits include increased productivity, enhanced food security, jobs and stability of export income (through crop diversification). In energy and water compelling benefits come from expanding energy access and security and reducing economic and social vulnerability. At the same time, the country has to manage trade-offs in making policy decisions

to improve the lives of the rural poor such as between forest conservation and increasing land for agricultural production. Possible solutions for managing these trade-offs are increasing the productivity of agriculture and providing economic incentives for forest preservation.

Ethiopia used a broad analytic framework for assessing green growth benefits. An Integrated Assessment Model was used for macro-economic impact such as the loss of GDP from climate change impacts in the agriculture and energy sectors. The benefits (and costs) of each option were assessed using multiple criteria that ranged from economic cost-benefit ratios, to qualitative assessments of the benefits for biodiversity and poverty reduction. A relatively basic spreadsheet-based analysis was used to assess sector specific benefits.

- Translate the high-level vision on green growth into a concrete set of analyzable variables on benefits and a robust benefits analysis framework.
 - Utilize a broad, though not necessarily complex, analytic framework that integrates a number of complementary approaches. For example, Ethiopia (Case 3) has employed 'extended' cost-benefit analysis in addition to other approaches such as macroeconomic assessments and isolated assessments of individual benefits.
 - Use comprehensive benefits messages to address the variety of audiences affected by green growth, including tailoring of messages to different 'value groups' who will have different entrenched interests.
 - Engage credible and trusted messengers in presenting robust, tailored, and balanced messages to offer evidence based argument for deviating from business-as-usual.
- 4.**
- Prioritize measures and technologies and construct credible pathways towards formulated targets**
- Selection of technologies and policies to achieve a desired outcome requires robust evaluation of options through consultative processes. Key lessons from effective approaches are:
- Top-down approaches to green growth analysis and planning need to be supported by bottom-up analysis of concrete actions and options. The analysis should consider options across a broad range of sectors (including agriculture, energy, forestry, transport and water), economy-wide goals (such as poverty reduction, natural asset protection and resource efficiency and employment), and their impact on different groups, including the poor (see the Mexico example in Case 4).
 - Use alternative pathways to explore the scale and pace of change required in different sectors and highlight the choices and actions that need to be made over time, along with uncertainties.
 - Apply an iterative process to analyze options, identify priorities and combine them into pathways for near and long-term green growth transformation. The analysis can start simple and increase in complexity over time, and with the input of stakeholders.
 - Choosing priorities and pathways for green growth requires clear assumptions, reasonable data and active stakeholder engagement.
 - The choice of analytical tools and approaches should be deliberate and driven by the local context of key economic, environmental, and social drivers, without letting the tool drive the analytic direction.
 - Combining outputs from different types of analysis can improve the consistency and robustness of results and address limitations of individual tools.

Figure 4:
Options, pathways and scenarios as part of green growth planning



Case 4:

Options analysis for the Mexico’s Low Carbon Plan

In 2009 the Government of Mexico published the Special Climate Change Program (PECC) which sets out a broad program to achieve a long-term climate change agenda of reducing emission by 50% by 2050 compared to 2000 level, and medium-term and sectoral goals for adaptation and mitigation.

Good underlying data on emissions and economic activity by sector enabled rapid analysis of potential measures and technologies for emission abatement. A range of tools were

used including the long-range energy alternatives planning (LEAP) system, the Computable General Equilibrium (CGE), Marginal Abatement Cost Curves (MACC), Input-Output (I-O) models and cost-benefit analysis. Using a range of tools allowed different aspects to be addressed which helped to improve robustness by drawing on the particular strengths and overcoming the limitations of each type of tool.

(UNESCAP, 2012c)

5.

Design portfolios of policies to address near-term development and longer-term green growth transformation goals and respond to specific market failures and political economy challenges

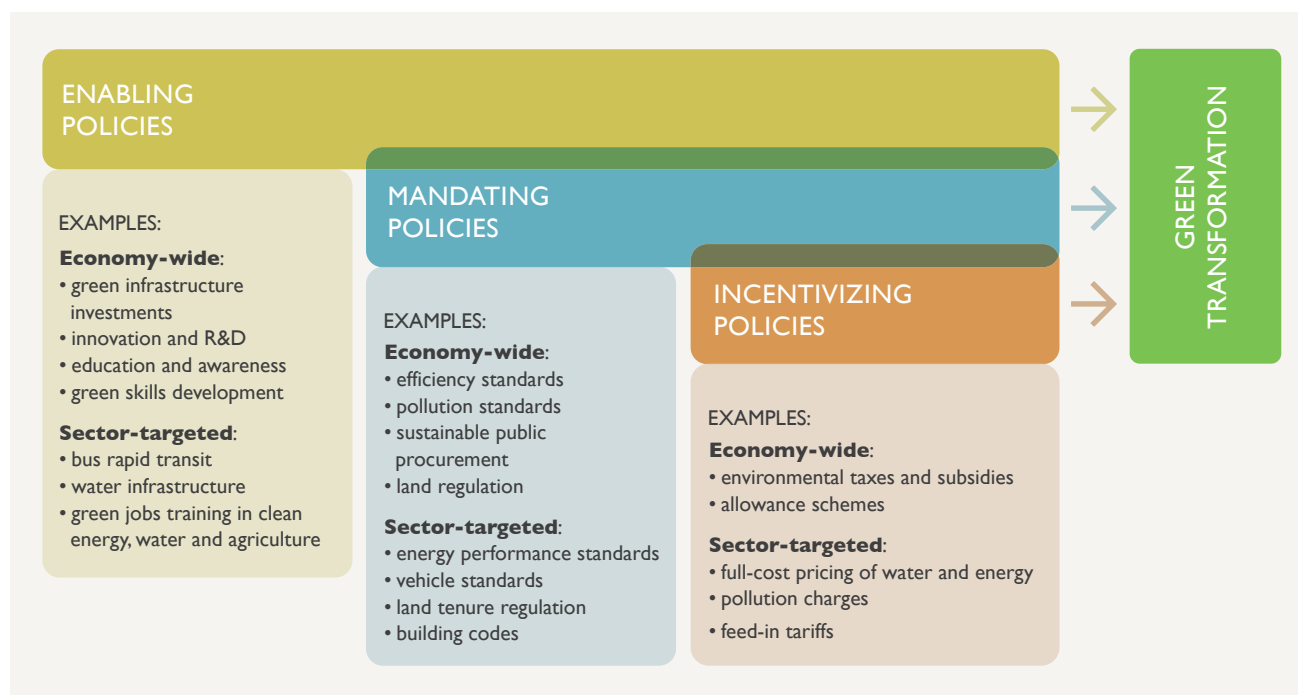
Governments pursuing green growth recognize the need for comprehensive and coherent policy reforms and developments to enable transformational change across the economy. Both economy-wide and sector-targeted policies are needed to achieve structural and behavioral change among consumers and producers and to mobilize private investment. These policies must address market failures, deal with political economy challenges, employ strong governance and enforcement regimes, and be integrated with other existing policies. Green growth policy lessons from current practice are:

- Apply a mix of policy instruments to achieve short term ‘wins’ and support long-term transformation. This can include fiscal or price signals that incentivize action, regulations and standards that mandate changes in practices, and policies that enable the transition through direct government support, such as for innovation and infrastructure, and information and education programs to enable workforce development and build public awareness.

- In design of a portfolio of green growth policies that includes the above types of instruments, give special attention to green innovation policies and labor and skills development which are essential for green growth transformation:
 1. Green innovation policies can decouple economic growth from environmental and natural resource depletion by advancing both ‘breakthrough’ technologies and local innovation by small and medium enterprises, micro-enterprises, and community groups.
 2. Labor and skill development programs can improve competitiveness and avoid bottlenecks to investment, increase employment opportunities, smooth the transition of workers from declining sectors, and reduce social inequalities especially for marginalized or lower skilled workers.
- Couple consistent and coherent policy instruments across green growth sectors and at national and sub-national levels that address multiple green growth goals with strong governance and enforcement.
- Design policies based on an understanding of resource limits and environmental threats to achieve development paths that protect and apply natural capital to accelerate and not hamper economic and social development.

Figure 5:

Policies for green transformation



Case 5:**The Singapore Green Plan 2012**

Singapore first launched its Green Plan at the World Summit on Sustainable Development in Johannesburg in 2002, and it has been reviewed and upgraded at 3 year intervals since then (MEWR, 2006). The plan is driven by concern for quality of life and resource security in the city state, as well as securing a clean and green image as a means to attract investment. The plan includes regulations and standards, pricing systems, demonstration programs, consumer behavior change campaigns, information management, and other policies. It addresses air quality, climate change, water, waste, nature conservation and public health. Singapore's government has

invested significant resources in achieving its environmental goals, and has met most of its 2012 goals. In 2009 the Inter-Ministerial Commission on Sustainable Development launched a longer term Sustainable Singapore Blueprint which sets out stringent sustainable development goals to 2030. These include ambitious targets for energy efficiency, water consumption, air quality, public transportation, water catchment areas and green buildings. One feature that has enabled Singapore's success is the use of a comprehensive mix of policies and measures tailored to each environmental goal.

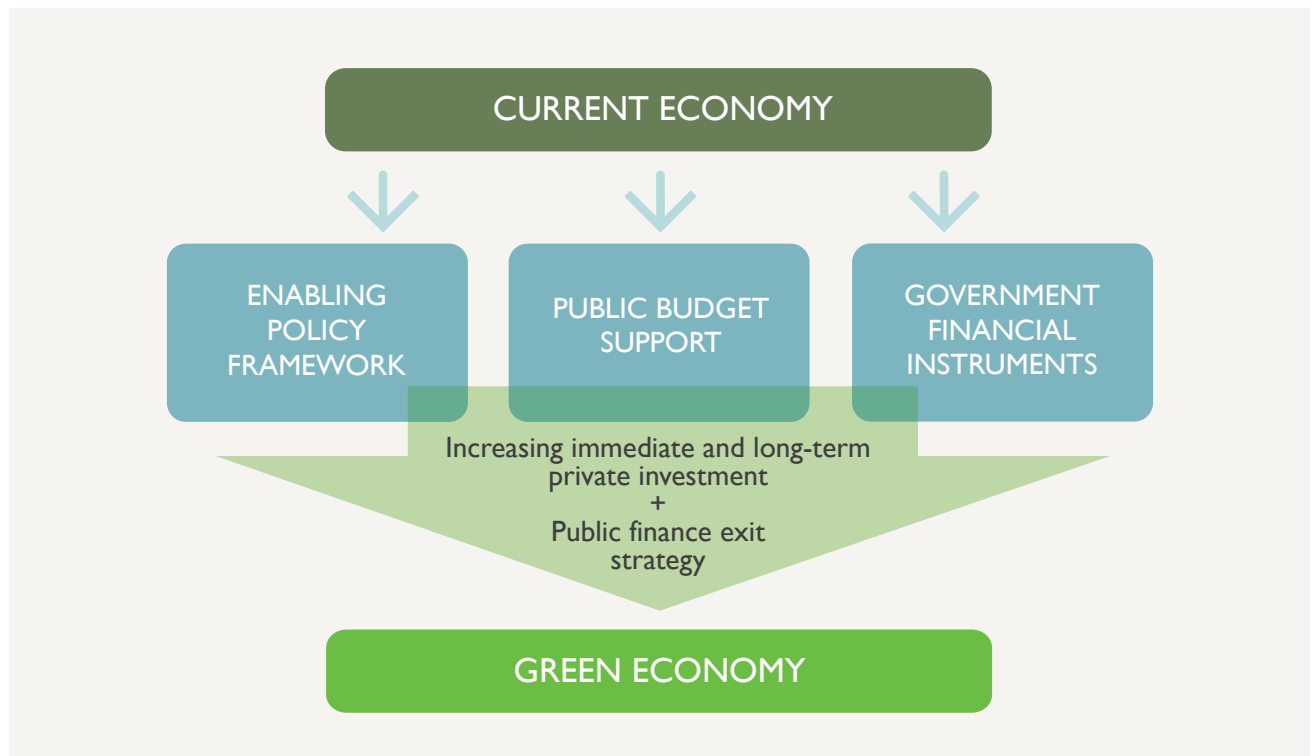
6.**Design public finance instruments to overcome barriers to mobilizing private investment into green growth sectors**

Transition to green growth depends on large-scale shifts in capital mobilization. Successful financing strategies for green growth create the market conditions for these mostly private sector investments to take place and overcome barriers such as investment risks, insufficient rates of return for some green technologies and practices, competing subsidies and policies, insufficient capacity, information gaps, and regulatory and institutional barriers. Effective green growth financing strategies combine three primary roles in mobilizing private green growth investment through: i) creation of an effective enabling environment for long term green investment; ii) allocation of public budgets and investments, including through dedicated funds and/or financial intermediaries to encourage green growth; and iii) tailored application of financial instruments to mitigate risks and increase returns on investment to mobilize private green investment. These strategies are most successful where they have the following features:

- Create an enabling framework that provides green price signals, investment grade policies, removes market barriers, aligns economic drivers, and supports early market projects and green products and entrepreneurs.
- Effectively allocate and manage public investments, including budget support for green growth programs implemented by national and sub-national agencies, dedicated funds for green growth, loan and equity investment programs, and support for dedicated market and project development institutions. Such public funding support should be fully integrated with current fiscal frameworks and strategic plans and have strong governance systems.
- Employ instruments to mitigate the financial risk and improve the return on private green investment, such as concessional loans, green lines of credits, guarantees, and insurance mechanisms, and ensure they are transparent, coupled with policy instruments, and provide appropriate levels of support and do not crowd out private capital.
- Team with central banks, financial regulators, development finance institutions, institutional investors, and others to attract long term green financing through financial regulatory and reform measures; expanded consideration of environmental benefits and risks by banks, investors, and fund managers; and promotion of socially sound sustainable banking and investment practices.

Figure 6:

Role of public policy and finance in unlocking private investment in green growth



Case 6:

Payment for Ecosystem Services, Costa Rica

The government of Costa Rica introduced the Payments for Environmental Services (PES) program as a way to tackle the high deforestation rates in private forest lands. The PES program departs from basic concept of subsidies by acknowledging and providing compensation for the environmental services and associated economic activities provided by the forests beyond the commercial value of the wood.

PES is financed by a number of different sources - national, international, private and public. At the national level, Costa Rica has contributed more than US\$170 million of the national budget since its launch in 1993, mainly by

two mechanisms: a fuel tax and a water tariff. The funds from these sources are collected by the Ministry of Finance who then transfer them to National Forestry Financing Fund (FONAFIFO) which manages the PES program (FONAFIFO, 2013). The government also introduced a risk mitigation mechanism, the Environmental Service Certificates (CSA) which aims to capture resources from the private sector at national and international levels to pay for projects under the PES program. The CSA reduces transaction costs and provides greater flexibility by replacing bilateral contracts between FONAFIFO and the buyers (Rodriguez, 2012).

7.

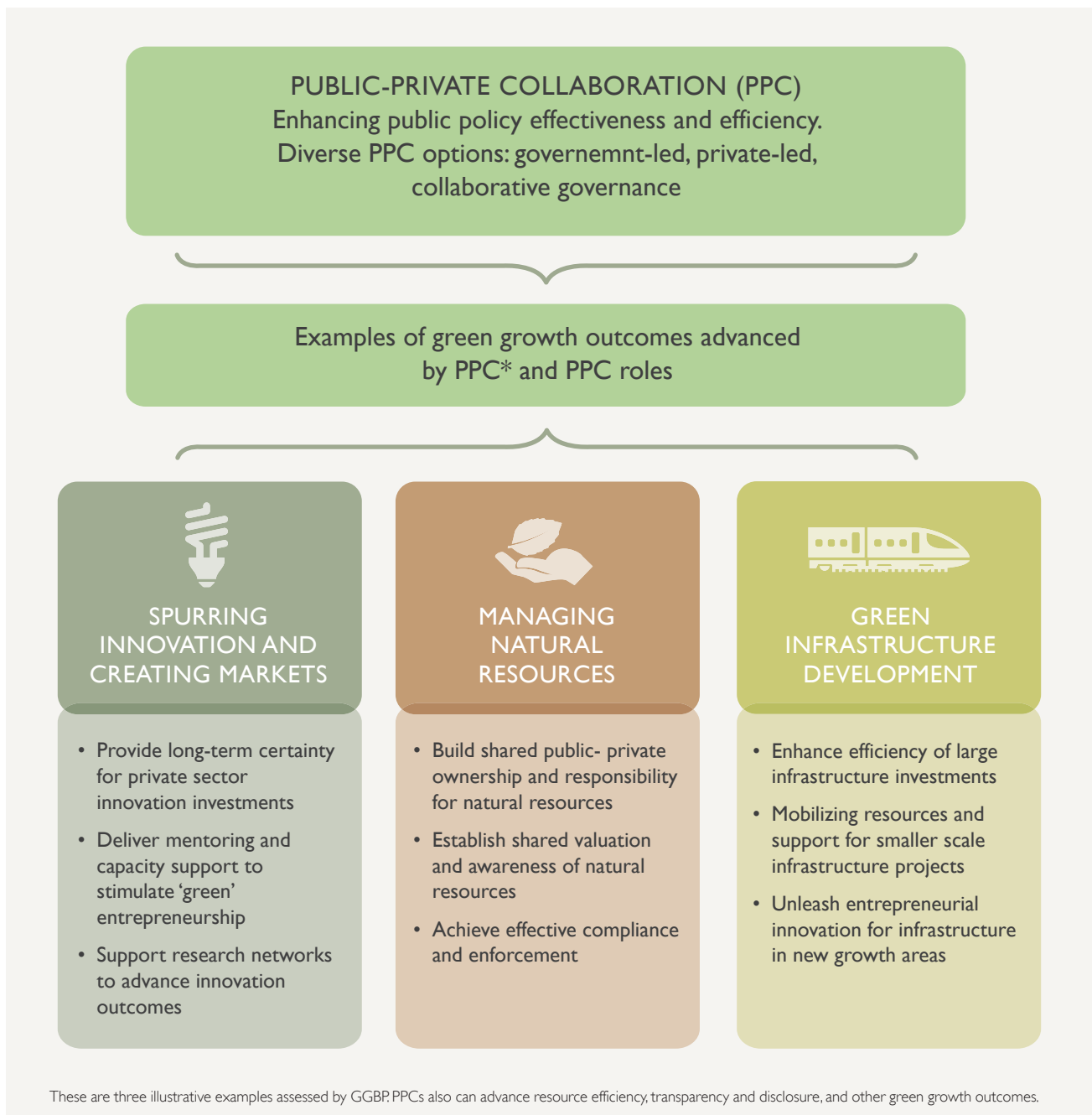
Tap the power of public-private collaboration

Successfully achieving green growth will require engagement from all parts of society to build new skills, unlock innovation, achieve more sustainable management of resources, and

create new visions and pathways for how economies are developed and communities interact. Strong government and private sector collaboration is an important tool to mobilize the resources, expertise, and innovative leadership needed to achieve green growth goals. Key lessons with design and use of public private collaboration include:

Figure 7:

Examples of green growth outcomes achievable through public-private collaboration



- The public sector can support green growth R&D and innovation processes by providing greater market certainty for innovators and facilitating capacity support to research and innovation actors (see Case 7).
- Public-private collaboration has proven effective in improving management of natural resources, especially where co-operation starts early in resource management planning and strengthens resource valuation and enforcement.
- Close government and private sector co-operation is essential in mobilizing increased public and private investments in green infrastructure for large public goods and for smaller distributed systems, while also supporting entrepreneurial innovation in emerging technologies and business models.
- Pursue public-private collaboration only where all parties are making substantial long-term commitments and have carefully considered the risks, costs, and benefits and where it is an appropriate mechanism that has clear value to governments and private sector partners.
- Design collaborations through forums that establish trust and promote both scale-up and innovation. Develop shared visions and clearly articulated goals and responsibilities, create transparency and accountability, and achieve deep and thorough stakeholder engagement.

Case 7:

Netherlands innovation agreements

In the Netherlands, companies, research institutes, universities and the government collaboratively drafted agreements to stimulate innovation and improve economic competitiveness. These agreements set sector-wide research agendas, commit participants to invest financial and human capital towards R&D and describe measures, plans, deals and targets. The government has such agreements in place with nine sectors: agriculture, horticulture, high-tech, energy, logistics, the creative industry, life sciences and health, chemicals and water. In the energy sector, for example, agreements focus on wind,

bio-energy, smart grids, green gas, solar and energy efficiency (Bunzeck, 2013).

A 'Top Consortium for Knowledge and Innovation' develops a research agenda, establishes collaboration between participating actors and disseminates knowledge to develop innovative products, services and technologies. The government co-funds innovation by top consortia and invests EUR 0.25 for every euro invested by a company (Government of the Netherlands, 2011).

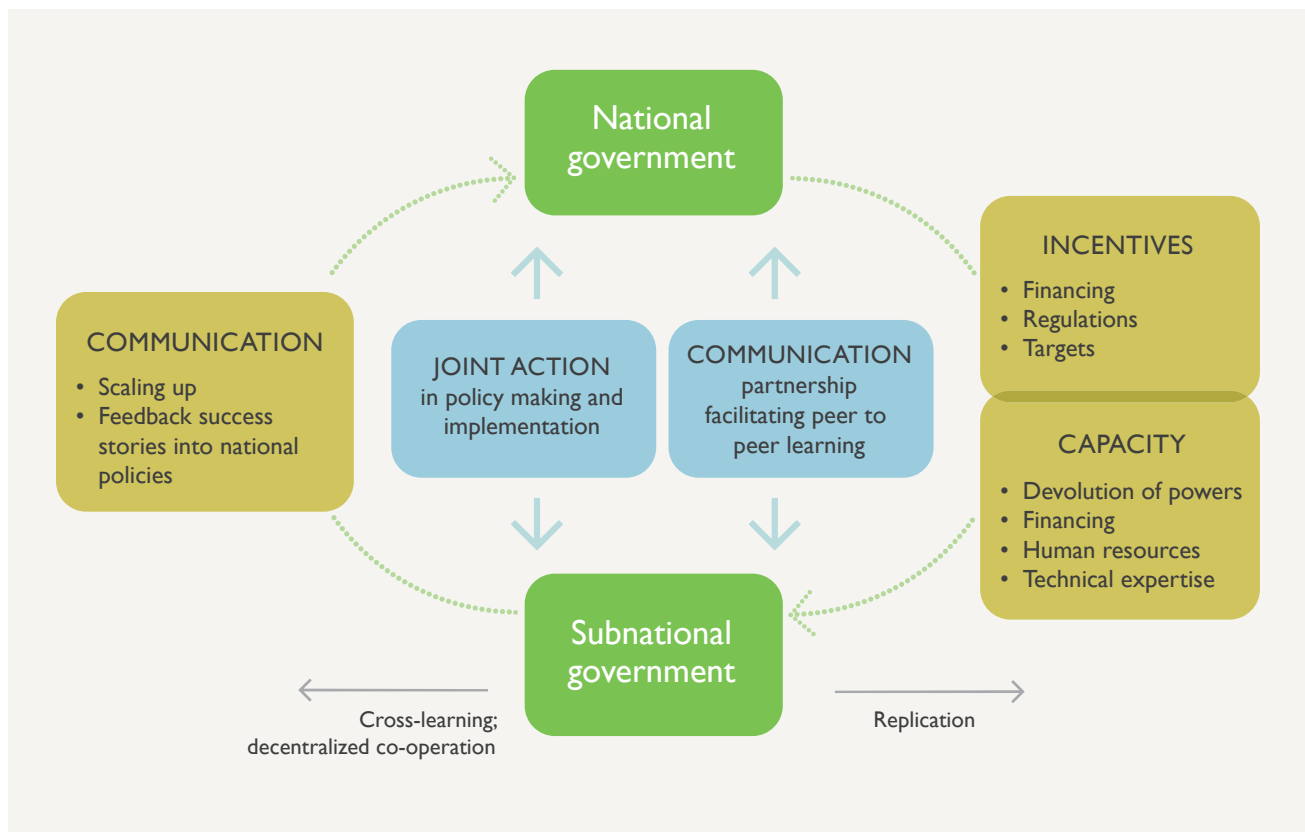
8.

Pursue mutually reinforcing action across subnational and national levels of government

Along with nationally led green growth programs, an increasing number of subnational governments are implementing green growth initiatives and in some cases are leading or catalyzing national efforts. Successful implementation of these national and subnational efforts requires close collaboration to enable activities to be mutually reinforcing, including:

- Developing interlinked green growth national and subnational strategies and measures where national governments enable and motivate subnational replication, and state and local governments provide leadership and support for national goals.
- Establishing financial incentives, regulations, and targets to motivate and support subnational governments in promoting green growth.
- Enabling subnational government to implement green growth by empowering them with mandates, providing financial, human and technical resources and encouraging peer learning.
- Facilitating dialogues between subnational and national governments that provide feedback of success stories at the subnational level and actively engage stakeholders who can bridge and help sustain actions across governmental levels.

Figure 8:
Model of national and subnational integration



Case 8:

Jiha Tinou Programme, Morocco

The National Agency for the Development of Renewable Energy and Energy Efficiency (ADEREE) launched the Jiha Tinou pilot program in Morocco (2012-2014) with a long-term goal of reducing energy dependence, and increasing the use of renewable energy at the subnational level to contribute to the national energy targets for 2020 (ADEREE, 2012).

Three municipalities were selected via a call for proposals for the pilot program based on criteria such as previous involvement in renewable energy development. The national government launched the ‘advanced regionalization’ process in

parallel with ‘decentralization reinforcement’ which provided a legal framework for transferring resource authority to subnational levels of government, thus allowing regions and territories to have ownership of their renewable energy and energy efficiency. Although early in its implementation, the program has contributed to mainstreaming energy considerations in territorial and urban planning, active interaction between municipalities and international partners, and establishing quantitative targets and roadmaps to assess and quantify local impacts.

9.**Build and maintain robust green growth monitoring and evaluation systems**

Effective monitoring and evaluation (M&E) systems enhance learning, decision-making and management, strengthen government accountability, improve public trust and enable stakeholder participation. Such systems should be built and maintained to assess, track, and communicate green growth progress and results. Governments have greatest success with green growth monitoring and evaluation where they:

- Incorporate monitoring and evaluation indicators which cover the most important economic, environmental and social policy objectives for the country or region.
- Combine a small number of easy-to-communicate headline indicators with more detailed sets of indicators.

Headline indicators such as resource productivity and natural asset base, as well as composite indicators like the Ecological Footprint, synthesize or aggregate complex environmental, economic, and social data into metrics that are easy to communicate. Detailed indicator sets allow for monitoring of the various underlying changes required to achieve green growth in key sectors such as energy, transport and agriculture.

- Establish institutional arrangements that involve key government units and stakeholders, are fully accountable and transparent, provide clarity on roles and link with existing monitoring and evaluation systems.
- Share monitoring and evaluation information in a timely and audience-appropriate manner using communication methods and channels to target and engage green growth relevant stakeholders with often divergent interests.

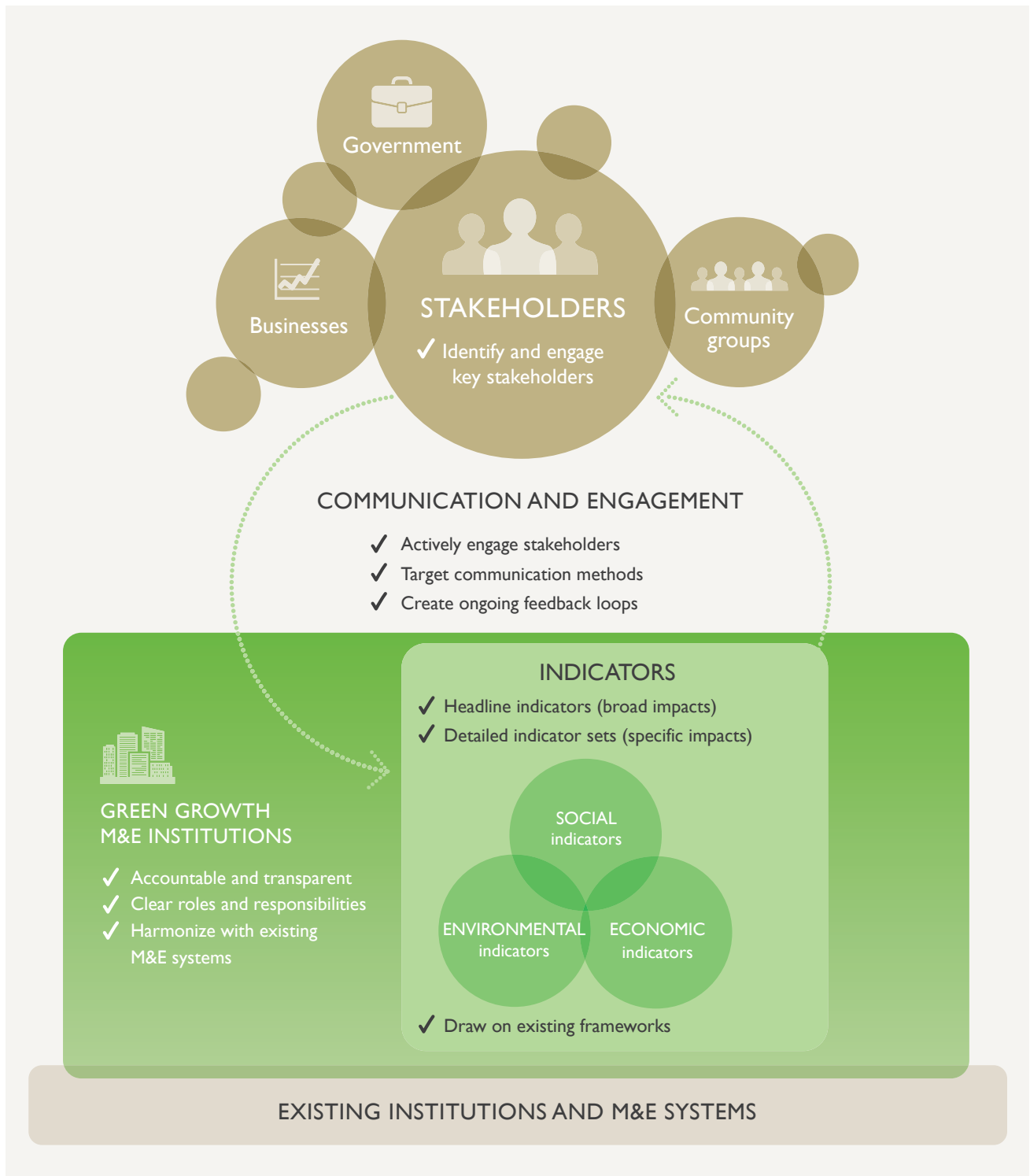
Case 9:**Karnataka Watershed (Sujala) Project, India**

From 2001 to 2009 the World Bank invested USD 100.4 million into watershed management and poverty alleviation in rain-fed areas of India. The program employed a systems approach, with a focus on soil and water conservation and sustainable resource use, and used participatory planning and implementation to improve local livelihoods, gender equity, and community capacity.

Monitoring and evaluation was a key facet of the program. It was conducted by the Indian Space Research Organization (Antrix), combining remote-sensing data with on-the-ground monitoring techniques, including a household survey with baseline and control group, focus group discussions, participatory observations, thematic studies, and case studies. It measured quantitative and qualitative indicators before, during, and at the end of the project, as well as after the project's withdrawal. It also included a systematic database that integrated large volumes of data, provided a flow of reliable and timely information that helped monitor the project's physical and financial progress at all levels, and generated reports to provide comprehensive data to program managers and beneficiaries. (World Bank, 2013)



Figure 9:
Monitoring and evaluation of green growth



Conclusion

In summary, the GGBP review of country experiences has found that:

Green growth can unlock substantial economic, social, and environmental benefits. Green growth strategies enable governments to achieve significant near and long-term benefits in economic growth, environmental protection, and poverty reduction. These synergistic benefits can be achieved through improvements in resource efficiency and management, support for green technology and business innovation, and investment in initiatives to mitigate the risks and costs of this transition to green development.

Integrated and robust planning, analysis, implementation, and monitoring are essential. Green growth strategies tend to be most effective where they link robust and credible planning, analysis, implementation, and monitoring processes in an iterative and reinforcing cycle and with active stakeholder engagement. Regardless of whether green growth starts with a head of state as champion or through action at the subnational level, successful strategies couple robust planning and co-ordination processes across different levels of government, thorough evidence and analysis, coherent policies and financing measures, strong partnerships with the private sector and other stakeholders, linked national and subnational action, and effective monitoring and evaluation that allows for ongoing refinements.

Broad support for transformative change is required. Green growth plans are most effective when driven by ambitious yet achievable visions with high level and broad government and stakeholder support. They should pursue both near and

long-term opportunities for dynamic shifts from the status quo in resource management, technology use, community development, industrial practices and competitiveness, education and worker training, and other factors.

Further efforts are needed to assess and validate the long-term and transformational benefits of green growth. While emerging evidence is demonstrating the value of green growth, this information is fragmented and is not yet adequate to determine the long-term economic, social, and environmental impacts of green growth and whether it is achieving the desired scale of transformation. Additional attention should be given to ongoing rigorous assessment of these longer-term impacts across countries and regions.

Greening growth represents a pathway for economic and social development that can sustain wealth creation and prosperity across society in a world threatened by global environmental risks and resource constraints. Governments in all regions face the challenge of fostering a transition to green development that enables durable economic growth and social development, while avoiding risks to public goods, natural assets, and social equality from the status quo. While not all encompassing, this Green Growth Best Practice assessment provides a strong foundation to inform and guide national and subnational governments as they address this vital challenge and seek to achieve sustainable development goals. It offers inspiring examples of green growth leadership around the world that can motivate others and create momentum towards more inclusive and sustainable economies.

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Introduction

Promoting healthy economic growth is a central preoccupation of policy makers, and a key test by which citizens judge the performance of their governments. Growth in economic productivity and output enables better living standards and more opportunity, creates jobs, and supports optimism and tolerance in the face of social and industrial changes. Rapid and sustained growth is the single most important way to reduce poverty. However, the quality and distributional impacts of economic growth also matter. Growth is not an end in itself but a means to enable broad-based progress in people's standard of living.

Long-term growth depends on directing natural assets towards more productive uses, and on improving *factor efficiency*; the quality of skills, infrastructure and technology that enables new possibilities. Thus economies become more resource efficient as they grow, creating 'more with less', allowing more people to benefit, and freeing up resources and attention to be turned to pollution control and environmental conservation.

However, efficiency improvements tend to be outpaced by growth in overall output. This pattern of economic growth has pushed critical global and local ecosystems towards the brink of irreversible tipping points, making the option of 'grow first, clean up later' untenable (Rockstrom et al., 2009). Many governments recognize that continuing with existing patterns of economic growth will lead to instability, natural resource scarcity, damage to vulnerable communities, and eventually a regression of development. Yet economic growth remains an immediate critical priority that cannot be ignored. (World Bank, 2012)

'Green growth' has gained international support as a way to reconcile the need for ongoing economic growth with the imperative of staying within environmental limits and maintaining healthy ecosystems (OECD, 2013; UNEP, 2011; World Bank, 2012; and UNESCAP, 2012). Furthermore it is recognized that there are specific complementarities between environmental measures and the lives and livelihoods of the poor. Environmental degradation is particularly serious for the poorest who tend to rely on natural resource intensive sectors such as agriculture, and who are particularly vulnerable to energy, food, water, and weather shocks. Measures which improve natural resource management, prevent pollution and reduce vulnerability to environmental risks will tend to benefit the poor (Smulders and Withagen, 2013).

The United Nations Conference on Sustainable Development (Rio+20) in 2012 marked the coming of age of the idea that green growth can be a means for achieving the long-held goal of sustainable development. The Rio outcomes document states that green growth "*should contribute to eradicating poverty as well as [achieving] sustained economic growth, enhancing social inclusion, improving human welfare and creating opportunities for employment and decent work for all, while maintaining the healthy functioning of the earth's ecosystems*" (UNCSD, 2012).

In both industrialized and emerging economies, governments have developed task forces, strategies, and plans in pursuit of green growth. Some prominent examples are presented below in Box 1.

These green growth strategies and plans are a response to a number of key drivers:

1. **Money can be saved:** technological advances and rising resource costs make green technologies increasingly competitive compared to other options.
2. **New industrial opportunities emerge:** global or regional policy, technology and business developments create opportunities to develop new industries and compete for new markets.
3. **Resources scarcity threatens:** pressure on energy, water and natural resource supplies and the dependency of economic growth on resource availability makes securing sustainable long-term supplies of key resources essential.
4. **Climate change intensifies hazards:** hotter, dryer, or more volatile weather is already being seen and is having an impact on agriculture, forestry, coastal communities as well as infrastructure and supply chain logistics.
5. **Consumers demand environmental responsibility:** Whether driven by values or regulation, environmental factors may become competitive issues in global value chains and international consumer markets.
6. **The quality of the local environment matters:** local pollution of air, water and food supplies is a concern for citizens in many countries, and local quality of life is a critical factor in attracting mobile high-skilled individuals.
7. **Uncertainty about environmental policy becomes a risk in itself:** belief that policy action (for example to address climate change) will occur in the future, is leading to concerns about 'stranded assets', a reduction in the appetite for investment, and a plea for a consistent long-term policy framework (Green Growth Group, 2013; and Ellis et al., 2013).

Box I

Examples of governments adopting green growth strategies

Chile launched the National Green Growth Strategy in December 2013 outlining a set of actions over the short, medium, and long term (2014-2022). Actions include implementing environmental management instruments, promoting the market for environmental goods and services, and monitoring and measuring progress (Government of Chile, 2013).

China has committed to green growth in its 12th Five Year Plan. Actions include investing in natural resource management, with the aim of creating 1 million new forestry jobs and reducing rural poverty (OECD, 2013).

Germany's green growth policies have been an important engine for environmental innovation, enabling the development of an internationally competitive environmental goods and services sector particularly focused on renewable energy.

Korea has adopted a green growth strategy to drive economic competitiveness through development and use of advanced technologies. The government is investing in innovation and deployment programs for 27 priority

technologies guided by a Green Technology Roadmap with the goal of becoming the world's 7th largest economy by 2020 (Young et al., 2013).

Mozambique launched the Green Economy Roadmap at the Rio+20 Conference on Sustainable Development, setting out its vision to become an inclusive, middle income country by 2030. In October 2013 the government approved the Plan of Action for 2013/2014 laying out the actions over the period of one year on the road to a green economy and is in the process of linking the Roadmap to the long-term National Development Strategy 2015-2035 (WWF, 2013).

Rwanda released the Green Growth and Climate Resilience National Strategy for Climate Change and Low Carbon Development in October 2011. It aims to be a developed climate-resilient, low carbon economy by 2050, through the achievement of three key strategic objectives: energy security and a low carbon energy supply; sustainable land use and water resource management; and social protection and disaster risk reduction (Republic of Rwanda, 2011).

These drivers do not constitute a *general* argument that green measures are always good for the economy, or refute those who say that 'green growth' is an oxymoron, or at best wishful thinking. Rather they are factors that can combine to create *specific* opportunities which, if responded, to effectively can give a boost in economic competitiveness and welfare. They differ from country to country and sector to sector. They are also dynamic over time, as knowledge of environmental impacts and interdependencies increases, technology breakthroughs are achieved and international markets and policies respond (Zadek et al., 2012).

Academics and international institutions continue to refine the definition of green growth (UNDESA, 2012), and study the theoretical economic benefits that could be achieved (Pye et al., 2010; and Toman, 2012). However, equally critical is the development of practical experience of understanding and responding to the drivers, implementing policies to unlock the theoretical benefits, managing trade-offs and overcoming barriers.

While national experience and action is crucial, ultimately achieving a global transition to sustainable development depends on developing the means to manage environmental impacts across national boundaries; establishing equitable caps on critical emissions and negotiating the terms of sustainable natural resource use within shared ecosystems. The development of domestic green growth strategies does

not replace this imperative. However, it helps to shift the dynamics of international negotiation towards collaboration to achieve green growth goals in the name of domestic self-interest (Purvis, 2010).

It is clear that trends such as water stress, biodiversity loss, and climate change, and the international response to them, are already affecting the opportunities and risks that shape economies. Responding effectively requires national policies that attract private and public capital into investments which produce economic benefits in the face of environmental challenges. This cannot be left either to environmental specialists or to global, top-down, legalistic negotiations alone but must be brought into the realm of economic policy-making and national planning.

Green growth practice

Green growth programs are the practical expression of economic policy-making that takes environmental and social risks and opportunities into account. They are experiments in developing practices and policies to unlock tomorrow's industrial opportunities. They involve a different mindset and a different set of actors than those that have been involved in the quest for sustainable development over the past two decades. Most importantly, they involve national economic development and planning ministries as prime movers.

Green growth is a relatively young field of practice. Experience and research is emerging. For example, blueprints for development and application of green growth policies have been developed in the Asia-Pacific region (UNESCAP, 2012) and in Africa (AfDB, 2013). But as yet no global systematic analysis has been completed on how governments are coordinating the different external and internal interests, and navigating the opportunities, risks, and hazards. As more governments pursue green growth strategies, assessing experience and sharing lessons becomes crucial.

Initial reviews of national *green growth*, *green economy*, *low emission*, *low carbon* and *climate resilient development* plans by the OECD (2013), UNEP (2011), the World Bank (2012), AfDB (2012 and 2013), and UNESCAP (2012), confirm that there is no single model, but highlight common process elements in the way that countries are developing their strategies. The GGBP assessment therefore focuses on nine interlinked steps (including overall planning and co-ordination, and monitoring and evaluation) that are commonly used by governments in green growth analysis, planning, implementation, and monitoring, as shown in Figure 1.

Figure 1:

Green growth topics addressed by GGBP



Chapter 1 examines the different approaches that countries are taking to planning and coordinating their approach to green growth, while Chapter 2 highlights the experience of setting high level visions and targets.

For many governments, explicit green growth planning processes start with a commitment or call to action by one or more political leaders or influential stakeholder groups. In response to this call for action, a green growth planning and co-ordination process is established. This process creates accountability and transparency, fosters strategic engagement of key stakeholders, and drives activities across each phase of work. The planning process often begins with the articulation of a high-level vision of ambition for green growth, which may be communicated in terms of targets (and associated baselines to measure against).

Chapter 3 looks at how governments are identifying, evaluating, and communicating potential benefits, and Chapter 4 examines their experiences in analyzing and prioritizing pathways and technology options for strategic action to capture these green growth opportunities.

Green growth plans and ambitions are a response to the realization of the linkage between environmental risks and opportunities and domestic social and economic benefits. This linkage is driven by the key trends outlined above, which tend to make greener choices economically more attractive, and which if not responded to, could lead to investments becoming 'stranded assets'; exposed to escalating risks and costs in future. A range of tools and approaches have been developed to enable governments to integrate these trends and potential benefits into their economic analysis, and to develop scenarios to assist in decision-making.

Chapter 5 assesses the experience with green growth policy design to date, while Chapter 6 focuses in particular on the use of financing instruments by governments.

The case for government action to unlock green economic opportunities is often based on the existence of market failures which prevent people and businesses investing in choices (such as energy efficiency) that would increase economic efficiency, save natural resources and increase productivity:

- **Negative externalities** are not priced into the cost of resources, so polluters do not pay but instead impose costs on society.
- **Knowledge spillovers** lead to underinvestment in

research and development – firms are not able to capture the full benefits of investment in technology and skills.

- **Imperfection in risk/capital markets** caused by the operational policies of financial institutions prevent capital flowing to where it could best be used.
- **Principal-agent issues** mean that, for example landlords and housing developers underinvest in energy efficiency because they are not the ones who pay the energy bills.
- **Information gaps** prevent people from making economically efficient choices (such as judging which appliance is most cost effective).
- **Network effects** lock in old technologies, because co-ordination is needed to develop better systems for example for public transport, communications, logistics, or consumer acceptance (Jaffe and Stavins, 1994).

A toolkit of policies are demonstrated by different countries seeking to create the incentives, mandates, and enabling conditions necessary for the transformation to green growth. This includes removing perverse subsidies, putting prices on natural resources, instituting taxes or cap-and-trade schemes, and using public funding and authorities to address the barriers to green investment. Other public policies can also target specific market failures, for example, through regulations and standards, clarification of property rights, labeling and awareness programs, R&D and infrastructure investment, and workforce development (de Serres and Murtin, 2010).

These chapters explore lessons from early experiences with developing these policy portfolios and the associated financing mechanisms.

Chapters 7 and 8 explore how countries have sought to enable complementary and reinforcing action through public-private collaboration and through integration of subnational action.

The fact that significant cost-savings and future growth opportunities can be identified, indicates not that these opportunities are easy to unlock, but that powerful barriers and vested interests have tended to keep them unexploited. Accelerating change towards more resource efficient technologies, greener energy supplies and inclusive industrial development is not simply a matter of developing new business practices, products and livelihoods faster but finding ways to enable old ones to retire more quickly (Halle et al., 2013).

If green growth policies are not to rely on autocratic (and ultimately unstable) repressive measures, they must be able to address the legitimate concerns of citizens and business, and mobilize support at a local level and amongst investors and industry. Green growth strategies therefore need not

only to set national frameworks but to enable and reinforce action which enable particular industries, regions, and cities to experience industrial, economic, and environmental benefits through head-starts in new industries, enhancements to the technology and skill base, and better energy, transport, and buildings infrastructure (Huberty and Zachmann, 2011). These chapters draw on the examples of innovative partnerships and collaborative mechanisms between national and local governments and between public and private sectors, to explore how best these different institutions and sectors can work together.

The final chapter focuses on monitoring and evaluation.

However, this is by no means an after-thought. It is unlikely that a single round of policy reform and implementation can

unlock the full potential for green growth benefits; rather, green growth strategies are exercises in exploration in the ‘art of the possible’; taking steps that support new industries, build knowledge, create institutional capacity, enable constituencies of support and defuse barriers thereby enabling further cycles of social, economic, and institutional momentum, both domestically and internationally (Jacobs, 2012).

Ongoing monitoring and evaluation is crucial. Robust projections and analysis can help to chart an initial direction. But the process should be flexible enough to take advantage of new technologies and unexpected opportunities, and be able to abandon one approach if a better one becomes available.

There are strong linkages between the processes covered in each of the chapters in this report, since each step of green growth planning influences and should support other steps. Figure 2 highlights some of the most important connections.

Figure 2:
Inter-linkages between processes

Linked to all processes	Planning and co-ordination
	Monitoring and evaluation
	Integrating subnational action
	Prioritization of options and pathways



Specific linkages	Establishing vision, baselines, and targets	Assessing and communicating benefits	Policy design and implementation	Public-private collaboration	Mobilizing investment
Establishing vision, baselines, and targets		✓			
Assessing and communicating benefits	✓		✓		
Policy design and implementation		✓		✓	✓
Public-private collaboration			✓		✓
Mobilizing investment			✓	✓	

Of course, each process may be linked to many others, and this figure emphasizes just the strongest and most important linkages.

Green growth strategies which bridge industrial, economic and environmental goals provide a means to concentrate ambition, accelerate progress and overcome barriers. However, raising costs (such as energy costs) can also have real impacts on economic growth, job creation and poverty reduction, while policies which seek to use limited public funding to leverage larger private investment are vulnerable to being exploited by powerful insiders and overwhelmed by informational asymmetries.

Furthermore, there are dangers that green growth policies, even if they are successful in sustaining overall growth, may have negative impacts on the poor. Poor and vulnerable groups are disproportionately affected by energy price rises or the removal of subsidies (although these can be replaced with more targeted social protection). There is the risk of regulatory capture by elites and incumbents, while technology and capital intensive development also tends to exclude the poor (Dercon, 2012).

The opportunity, and potential for green growth therefore should not be interpreted as a call for maximum government support for every green industry, or for environmental leadership ambitions to override considerations of affordability and welfare. Strategic decisions need to be made about what to do, when and how best to overcome barriers. Green growth strategies must be carefully designed to maximize development benefits and mitigate costs for the poor, and to avoid pitfalls and hazards. They must be implementable from the starting point of the current institutional and political context that exists in each country.

The Green Growth Best Practice Assessment

The GGBP initiative started its assessment by asking policy-makers and practitioners what they want to know about green growth practice. More than 100 people shared their views through regional workshops in Africa, Asia, and Latin America, at international events, and through communities of practice such as the Low Emission Development Global Partnership and the Global Green Growth Forum. Their questions informed the development of the framework outlined in Figure 1. The assessment also builds on other consultations, including inter-regional and national consultations hosted by the UNDP and the UN Conference for Sustainable Development.

The questions the practitioners raised are grouped into nine clusters, representing the basic areas outlined in Figure 1.

1. What **planning and co-ordination** processes are most effective for delivering green growth?
2. Which approaches to **setting high-level visions, targets**

and **baselines** are most effective in supporting the design of feasible green growth programs?

3. What approaches to assessing and communicating the **benefits of green growth** are most successful at gaining decision-maker and stakeholder support?
4. What approaches to **prioritizing options and pathways** are most successful in supporting the design of feasible green growth programs?
5. What **cross-cutting policies and policy portfolios** are most successful at generating near-term benefits while enabling longer term social and economic transformation?
6. What **investment mobilization strategies** have been most effective at attracting resources for green growth?
7. What approaches to **public-private collaboration** are most successful in mobilizing private sector leadership?
8. What approaches to advancing green growth at the **subnational level** are most effective at achieving co-ordination and ambition?
9. What **monitoring and evaluation** approaches are most successful in informing policy learning and implementation?

These questions focus on process steps for governments in developing and implementing green growth strategies. Substantive issues such as the merits of particular technologies, or of policies for energy system transformation are not considered.

The aim was to create a report to serve three primary audiences:

- **Policy makers, program managers, and politicians** who establish the mandate and put green growth plans into practice;
- **Analysts** who conduct and manage assessments in support of policy-making; and
- **Planners and facilitators** who lead the governmental green growth processes.

The findings will also be of interest to the research community, and to private sector and civil society actors, as stakeholders in national processes and programs.

Author teams made up of technical experts, researchers and policy practitioners were assembled to answer each of the nine questions. In identifying national experiences to analyze, GGBP established its scope as focusing on *programs at national, state, provincial and local levels that are designed to achieve both economic growth and environmental protection together*. In particular we focused on plans and programs that:

- Form part of a comprehensive development framework for long-term economic, social, and environmental transformation;

- Foster efficient and sustainable use of natural resources;
- Aim to achieve socially-inclusive development;
- Aim to improve resilience to climate change and natural disasters;
- Aim to promote a low carbon/low emissions economy.

Types of plans and programs that usually display the above characteristics include:

- Green growth and green economy plans and strategies;
- Low emission (or low carbon) and climate resilient development strategies and related climate plans that seek to achieve both climate and development goals;
- Sustainable development strategies and programs;
- Sector specific programs and policies which seek to advance economic, environmental and resource efficiency goals.

The author teams based their assessment on existing published theory, research, case studies and meta-analyses, as well as official documents that have the characteristics defined above. Where there was insufficient evidence of practices consistent with these criteria, GGBP also identified practices from broader experiences that could provide valuable learning for practices applied to green growth plans and programs. In many instances, GGBP conducted interviews with practitioners to supplement information available from public sources. In analyzing these cases the authors also documented key contextual factors to support planners and policy-makers to relate the findings to their own situation. Figure 3 provides an overview of the countries and regions featured in the GGBP cases.

GGBP authors used three primary criteria to evaluate the effectiveness of the practices assessed within each chapter:

1. **Scale of impact.** Is there evidence that the process, method, or strategy will enable significant near and long term impacts in advancing green growth and transforming relevant country systems?
2. **Degree of robustness.** Does the process, method, or strategy achieve credibility and legitimacy, support of key stakeholders, and integration with wider programs?
3. **Level of efficiency.** Does the process, method, or strategy use human and financial resources efficiently in achieving its purpose in the appropriate timescale?

The assessment highlights aspects of each case that are noteworthy – in that respect ‘good practice’ is a more accurate description than ‘best practice’. The countries chosen for each chapter provide examples spanning a broad range of contexts including developed, low income, emerging and newly emerged.

A network of more than 150 experts from all regions provided feedback to guide the design of the assessment and review its findings. Each chapter was subject to formal expert and practitioner peer review, with reviewers asked to ensure that the analysis did not miss any crucial cases, literature or lessons and to check analytical robustness. Each of the chapters was reviewed by a group of 8-17 experts drawn both from the GGBP expert network and the broader international community. The reviewers were chosen to reflect a wide range of geographies and to provide expertise on key issues relevant to the chapter. They included individuals from government, think tanks, consultancies, and international organizations. The chapters went through three phases of review and drafting. Additionally each of the case studies was reviewed by experts from the relevant country. To ensure the relevance for practitioners, early findings were shared in workshops, international conferences, and webinars. In discussion with the authors feedback was integrated into the analysis presented in this report.

A broad portfolio of outreach activities is planned to ensure that the report findings are applied by governments and institutions around the world to inform and strengthen green growth programs. This will include convening sessions at international conferences and workshops and enabling authors to visit countries and present relevant results of interests to policy-makers and stakeholders. In addition, the report will form the basis for an online handbook to enable broad access to findings and case studies, supported by e-learning materials and policy briefs.

The assessment approach seeks to allow for an examination of the emerging evidence on the design choices that practitioners are grappling with, and for learning from their experience and challenges with implementing green growth programs. There are a number of limitations and sources of uncertainty involved in this analysis, and readers are encouraged to keep these in mind. GGBP did not evaluate all green growth practices and instead focused on nine priority topics. Thus, it should not be treated as a comprehensive evaluation of good practices across the full continuum of green growth approaches.

While GGBP's objective is to advance understanding of *approaches for long-term transformation*, many of the programs and practices assessed remain too new for final evaluation and it was not possible in most instances to attribute impacts associated with each practice. Thus, the GGBP assessment focused on practices demonstrating midterm success and sought to understand early lessons and indications of their potential to catalyze long-term economic shifts. As with any project, time and resource constraints restricted the number of cases that the author teams could evaluate and the depth of analysis possible. It should be noted that the cases are not the result of systemic review of documents, data and experience but are based on published information and limited interviews. While the teams reviewed

Figure 3:
GGBP case studies¹ by region and at the global level



¹ More than one program or case was evaluated for several of the countries listed in the figure.

experiences across several cases from different regions for each chapter, this is only a small sample of the work done by governments around the world and does not provide a comprehensive analysis of good practices for each step or country. The cases should not be viewed as an overall evaluation of the green growth approach of each country.

Using the report

This report, *Green Growth in Practice: Lessons from Country Experiences*, presents results from the GGBP assessment, with a chapter focused on each of the nine key steps. It should be treated as an initial analysis and description of lessons on green growth practices which provides a starting point for practitioners in identifying effective approaches, and which highlights key case examples which offer models

and lessons. The Executive Summary provides a summary of lessons across the nine steps.

The report is not necessarily intended to be read from cover to cover, but provides a resource to draw from, aligned to the key steps in the process of planning, analysis and implementation that many countries are undertaking. The chapters address questions from policy-makers and practitioners about what processes and approaches have proven useful and effective at different stages, and highlights examples in practice from different countries. Often, while there are general principles from the literature, the answer that emerges about how best to apply them is 'it depends'.

Processes that have emerged in different countries are shaped as much by local institutions, politics and capabilities as they are by technical design. As such the individual chapters do not provide blueprints for each step, but rather key factors to consider – which could serve as a checklist when undertaking a green growth planning exercise.

There are further resources on the website (www.ggbp.org) that serves as a companion resource for this report. It allows readers to search for information (for example by process, sector and level of government) and by country. The individual case assessments used in this report are available as part of this online resource.

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Chapter I

Planning and co-ordination

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This chapter examines experiences in the relatively new field of green growth planning, from countries including: Chile, China, Colombia, Ethiopia, Mexico, Nepal, South Africa, South Korea and the USA. These examples provide us with valuable early insights into the challenges of planning and coordinating the transition to green growth, and how they can be effectively managed.

It is too soon to judge whether the efforts being undertaken in these countries will produce the fundamental change they seek, but at the very least they have begun an important dialogue about how economic and industrial policy should respond to environmental risks and opportunities, particularly those presented by the impacts of climate change.

Governments are employing a wide variety of approaches to green growth planning, with no one-size-fits-all approach. Cross-cutting lessons include:

Leadership

Ensure strong, high-level leadership that links long-term national goals with environmental risks and opportunities and builds broad coalitions.

In most cases strong leadership 'from the top' was identified as a key factor in effective green growth planning. An important function of this leadership is to build coalitions of stakeholders, even where there are conflicting interests. Key messages that emerged are that effective green growth processes:

- **Have a high level champion** who recognizes the link between the country's long-term economic growth and its response to environmental challenges, and who initiates the process, lends it credibility, pushes it forward with appropriate guidance and oversight, advances relevant institutionalization, and supports follow-on actions.
- **Mobilize winning coalitions** to support green growth objectives and policies, including from key ministries, the business community and civil society.

Objectives and mandate for the process

Establish a mandate for the process with clear economic, environmental, and social objectives, supported by strong institutional governance.

Articulating clear economic, environmental, and social objectives supported by formal outcome-based mandates provides the foundation for green growth planning and implementation processes. Effective green growth processes:

- **Provide clear and well-articulated objectives** which frame and define the green growth vision or long-term aims and combine economic, environmental, and social objectives. These may be expressed as part of a formal mandate or presented in a national strategy or policy document.
- **Establish strong supporting mandates** with sufficient political or legislative support. These mandates take many different forms, from presidential or inter-ministerial decrees (Chile), formal policy frameworks embedded in legislation (Mexico), or high-level policy documents (US States). In the cases examined, some mandates also set out key elements of process design; making clear how the planning process is to take place, who will be involved, and what methods and tools will be used.

Process design

Design a robust and adequately resourced planning and co-ordination process focused on green growth objectives, with clear 'rules of the road' and which builds a compelling evidence base.

Effective planning processes must address the conflicts and tensions involved in seeking to depart from current economic pathways. Key messages are to:

- **Focus on green growth objectives** following a process that can be supported by the green growth mandates.
- **Establish clear 'rules of the road'** which set out the sequence for the planning process while also allowing for adjustments along the way. To keep stakeholders effectively engaged, facilitators should determine and clearly communicate how long the process will take, what the key inputs and outputs are, how meetings will be run, who will be in charge, and what the expectations for participation are.
- **Build a compelling evidence base** which is credible and convincing to all relevant stakeholders, ensures political buy-in, and provides clear guidance and articulation of options.

Stakeholder engagement

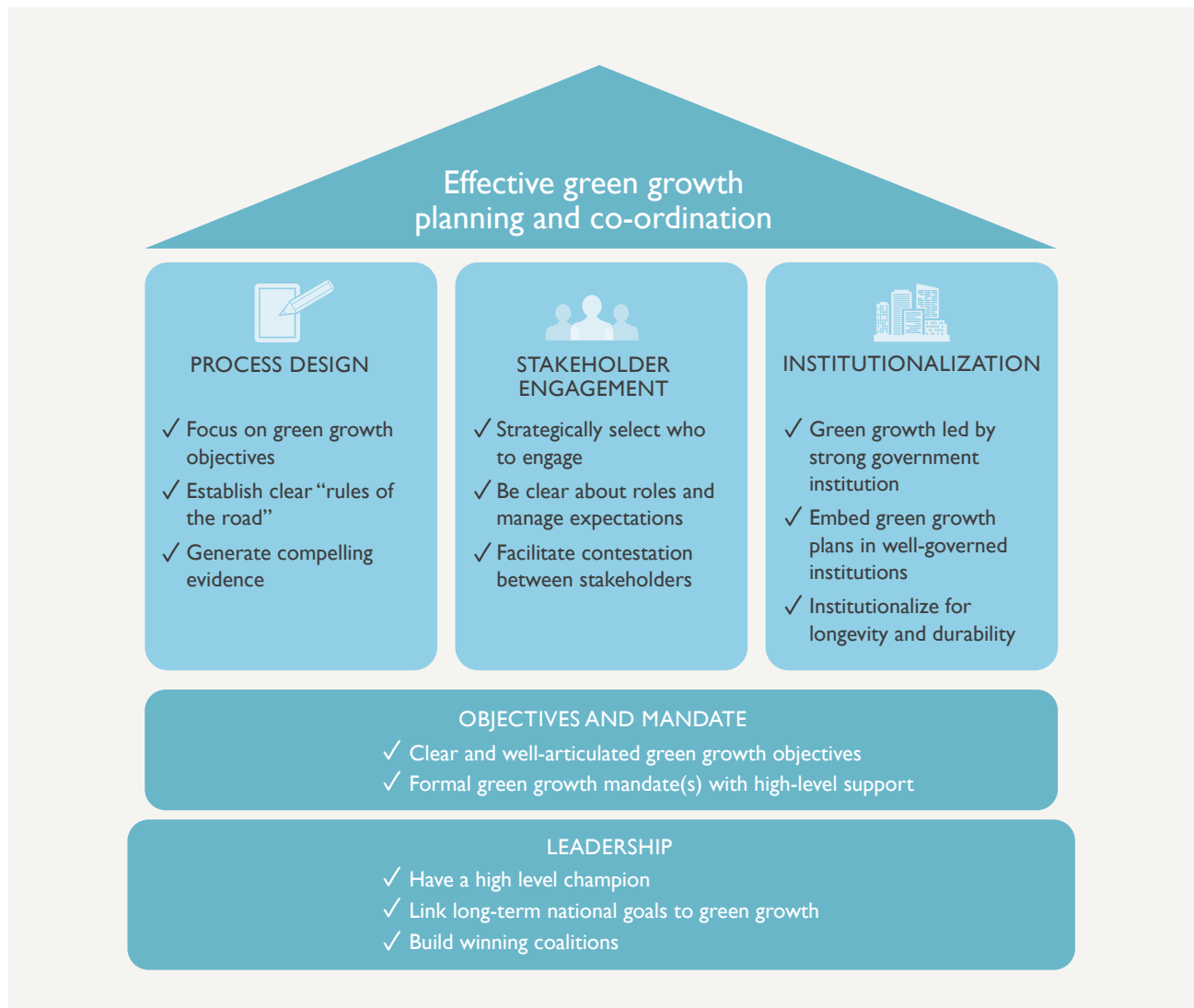
Implement active and strategic processes of stakeholder engagement with clear roles, well-managed expectations, and facilitated contestation.

The way in which stakeholders are engaged and managed is a key determinant of success. A major challenge in the transition to green growth is to bring together groups of stakeholders with traditionally polarized or conflicting interests to find mutually acceptable ways to achieve development objectives. Given the diverse needs and interests of these stakeholders, ‘winners and losers’ will inevitably emerge at different stages and they must be understood and managed

if the process is to progress. To achieve this, effective green growth stakeholder engagement processes:

- **Strategically target stakeholders to engage** based on their relevance to the green growth planning process and the stage of the planning cycle. The most effective processes strike a balance between comprehensive representation and workable sized groups, between single research providers and larger research consortia, and between local experts and imported specialists. The level of representation (CEO vs line staff), the time they allocate, their ability to make unconstrained decisions, and their expertise, all profoundly affect process effectiveness.

Figure I:
Foundations for green growth planning and co-ordination



- **Manage stakeholders' expectations** for how the process will be run, and the various roles that stakeholders will play, such as researcher, interest group representative, technical expert or reviewer. Roles and expectations should be clear from the outset and endorsed by participants in the process.
- **Facilitate contestation between stakeholders** to anticipate and manage conflicts, help reach consensus and enable the development of more robust and creative planning.

Institutionalization

Embed green growth plans in well-governed institutions to manage a predictable long-term cycle of planning, implementation and review, to align with other activities, and to protect against political change and interference by interest groups.

Both at the commencement of green growth processes, and in their short- and long-term implementation, effective institutional arrangements are crucial to ensure robustness and longevity. Specifically, effective green growth institutional arrangements:

- **Embed the process in well-governed institutions** to ensure that the green growth process is coordinated with effective leadership and ability to implement. Such arrangements can take many forms but at best are cross-ministerial and coordinated at a seniority level that ensures effective decision-making and timely implementation.
- **Institutionalize the process to ensure longevity** over long-term cycles of review, iteration, and stability. Critically, this institutionalization should secure the process and its outcomes against political change and interference by interest groups as much as possible, through implementing regulation or legislative instruments.

1. Introduction

Green growth planning is a relatively new field which has emerged in response to the increasing desire of leaders and those they represent to consider the impacts of climate change and natural resource management on long term economic and social development outcomes.

This chapter explores examples in practice and asks the question:

What practices ensure an effective green growth planning and co-ordination process?

What do we mean by green growth planning processes?

Many countries are now undertaking explicit green growth planning processes. This can mean undertaking studies, developing national strategies, or integrating green growth objectives into national development plans.

This chapter uses the term '**green growth planning and co-ordination**' generically to cover all these different approaches to transition management (Kemp et al., 2007).

It does not indicate a planned economy approach, but it recognizes the role of governments as the prime mover in enabling long-term change in large socio-technical systems where environmental externalities must be addressed.

As noted by UNESCAP (2012a): *“only government policies can jump-start green growth. In the longer run, when we have arrived at a green economy, green growth will be driven by the private sector and by markets. In the short and medium terms, however, green growth requires government to drive the process and manage the transition.”*

The cases examined illustrate that there is no one-size-fits-all approach to successful green growth planning; processes must take into account the unique socio-political, economic, and cultural circumstances of each country. It is too soon to judge whether these processes will produce the fundamental change they seek, but at the very least they have started an important dialogue regarding how economies should respond to environmental risks and opportunities, particularly those presented by the impacts of climate change.

As a relatively new and evolving area of practice, attempting a comprehensive evaluation of green growth processes is challenging. No government has reached the stage of implementing a comprehensive green growth plan. Even in the most celebrated cases, and those that appear to have a strong initial set of actions, such as South Africa or South Korea, economic growth trajectories have not been fundamentally altered.

Following an initial review of over 200 academic papers, research reports, strategies and plans, as drawing on their own experiences, the author team identified a set of cases to investigate. The selected case studies represent a variety of approaches and contexts, with varying degrees of effectiveness and success. The analysis of each case is not intended to be comprehensive but rather to illustrate particular lessons useful for understanding effective planning processes. In evaluating the cases, the team drew on expert judgment of the authors or those close to the process, as well as independent analysis, where available. Cases were assessed against a number of proximate criteria of effectiveness including:

- **Impact:** Do they achieve their stated objectives? Have they catalyzed both incremental and far-reaching socio-economic changes within the systems they seek to influence (as far as it is possible to evaluate to date)?
- **Legitimacy:** Are they recognized in the eyes of relevant stakeholders as a basis for implementation?
- **Credibility:** Are they technically credible based on rigorous analysis and credible research?
- **Relevance:** Do they ask and answer questions relevant to decision makers and the system that they wish to influence?

2. Leadership

Ensure strong, high-level leadership, which links long-term national goals with environmental risks and opportunities and builds winning coalitions.

Green growth requires transformation of core systems necessary for the effective functioning of the economy, such as the energy, transport and food systems. Such transformation often involves messy and conflicted process requiring navigation and engagement by high-level leaders, as well as broader coalitions of support (Meadowcroft, 2009).

2.1

High-level champions

Global, national and subnational 'champions' play a crucial role in making the case for change and providing leadership

The case studies include:

Country	Case
Chile	Mitigation Action Plans and Scenarios (MAPS)
Colombia	Low Carbon Development Strategy
Ethiopia	Climate Resilient Green Economy (CRGE) Initiative
Mexico	Climate Change Action Plan
Nepal	Climate change and development process
Rwanda	Green Growth Strategy
South Africa	Long Term Mitigation Scenarios (LTMS) and the National Planning Commission's Vision 2030 (NPC2030)
South Korea	Green growth planning process
USA	Subnational processes

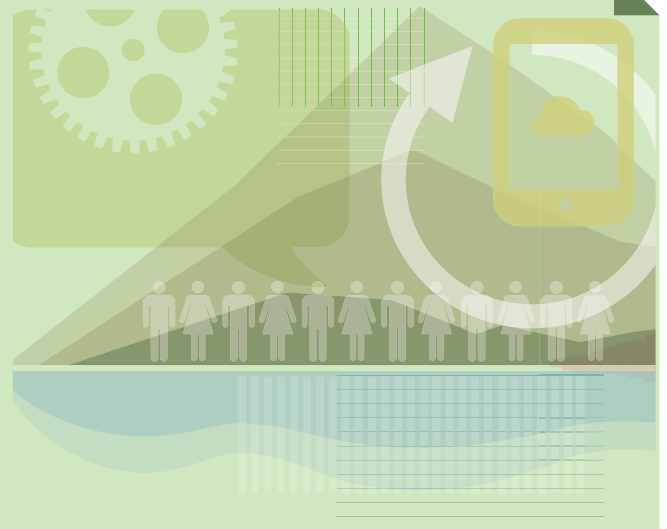
We also refer to other cases throughout the chapter where an additional issue is illustrated. Due to time and resource constraints there are a number of important early green growth planning pioneers, including the UK, the European Commission and Germany, among others, that are not included.

during change processes (Sukhdev et al., 2011). Many of the cases we examined substantiated this, with examples such as South Korea (Case 1), South Africa and Mexico (Case 2) illustrating how inspirational, high-level leadership has played a crucial role in initiating and sustaining ambitious green growth planning processes.

Leaders pursue strategies for a wide range of complex reasons, and in some cases the political benefits are not always obvious. For example, the desire to demonstrate global leadership has been a key motivator for leaders of a number of countries in recent years. Some leaders, notably former President Calderon of Mexico and Lee of South Korea have made climate change and green growth their 'legacy issue' investing considerable personal and political commitment to drive progress both domestically and internationally. In other cases leaders may undertake domestic green growth planning processes to influence or align with

Case 1:**Leadership in South Korea**

In South Korea, strong leadership from the President's office, followed by ministerial representation on the Presidential Committee for Green Growth, sent a strong message throughout the government that green growth planning and implementation was a priority (UNESCAP, 2012b). President Lee (2009) stated: *"The challenge for Korea going forward is to recognize that we are entering a new stage in our development that will no longer permit us to conduct 'business as usual', without regard to the toll our economic activities are taking on the environment and, indeed, on future generations(...) It is imperative that we fundamentally change our economic strategy"*.

**Case 2:****Leadership in Mexico**

In Mexico, President Felipe Calderon played a key role in driving the process of creating a national action plan and legislation on climate change. His strong personal and political commitment to the environment and addressing climate change was reinforced by the experience of natural events, such as flooding in the south of the country that led to public demands for action and increased political sensitivity to the issue.

key economic or political partners in their regions (such as in Colombia and Chile), or to secure a more level playing field for competition. Recession can be a motivator too, with compelling arguments increasingly made that supporting green investment can contribute to restoring economic confidence (Zenghelis, 2012). Green stimulus packages such as in the South Korea and US demonstrate how leaders can use green growth opportunities for temporary economic stimulus (Jacobs, 2012).

Leaders and policy-makers are well aware that economic growth, and the employment it generates, remain the core interest of voters and investors, and therefore that any measure that threatens to constrain growth is unlikely to attract political support. This has been a key barrier to action on climate change, where the dominant discourse has traditionally centered on the economic cost of mitigation, and international negotiations have been largely concerned with how the global 'burden' should be distributed (Jacobs, 2012). In this respect making the case that green growth policies

enable better growth offers a means for leaders to overcome this negative and politically unattractive framing of the issues (Jacobs, 2012).

Increasing numbers of governments, in both developed and developing countries are integrating green growth objectives into their core development planning processes, recognizing that these strategies can play a significant role in achieving economic development objectives. This trend is illustrated by statements such as the Asia Pacific Economic Cooperation (APEC) Leader's Declaration of 2011, which stated: *"We are committed to advancing our shared green growth objectives. We can and must address both the region's economic and environmental challenges by speeding the transition toward a global low-carbon economy in a way that enhances energy security and creates new sources of economic growth and employment"* (APEC, 2011).

Green growth is a departure, and a potentially radical one, from the current development paths of most countries. It will not be 'naturally driven' by markets, electorates or existing policies and often faces stiff opposition from interest groups. Effective planning for green growth will have to address all the typical barriers normally faced by governance and institutional processes such as election cycles, leadership changes, and entrenched bureaucracy and, as the experiences from Chile, Colombia and Brazil illustrate, ensuring sufficient time and resources are made available to support the planning process.

In the case of climate change mitigation, key barriers are the vested interests of those most likely to be negatively impacted by any energy price increases, including workers and investors in emissions-intensive sectors, and energy consumers (often the poor). Moreover, in any market transition existing capital assets and skills can suffer rapid depreciation, and effective green growth processes must recognize and address this. Jacobs (2012) points out that: *"...the political battles over green growth will not take place*

simply at the level of discourse. It is clear that high carbon and resource-intensive industries will seek to ensure that the concept of green growth does not make intellectual or political headway. But even more vociferously they will oppose the particular environmental policies which are put forward to stimulate it." Therefore, effective green growth strategies will have to establish political support for a positive economic message while finding solutions for those who will experience losses.

The critical role played by individual leaders in driving the green growth process means that long-term implementation is potentially vulnerable to political transitions and shifting priorities of leadership. This can be seen for example in Colombia's Low Carbon Growth Strategy process, South Korea's green growth planning process, the Long Term Mitigation Scenarios (LTMS) in South Africa, MAPS Chile and the Brazilian GHG Mitigation Scenarios ('IES' – Implicações Econômicas e Sociais) where shifting from a process driven by presidential championing, to one institutionalized into legislation or constitution has proved difficult. Strategies to effectively manage political transitions are therefore essential for the long-term viability of green growth. Processes that survive political changes are likely to be stronger for the spread of leadership, for example, the Chile MAPS project is driven by a full inter-ministerial Steering Committee, and Brazil's IES is supported by numerous ministries, which can help ensure continuity across leadership transitions in countries that do not experience a total civil service rotation with every new administration.

2.2

Winning coalitions

A 'winning coalition' is a group of supporters (in parliament, but also more broadly amongst influential players, the media and the broader electorate) sufficient to enact a course of policy or legislation. The opposite of a winning coalition is a blocking coalition able to prevent this action, whether actively or passively (Sebenius, 1994).

To be effective at enabling green growth, leaders must build winning coalitions (Bueno de Mesquita et al., 2002 and Paterson, 2012). This involves facilitating dialogue and building consensus across different sectors, involving multiple ministries, agencies, and stakeholders that would not routinely be in contact with each other (World Bank, 2012a). Leaders also mobilize and support new interest groups to counter entrenched opposition (such as from coal and other fossil fuel interests). For example, Paterson (2012) shows how the emergence of emissions trading in Europe has generated a shift in the coalitions of support for climate policy, especially amongst business actors, including the financial sector. Other sectors also stand to win under green growth scenarios, notably low carbon technology and service providers such as those in energy efficiency, renewable and low or zero carbon

energy. Paterson points out that when designing policies it is useful to keep in mind the tensions which inevitably arise in the dynamics of creating political coalitions. For example, a key tension lies between the need to create benefits for particular sectors of the economy to sustain policy support, and to pursue overall efficiency and environmental integrity.

Building effective political and institutional coalitions within government is also critically important to the success of green growth, in particular by ensuring that finance and core economic ministries support green growth processes: *"While the policy motivation for greener growth may lie in environmental concerns, green growth policies are not exclusively environmental policies. They should be core economic policies that have engaged central planning, finance, and sectoral ministries as well as environment agencies in their formulation"* (OECD, 2012).

But not all leadership in green growth originates in government. In some cases non-governmental actors provide early leadership, such as in the UK where a combination of effort by environmental NGOs and the business community created the political conditions for passing its pioneering 2008 Climate Change Act (Lockwood, 2013). In some cases, non-government processes are antagonistic to the prevailing government position, while in other cases they aligned to accelerate action. In general, these non-governmental processes push public leadership but cannot replace it, as can be seen from the experience of the US Climate Action Partnership (Case 3).

Case 3:

The US Climate Action Partnership

The US Climate Action Partnership (USCAP) was convened in 2007 by a group of Fortune 500 companies and NGOs to develop a 'blueprint' for climate change legislation for the United States. At a time when the economy was growing and when there was a increasing public awareness, and concern about climate change, and with an election pending, there was a sense that action on climate change was inevitable. The carefully negotiated blueprint that was developed over more than a year underpinned legislation that passed the House of Representatives in 2009. However, it was ultimately rejected by the Senate amid opposition from republicans and moderate democrats, many of whom rely on the fossil fuel industry for campaign contributions. Rapidly changing political and economic circumstances (the economy had declined precipitously in the intervening two years) influenced the rapid rise and subsequent failure of USCAP, which disbanded shortly after the defeat of the legislation in 2009, without having accomplished its objective of economy wide, market-based climate change legislation for the US.

3. Objectives and mandate for the process

Establish a mandate for the process with clear economic, environmental, and social objectives, supported by strong institutional governance.

Green growth planning processes can have a range of objectives, from the narrow (such as establishing the case for a carbon tax) to the wide (developing a green growth strategy for the country with a portfolio of policy actions). While all include the consideration of economic, environmental and social objectives, some are limited to studies to build consensus (such as the South Africa's LTMS), while others aim to develop a set of operational policies (such as Peru's PlanCC, www.planccperu.org). In some cases, green growth objectives are integrated into medium-term economic development plans, such as in Colombia, China, Vietnam, Cambodia and Indonesia.

For green growth planning processes to advance, they not only need clear objectives but strong supporting mandates. This increases the legitimacy of the objectives, signals seriousness of intent, encourages participation, and supports implementation of the process.

3.1

Scope and timeframe

Defining the scope of a green growth planning process is an important early design question. The scope of the planning process may be sectoral (as with the LCDS in Colombia), or economy-wide (as with the MAPS Chile). The focus may differ, with some aiming primarily at advancing greenhouse gas mitigation (such as the LTMS in South Africa) and others focusing on how economic opportunities and risks relate to broader development objectives.

The mitigation or 'climate first' approach identifies actions to abate emissions, their costs and co-benefits, and the policy instruments that could drive them. However, in many cases this approach has had limited impact, for example, Bulkeley (2011) concludes that "numerous cities which have adopted greenhouse gas reduction targets, have failed to pursue such a systematic and structured approach and, instead, prefer to implement no-regret measures on a case by case basis." Hence, climate first approaches may not be enough to drive green growth, but in some cases may serve as a starting point for action.

A number of commentators have focused on the 'climate first' vs 'development first' framing of green growth planning processes. Van Tilburg et al. (2011) describe the 'climate-first' approach as a process that focuses on mitigation policies and measures that are undertaken with the explicit goal of reducing GHG emissions. However, this incremental approach does not address economic structure or existing high-emission pathways. For this reason, combating climate change through aggregation of such mitigation actions alone is difficult and costly.

Case 4:

Integrating climate and development in Nepal

In Nepal, articulating climate change as a national development agenda included: (1) the need to address the challenges posed by climate change impacts to Nepal's socio-economic development goals; (2) the need to effectively engage with, implement and maximize the benefits of the UNFCCC; (3) the need to make socio-economic development practices and natural resource management practices climate friendly; and (4) the need to mobilize and manage climate finance effectively. (Government of Nepal, 2011)

Case 5:

The Rwanda Green Growth Strategy

The Rwandan Government's 2011 Green Growth National Strategy, envisages Rwanda as a "developed, food secure country, with a strong services sector, low unemployment and low levels of poverty" (Government of Rwanda, 2011). The strategy focuses on low carbon domestic energy resources in order both to reduce Rwanda's contribution to climate change and enable it to become independent of imported oil for power generation. It also prioritizes the development of robust local and regional knowledge to be able to respond to changes in the climate and sees Rwanda becoming a regional services hub.

The 'development-first' approach is an alternative approach, which involves integration of environmental boundaries into development planning and comes up with more structural solutions such as alternative infrastructure and spatial planning that have lower emissions to start with (Morita, 2001). Due to its development perspective, the development-first approach is attractive since it can be aligned with the interests of local stakeholders (Winkler, 2010). In practice, while the split between 'climate first' and 'development first' reflects the primary focus of policy makers' priorities, many policies and measures can be used in both approaches.

The more integrated approaches seek to incorporate climate change considerations into development plans and vice versa. They examine economic consequences broadly, going beyond direct costs and benefits. The approaches undertaken in Nepal (Case 4) and Rwanda (Case 5) illustrate how countries are seeking to integrate both climate change and development into their strategic planning. This hybrid

approach stems from a growing recognition that addressing economic development in the absence of climate change considerations is no longer a viable or realistic option. Early indications show that the most effective green growth processes integrate climate change or other natural and social capital considerations into economic development planning, and not the other way around.

Another important consideration for framing green growth objectives is the timeframe for development and implementation (Case 6). There is tension between the cumulative nature of ecological impacts and the long-term life of infrastructure on the one hand and the short-term nature of planning and political cycles on the other. While short-term benefits should not be ignored and may play an important role in securing public support or building winning coalitions, it is clear that the case for green growth is generally stronger when considered over a longer time span, when the impacts of climate change and environmental degradation are expected to be more pronounced. Most processes analyze impacts over decades, looking out as far as 2050 in some cases, while others are focused on the nearer term, for example looking out to 2020.

Jacobs (2012) notes that *“protecting the environment does have costs in the short term. But these should really be understood as the investments needed to generate growth in the medium to long term. There is a particular urgency about environmental investment, because in every year in which it is not made, environmentally damaging and high carbon capital will be laid down in its place, locking in high emissions and resource depletion for years to come”*. A key output from analysis should therefore be a quantitative assessment of both shorter and longer-term benefits. Policy objectives and mechanisms need to be credible and predictable over the long-term in order to attract investments into green industries and infrastructure (World Bank, 2012b).

3.2

Mandate

Mandates provide the authorization to drive green growth processes. It is critical that they are robust and official, as processes are likely to face contestation. A good example is MAPS Chile where nine ministers formally signed off the Chilean mandate (Case 7), which was expressed in a lengthy project document.

In recent years green growth planning has evolved beyond instructions to study options to full blown legislation. Examples include: the UK's climate legislation, Mexico's Climate Change Law, the US Clean Air Act, Japan's Fourth Basic Environmental Plan, and the activity in Australia around its Clean Energy Act, among many others. Significant movement in this direction in Bangladesh, Brazil, Chile, Colombia, South Korea and others are noted in the developing world (Globe International, 2013). All of these

Case 6:

Delivery timeframes in Chile and Mexico

The MAPS group of processes is looking at split timeframes: MAPS-Chile was designed to develop and assess a portfolio of specific scenarios with mitigation actions to be assessed in different time periods: 2007 to 2050, and 2012 to 2050 and intermediate years.

Mexico used planning vehicles across a variety of timeframes. The National Climate Change Strategy sets out a long term vision 10, 20, 30, and 50 years into the future, while the Special Action Plan on Climate Change (PECC) serves as a six-year policy implementation planning document for the country's longer term objectives.

Case 7:

Mandates in MAPS Chile

The MAPS-Chile process objectives are expressed in the form of a set of questions to be answered through a process of assessment:

1. What are the most efficient and effective mitigation options to fulfill international pledges from Chile? Are some of them more feasible and favorable to perform?
2. What are the foreseen opportunities and compensations associated with the different mitigation options, in terms of poverty alleviation, contribution to positive macroeconomic and microeconomic figures, allowing Chile maintain its international market competitiveness?
3. What are the key connections among mitigation and adaptation options at the country level?
4. What public policies, instruments and key private initiatives would contribute to climate change mitigation, aiming at improving a low carbon development?

plans and regulations carry with them an associated set of institutional arrangements that respond to a country's particular circumstances and are likely to work most effectively when they are designed regulate in ways which also confer tangible benefits on the regulated (Oye and Maxwell, 1994).

Effective mandates set objectives that are relevant to society and include the details of the process such as how it is to be sequenced, who will be involved, and what methods and tools will be used.

The development of mandates is closely linked to the leadership processes described above. In the MAPS

processes, deliberate mandate setting and coalition building took up to two years, and hence a key lesson is to give sufficient time and effort to these critical elements. However, robust processes can be designed in less time, given the

appropriate leadership and stakeholder management, as in the case of Kenya, which developed its climate change action plan within 12-18 months.

4. Process design

Design a robust and adequately resourced planning and co-ordination process focused on green growth objectives, with clear ‘rules of the road’ and which builds a compelling evidence base.

Strategic process design of the steps to develop a green growth strategy is crucial, to ensure that it is focused on the overall green growth objectives and that it is able to deal with the often messy and conflicted process of making the transition to a green economy. Without a clear design aligned with overall green growth objectives, there is a risk that the process may become overly focused on a particular drivers, such as donor finance which could compromise or delay progress towards the overall green growth outcomes or vision (see for example the case of Ethiopia’s CRGE, highlighted in Case 8).

Some earlier processes such as the South African LTMS evolved through trial and error, working from initial broad principles and refining the process in real time. Later MAPS processes built on this experience and adopted key elements of this trial-and-error approach (Raubenheimer, 2011). The IES process in Brazil, for example, is being meticulously designed. Common to the MAPS family of processes is the articulated interaction between stakeholder experts and a research team.

Thinking strategically about which stakeholders will be invited to participate, how meetings will be managed, who will lead the process, how long it will take, what tools will be used, and other key ‘rules of the road’ will make the difference between a process that flounders and stalls and one that successfully achieves its objectives. Given the potential for contestation and conflict in green growth processes, this roadmap needs to be written, explicit, and clearly understood by all participants. Process facilitators should determine and clearly communicate how long the process will take, what the key inputs and outputs are, how meetings will be run, who will make particular decisions, what the expectations for participation are, and other key design choices. However, while the processes should be predictable, it should also be flexible and designed to adapt to changing political circumstances. This is particularly important for green growth processes given the diverse (and often) conflicting interests of stakeholders that must be reconciled.

Case 8:

The Ethiopia Climate Resilient Green Economy (CRGE) Strategy

Ethiopia’s CRGE is driven by government and has been successful in attracting investment, which has been one of the drivers of political support for the process. However, despite this success, there is a risk that through its focus on climate finance, the process loses sight of the broader goal of driving transformative change. In Ethiopia, the government is aware of this risk and is looking to fully integrate the CRGE into the national planning process to mitigate this.

Effective process design is thus *deliberate*, and takes into account local context. Well-designed processes consider how to manage barriers and conflict, and ensure participation by key players (UNESCAP, 2012a). They enable workable compromises among sectors and stakeholders to ensure that decisions and action can go ahead despite uncertainty and resource constraints (Cash and Clark, 2001).

Better use of evidence in policy and practice can dramatically help reduce poverty and improve economic performance; particularly in developing countries where evidence based practice is generally less well established (Sutcliffe and Court, 2005). There are now a wide range of relevant tools and methods available to generate and utilize this evidence (Sutcliffe and Court, 2005; Nutley et al., 2000), many of which are discussed in more detail in later chapters. A key question of process design is how best to apply these tools and methods for the production of the data and evidence needed to support effective decision-making for green growth (Raubenheimer, 2011). Evidence must be both reliable and credible if it is to be compelling enough to gain political buy-in, overcome contestation during implementation phases, and provide clear guidance for action.

Later chapters (such as [Chapter 3: Assessing and communicating benefits of green growth](#), [Chapter 4: Prioritization of green growth options and pathways](#) and [Chapter 9: Monitoring and evaluation](#)) explore the content

of this evidence base in more detail. Experience of planning processes indicate that they will only be robust if they are based on evidence (Ludi et al., 2011); and most now are. For

example, Chile, South Africa, and Brazil are all developing their plans with a heavy emphasis on building a credible evidence base.

5. Stakeholder engagement

Implement active and strategic processes of stakeholder engagement with clear roles, well-managed expectations, and facilitated contestation.

How stakeholder engagement is approached is one of the most important elements in developing green growth strategies. Green growth plans that lack a foundation of shared assumptions are certain to attract contestation. Managed stakeholder engagement processes encourage this contestation to take place as part of the process, in the search for agreed development pathways.

In designing stakeholder engagement processes, compromises must be made between representation and a workably sized group, between the focus of single research providers and the diversity of larger research consortia, and between indigenous research and imported expertise. The roles assigned to stakeholders, and the degree of autonomy and creative space they have is critical. In effective green growth planning processes the leader-stakeholder partnership is profound: its role is that of co-developer of a long-term alternative vision of the future and co-management of the transition (Kemp et al., 2007). Chile and the other MAPS processes are built on this principle, although as studies rather than plans. Credibility is key: no matter how the stakeholder involvement is structured, if the process is broadly seen as credible, it will be more likely to be robust.

Stakeholders and expert working groups can harness creative capacity to solve problems and identify new alternatives. There is an emerging body of tools and methods to support this. Nevertheless, applying them successfully requires judgment and skill (CDKN, 2011).

The aim of stakeholder engagement is not only to strengthen the planning processes, but to enable stakeholders to learn and change their own positions and perceptions. The impact by and on stakeholders that emerges from these processes (if well managed) is often more significant as a driver of change than the results of technical analyses. The South Africa LTMS process actually envisaged this impact on stakeholders as part of its core objectives: “*South African stakeholders understand and are focused on a range of ambitious but realistic scenarios of future climate action both for themselves and for the country*” (Raubenheimer, 2011). Many of the stakeholders in post-LTMS interviews argued that the process changed their opinions, knowledge base and perceptions and connections with others.

In contrast to the stakeholder-driven engagement processes, there are processes where engagement beyond government is very limited. This choice may reflect concerns to minimize risk for the process itself or a broader national approach that favors top-down leadership. Narrow engagement does not necessarily mean that these green growth processes are not effective, but it runs the risk of developing outputs and plans that are not accepted hence affecting long term robustness. This was illustrated by the difficulties the Mexican government had in securing support for its first set of baseline projections in the Special Action Plan on Climate Change (PECC), which were developed by a private consultancy in a process that did not include the business community or other key stakeholders. The Government is currently working to develop its own projection and modeling capacities that will enable it to more effectively engage the private sector and other key stakeholders in developing baselines and scenarios.

5.1

Stakeholder selection

The choice of which stakeholders are engaged is one of the most central and crucial in process design (Cash and Clark, 2001). Key questions to ask include: Which individuals or groups are likely to resist change? Who is likely to be adversely affected and needs to be compensated? Who is likely to benefit but does not realize it? What strategies could be used for persuading or isolating groups? (Bianchi, 2001). Different processes may suit different approaches. For example, study processes allow for greater inclusiveness and wider ranging objectives, whereas planning processes may require more targeted stakeholder engagement in order to address the specific parameters of the planning process, and may require the more formal negotiation-type processes.

In the South Africa LTMS (Case 9), stakeholders were required to act in their personal capacities as participants of a scenario group, rather than as representatives of a specific interest group. As Bob Scholes, of the Council for Scientific and Industrial Research relates, “*To my mind the LTMS was a very participatory process. Participation does not mean that every person needs to sign off on the study. The South African notion of significant consensus is here a very useful one*” (Raubenheimer, 2011).



Case 9:

The South Africa Long-Term Mitigation Scenarios (LTMS)

At the invitation of the Ministry of Environment, the LTMS stakeholder engagement process assembled around 80 people from different sectors and interest groups into a Scenario Building Team. These comprised 35 from government, 19 from industry, 7 from civil society and 2 from labor, as well as academics and consultants. Participants agreed to maintain confidentiality as the condition of their participation. These scenario-builders brought key sectoral knowledge and served in their personal capacity at the request of the Minister. The Scenario Building Team drove the analysis, by commissioning research, identifying quantifiable mitigation actions and debating and agreeing the inputs and assumptions used in the models. The intensive stakeholder involvement is a particular feature of the LTMS approach, which has been seen as critical in ensuring buy-in from amongst different groups.

Stakeholders require a certain level of expertise, and need time and freedom to think creatively. The IES Brazil plans to draw a small group of stakeholders from a larger body of players in the already established Forum on Climate Change. In US states diverse stakeholders were appointed by Governors and Cabinets to reflect parties that would be affected by or would need to implement new solutions, and also to provide wide expertise across economic sectors and issues. Participation by a diverse group of interests and experts has been critical to the development of feasible recommendations.

There is a large body of literature available on stakeholder processes in relation to social development (for example, Bianchi, 2001), and specific development objectives such as health reforms (Schmeer, 1999). Green growth processes face a number of unique challenges due to their focus on decoupling economic growth from environmental improvement and the resultant inter-generational and long-term consequences this may lead to. To be effective, stakeholder selection has to reflect the need for building winning coalitions which combine interests to deliver green growth objectives. Experience from stakeholder processes for sustainable development and climate change can provide useful guidance here on addressing the common challenges that arise, such as knowledge gaps, skepticism, and emotional reactions (Gardner et al., 2009; Unerman, 2007; WWF, 2011; and Bianchi, 2001). Once stakeholders are selected and invited to participate, careful management is needed to

ensure focus on green growth objectives. This is the next challenge.

5.2

Managing stakeholder engagement

The first choice of stakeholder management is the degree of influence they are allowed to exercise, in other words, their level of self-determination (Albu and Griffith, 2005). The degree to which stakeholders make unconstrained decisions as a group can be a major determinant of project output and direction (Unerman, 2007). Stakeholder self-determination is often more easily supported through study processes, as opposed to planning processes, where options might be more constrained.

In the South African LTMS, the process design was specifically aimed at ensuring that the members of the Scenario Building Team took the lead in all aspects of the process. Thus, not only was there broad representation, but also decisive engagement, with stakeholders actually commissioning the research and agreeing all inputs and assumptions. A similar process was also used in US state-level green growth planning (see Case 10 on the next page). This however leads to contestation, which needs deliberate management. Independent third party mediators have proved effective in facilitating similar processes and providing conflict resolution (Bianchi, 2001).

Case 10:**Stakeholder engagement in US state green growth planning processes**

For US states, the convening authority typically sets the goals and objectives of processes, as well as process design and staffing, but stakeholders and work group members drive the creative process of finding the best solutions. In the most effective processes, they do this in collaboration with agency representatives in a non-adversarial environment. For instance, in Florida, stakeholders actively debated the best-cost assumptions for solar power. They received technical and facilitative assistance in making choices, including access to agency analysis, and subsequently opted for an ambitious approach that reflected their confidence in the cost assessment. Similarly, the goals for individual policy options as well as overall plans are invariably stronger when stakeholders believe that they have more local control over implementation.

Stakeholders pose a risk: they naturally hold different views on different issues and the more diverse their interests or values are, the more they will contest the deciding points in green growth processes. This can either be seen as a risk to be avoided, or an opportunity to create robustness of the outcomes. Effective processes use initially divergent views as stimulus for debate and creativity. The South Africa LTMS involved stakeholders from government, private sector, NGOs, and labor unions, thus inviting robust interaction (see Case 9). Once results appeared, broader consultations were held in roundtable meetings with CEOs of major companies, as well as leaders in the other sectors, and finally with Director Generals in all government ministries. There was contestation all along. This unusual approach is commented on in the World Bank review of the LTMS (Winkler, 2009).

In US states, open stakeholder processes with formal voting at each stage of the process resulted in high levels of consent among stakeholders on specific recommendations. Expert third-party facilitation, conflict management processes and scenarios are among the methods that have proven useful in the management of contestation.

6. Institutionalization

Embed green growth plans in well-governed institutions to manage a predictable long-term cycle of planning, implementation and review, to align with other activities, and to protect against political change and interference by interest groups.

Institutional arrangements are a critical factor both during the initial research and planning stages of the green growth process, and later in the implementation of the plans that emerge from this process. High-level leadership may be important to initiate a green growth planning process, but to ensure its durability, institutionalization is equally important (Case 11). Developing effective arrangements that align with other activities and protect green growth plans from political changes, and interference from interest groups takes time and requires gradually building the institutions and systems that link environment and development goals and stakeholders (OECD, 2012). To be effective and durable, governments must integrate green growth objectives into their broader economic policy-making and development planning through existing mechanisms such as poverty reduction strategies, sectoral and economic development strategies, and public financial management – especially the national budget process (OECD, 2011).

Case 11:**Institutionalizing climate change in Colombia**

In 2006, Colombia began updating its approach to national climate change policy in an effort to mainstream it into key sectoral planning decisions. Previously, it had relied on support from a National Environment Council (led by the Ministry of Environment), which lacked sufficient expertise and influence on economic, sectoral or territorial decision-making. To address this, a new approach was mandated in the 2006 revision of the National Development Plan, requiring better mainstreaming of natural risk management into territorial planning. Consequently, with the support of the National Council for Economic and Social Policy (which produces the country's high-level, cross-ministerial policy documents), a new institutional framework was defined to include the design of a National Adaptation Plan and Mitigation Strategy as part of the National Development Plan 2010-2014.

Country-specific factors such as the country's institutional form of governance, its dependence on fossil fuels, per capita income, and traditions around economic intervention (Lachapelle and Paterson, 2013) could all potentially help or hinder the development of effective institutional arrangements for green growth. Historically, more centralized states (such as parliamentary, unitary ones) have generated better environmental policy and performance than more decentralized (presidential-congressional, federal) ones; and coordinated market economies, such as Sweden, and Germany appear to perform better in this respect than liberal market economies like the UK, US and Australia (Scruggs, 2003). In many developing countries, the main challenge may be the need to build capacity, such as improving the availability of data to allow economic and infrastructure planners to take climate change impacts into account (Kaggwa, 2009).

Varied approaches and levels of effort are required in different country contexts to effectively integrate green growth objectives into broader economic policy-making.

Across the cases examined a common theme was the establishment of institutional arrangements to engage key ministries necessary for implementation of the green growth process. Inter-ministerial steering or oversight committees were a common approach, the most successful including high-level representation from a wide range of ministries that are tasked with both the development and subsequent implementation of the green growth strategy (Case 12).

Institutionalization can be further embedded in constitutions or legislation, or in institutions themselves, such as Commissions or other more permanent structures. These institutional arrangements, allow for continuous iteration of the evidence base, the engagement of new stakeholders and the review and revision of plans and objectives. Where they are able to provide long-term legislative certainty, they provide important signals to attract the investment into green infrastructure and industry (Globe International, 2013). Another key consideration is the integration of green growth planning at various levels of government. While it is important for national government to set country-level green growth objectives and the mandates to support them, it is often sub-national government that are responsible for implementation. For this reason, co-ordination between central and local government plays an important role in the effective institutionalization of green growth planning (UNESCAP, 2012a) and effective planning processes will take this into consideration (OECD, 2011). This is discussed in more detail in the [Chapter 8: Integrating subnational action](#).

Institutional arrangements put in place through legislation are often better protected from political changes and pressures of interest groups than those put in place through presidential decree or executive order. For example Mexico's Climate Change Law which would require an act of Congress to change.

Case 12:

Ministerial engagement in the MAPS-Chile process

In Chile, the Mitigation Action Plans and Scenarios (MAPS) process supports the Governments' low emissions development and climate change planning through collaborative development of economy-wide greenhouse-gas mitigation scenarios. The approach (which drew on the earlier experience of South Africa's Long-Term Mitigation Scenarios) involved seven ministries in steering and contributing to the development of the national low carbon development strategy and the subsequent Sectoral Mitigation Action Plans (SMAPs). A key component of this approach included embedding climate advisors in each targeted sectoral ministry (which were jointly funded by the Government of Colombia and the US Agency for International Development) and are tasked with liaising with national low carbon development planning process and integrating climate change considerations into the day-to-day work of the line ministries. These included ministries of: Finance, Agriculture, Energy, Transport, Foreign Affairs, and Mining, all coordinated by the Ministry of Environment.

In Colombia, the Government has embedded advisors in several key line ministries, including Energy, Finance, Agriculture, and Transportation. These advisors are responsible for representing the ministry to the country's Low Carbon Development Strategy process, helping to develop and implement each sector's 'Sectoral Mitigation Action Plan', and for advising ministry leadership on issues related to climate change mitigation and adaptation. This approach has ensured that climate change is being integrated into the 'business as usual' planning processes, such as the 5-year National Economic Development Strategy (see Case 11), as well as things like the country's Transportation Master Plan. The embedded advisors are funded by an outside donor (the US Government) and thus have been protected from a number of recent political changes at the ministerial and vice-ministerial level in the line ministries. Complete government turnover (even at the technical levels) when political parties change is a particular challenge in many developing countries. The benefit of this approach is that these embedded advisors have been able to maintain continuity of the work of the green growth planning and implementation process despite these recent political transitions and have been successful at engaging the new leadership in the existing process.

Next steps

It is too soon to tell in most cases which green growth strategies will be the most effective. Only sustained and close examination of the emerging approaches around the globe over the next decade can provide conclusive insights into understanding which green growth planning practices are most effective at driving long-term, transformational change.

There are a number of elements addressed in this chapter that would benefit from additional analysis and future research, specifically this could include:

- More comprehensive and deeper analysis of developed country processes, such as the UK and EU.
- Examination of a broader range of case studies in both developed and developing countries, with a particular focus on key differences and similarities in what constitutes effective green growth process.
- Assessment of countries that have developed and implemented green growth processes over a longer period, such as five to ten years, to better understand the impacts of a given set of policies and to assess the durability of specific institutional arrangements.
- Conducting primary research through interviews (and other methods) into the political tactics and institutional arrangements of successful green growth processes, as these emerged as two of the most important determinants of success.
- Conducting further, more detailed analysis on how best practice from other areas, such as conflict management, strategic planning, stakeholder management processes can better inform and support emerging green growth planning processes.

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Chapter 2

Establishing vision, baselines, and targets

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This chapter focuses on how governments are establishing high-level visions for green growth, supported by associated targets and baselines.

A **vision** is a long-term and shared objective to guide policy making. The main focus of a vision for green growth is to articulate a cross-government objective in order to provide a common purpose for national, sub-national, and regional **targets** and action. These targets are often expressed in terms of deviation from a 'business-as-usual (BAU)' **baseline**.

In this chapter we address the questions:

What processes and approaches have proven useful when creating a high-level vision for green growth and for establishing and using baselines and targets?

Key messages are:

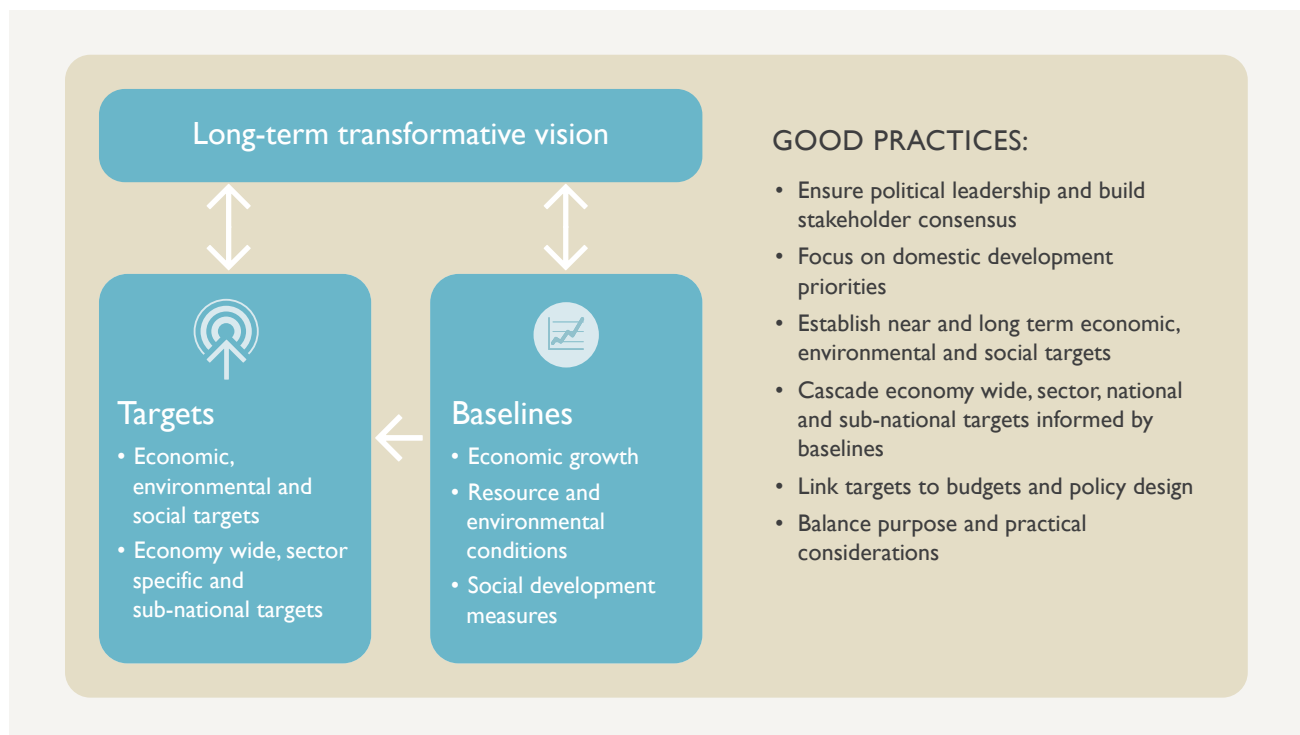
Vision

Establish a vision for long-term green growth driven by high level political leadership and supported through consensus building with stakeholder groups.

- Green growth strategies will have a higher chance of success when they focus on clear, specific domestic priorities, strategic sectors and socio-economic issues and are integrated with wider economic development visions. Championing by the political leadership, in many cases the country's President or Prime minister has often been critical in developing a green growth vision across government.

Figure 1:

Vision, baselines and targets as part of green growth planning



- It is vital that the green growth vision is established beyond the environment ministry, and is shared by powerful ministries including planning, finance, and trade and industry as well as key sector ministries such as energy, transport, and agriculture.

Targets

Establish targets aligned with domestic priorities, such as economic output, poverty reduction, employment, emission reduction, industrial growth, and natural resource protection.

- Targets should be chosen in a way that aligns with the country context. Overarching targets such as national emission reductions are useful for measuring the progress and success of the green growth strategy. But setting a high-level target which is of no immediate consequence to policy makers and stakeholders should be avoided. Individual and specific targets are needed to operationalize policies and assess progress in relation to priority technologies and sectors.
- Combining a long-term target to reflect the general goal, with short-term targets to guide concrete action has been a successful approach.

Baselines

Balance purpose and practical considerations in establishing the basis for developing and communicating baselines.

- The definition and scope of a baseline should respond to functional need, including the policy targets and timeframes in question. However, data availability can be a constraint.
- Baseline choices directly influence the effective ambition of any particular relative targets. Transparency about assumptions can reduce potential mistrust of politically motivated baseline adjustments.
- The purpose of a baseline is to serve as a reference to which a green growth pathway is compared. A baseline requires making many plausible assumptions that can contribute to understanding a country's green growth pathway, even if sometimes those assumptions are greatly simplified. Many tools are available for developing baselines, but even a simple, transparent approach can be fit for purpose. Choose complex models only if the policy questions require so and data and resources are available.
- Aim for transparency and broad stakeholder engagement in the construction of the baseline, to improve credibility and support future updating and replication.

1. Introduction

This chapter focuses on how governments are developing high-level visions for green growth and setting associated baselines and targets. Advancing a national strategy for green growth depends on leadership and a shared sense of direction within government, and with other actors. A compelling high-level vision for green growth can support this.

This chapter asks the question:

What processes and approaches have proven useful when creating a high-level vision and for establishing and using baselines and targets?

What do we mean by visions, targets, and baselines?

A **high-level vision** is a long-term and shared objective to guide policy making. The main focus of a vision for green growth is to articulate an objective across the government in order to provide a common purpose for national, sub-national and regional action. Green growth strategies are often driven by a combination of domestic priorities and the desire to contribute to addressing global problems. These

strategies can cover a broad range of economic, social, and environmental aspects. For example, in a country where many people lack basic electricity and modern fuels, the vision may focus on enhancing access to sustainable and affordable energy. In a country where air pollution impacts on health, the emphasis may be on reducing hazardous emissions from vehicles, energy generation and industry. In a country with

significant forests, the vision could focus on sustainable land management and emissions reduction from deforestation.

Targets specify the desired outcomes of policy action (unlike 'goals', which refer to general aspirations). They are expressed as a concrete desired value of a specific indicator (e.g. GDP, poverty headcount, access to clean water, GHG emissions, etc.) at a given point in time. They can be set as absolute targets (e.g. tonnes of GHG emissions) or relative ones (e.g. tonnes of GHG emissions per dollar of output from the economy). Targets can also be defined in relation to business-as-usual scenarios (e.g. reduction in tonnes of GHG emissions compared to a projected baseline).

In order to set a target or assess progress, a reference level is useful. One approach is to use a historic reference level such as 'compared to 2009'. A more sophisticated approach is to develop a baseline. **Baselines** are defined

levels of specific variables or groups of variables (such as economic output, GHG emissions, poverty headcount, and air pollution), which are used as a reference against which to measure progress of set a target. Baselines can reflect either a historic rate of change (e.g. in forest cover or emissions) or future projections based on assumptions related to factors such as policies, economic structure, population growth, income distribution, energy prices and consumption, technology development. Baselines are often developed to reflect a 'business-as-usual' continuation of current policies and trends.

Both historic reference levels and projected baselines are used as benchmarks to inform target-setting, to establish a common understanding of the performance goals, and to enable governments to measure and communicate progress.

Even where individual targets and baselines have been established for different aspects of green growth, it is important to note that many of these metrics are linked. For example, countries may set targets for biodiversity conservation, deforestation abatement and GHG emission reduction, but in practice these three are not independent.

This chapter draws on experiences from a series of case examples:

Country	Case
Ethiopia	Climate Resilient Green Economy Strategy
Mexico	Special Program on Climate Change
Guyana	Low Carbon Development Strategy
Brazil	Baseline setting
Ukraine	Baseline setting
Kazakhstan	Baseline setting
India	National Action Plan on Climate Change
Vietnam	Green growth strategy and vision

Country	Case
Cambodia	Green growth strategy and vision
Germany	'Energiewende'
Denmark	GHG emission targets
China	Green growth targets
South Australia	State Natural Resources Management Plan
Indonesia	Targets for emission reduction with and without international support

It assesses them in a qualitative, descriptive manner against three evaluation criteria:

- **Robustness:** Do the vision, baseline, and target reflect the most important development issues and do they achieve broad support?
- **Efficiency:** Does the process used to establish the vision, baseline, and target create high quality outcomes without excessive cost, time, or burden?
- **Impact:** Are the vision, baseline, and targets supporting (or likely to support) significant change in the development path?

2. High-level vision

Establish a vision for long-term green growth driven by high level political leadership and supported through consensus building with stakeholder groups.

An effective high-level vision is both compelling and realistic; it addresses local priorities, and is grounded in sound analysis. It must articulate how economic, social, and environmental goals are linked in order to overcome 'silos' between government agencies (AfDB, 2013). India's National Action Plan on Climate Change – led by the Prime Minister's Office – is an example of such an integrated approach to setting a vision (Government of India, 2008) and South Australia's State Natural Resources Management Plan is an example of an integrated approach in natural resource management (Government of South Australia, 2012) at the subnational level.

Visions address domestic priorities, but in the context of international dimensions, such as climate change, energy trade, economic competitiveness, international co-operation and partnerships.

Key factors in establishing a vision for green growth are political leadership, often from a weighty sponsor such as a country's President or Prime Minister; consensus building processes to ensure public acceptability, support from key stakeholders, and alignment to domestic priorities and budgets.

2.1

Political leadership

Leadership is critical to establishing a common vision of the benefits of a green economic transformation and the pathway to achieving and building support for policy priorities in partnership with public, private and civil society stakeholders (OECD, 2013).

High-level leadership is important to ensure that key political and societal leaders will openly support transformative change. Ethiopia's process to develop a green growth vision and strategy was overseen by an inter-ministerial committee led by an economic advisor of the late Prime Minister, Meles Zenawi (Case 1). A key factor in its adoption was the personal championing of the Prime Minister and the close alignment with Ethiopia's economic ambition to become a middle-income economy.

2.2

Consensus building

As green growth strategies envision systemic change in development paths, which would impact many aspects of social and economic life, building buy-in, consensus, and ownership is critical for success. Public concern is often mobilized around the health effects of pollution and local

Case 1:

Green growth policy development in Ethiopia driven by the Prime Minister

In Ethiopia, the Prime Minister and his staff were instrumental in developing the high-level vision and strategy. The main framework for green growth is the Climate Resilient Green Economy Strategy (CRGES), launched in 2011. It is based on a vision to achieve middle-income status by 2025 through a climate-resilient green economy.

Achieving middle-income status implies increasing GDP per capita by 475% by 2030, while reducing greenhouse gas emissions by 35% below 2011 levels. The strategy also recognizes the need to adapt to climate change in agriculture and forestry (FDRE, 2011). In the preparation of the strategy, about 150 potential green economy initiatives were identified and analyzed and 60 initiatives were prioritized.

Case 2:

Ambitious vision and targets for Denmark

Since the 1980s, the **Danish** economy grew by around 80% while energy consumption remained broadly constant and CO₂ emissions fell. For the year 2020, the Danish Government has set a target of reducing GHG emissions by 40% compared to 1990. Its vision is for the country to be independent of fossil fuels by 2050. The vision was developed over several years and supported by a report in 2010 from a Climate Commission that was created by the Government in 2008. The final vision as set out in the Danish Energy Strategy was adopted by Parliament (Government of Denmark, 2011). The enabling factors in the Danish experience seem to be a long tradition of fiscal measures and other regulation to support environmental goals. This has contributed to the development of a clean tech industry, which makes ambitious target setting easier as there is a large constituency benefiting from such measures.

environmental damage. Developing green growth strategies that respond to such immediate as well as longer term concerns can help gain acceptance.

As described in [Chapter 1: Planning and co-ordination](#), a typical process has a steering committee, involving senior representatives from government ministries, local government, businesses, academia and civil society. In some countries, such as Korea, Guyana, and Mexico, the highest ranking official leads this committee directly, which has proven to be very effective to ensure a strategic, integrated economy-

wide approach (Zelenovskaya, 2012). Inter-ministerial committees can help build consensus across the government. Involvement of typically strong ministries such as the finance ministry is particularly important (Clapp et al., 2010).

Among developed economies, several examples stand out from countries which have made a significant commitment to green growth with strong stakeholder support. In Denmark, strong public awareness and business engagement has enabled support for an ambitious vision, which is sustaining high economic growth and at the same time reducing fossil-fuel dependency and protecting the climate and the environment (Case 2).

Germany is considered a pioneer in green growth policies (World Bank, 2011) and has established a strong vision for transforming its energy system (Case 3).

2.3

Domestic priorities

A growing number of developing countries are developing green growth visions that seek to achieve poverty reduction and economic growth through sound management of natural capital and improvements in resilience to natural disasters and climate change.

Focusing on *domestic* priorities, and identifying targets that are clear, specific, and quantifiable, and integrating green growth in a wider vision of economic development will have a higher chance of success (ADB, UNESCAP, and UNEP, 2012). This approach is illustrated by the cases of Vietnam (Case 4) and Cambodia (Case 5).

Case 3:

Germany's 'Energiewende'

A central part of the **German** green growth vision is the *Energiewende* (energy transformation); an ambitious plan to shift from fossil fuels to renewables, which became policy in 2000. Following the Fukushima disaster in March 2011, Chancellor Angela Merkel ordered the immediate closure of seven reactors, and brought forward plans to phase out nuclear power (Agora, 2013; Economist, 2012). Germany reaffirmed its clean-energy goals but it must now meet those targets without nuclear power. Germany's experience shows that the extremely high levels of environmental awareness of its citizenry are an important political driver of green growth choices. Germany also shows how complex an energy revolution is to implement: it currently still experiences increasing coal production and GHG emissions.

Case 4:

Green growth strategy and vision in Vietnam

In 2012, **Vietnam** approved the National Green Growth Strategy for the period 2011-2020 with a vision to 2050 (Government of Vietnam, 2012a). The strategy defines green growth as an important part of the country's sustainable development, to contribute to employment, poverty reduction, and improvement of the material and spiritual life of all people. The strategy lists climate change among the envisaged investments to stimulate economic growth, next to conservation of natural capital, and improvement of environmental quality. In the strategy's overall objectives, green growth is presented as a means to achieve a low-carbon economy and to enrich natural capital. When further specifying the objectives, the strategy highlights that greening of existing sectors and more efficient use of natural resources contribute to restructuring and improving economic systems in the country. Finally, the vision contains the objective of improving the living standards of people with an environmentally-friendly lifestyle and increased employment from green sectors.

Case 5:

Green growth strategy and vision in Cambodia

In **Cambodia**, the main driver behind the high-level vision is the problem of pollution that has come with economic and population growth. The National Green Growth Roadmap (Kingdom of Cambodia, 2009) includes access to water, agriculture, sustainable land use, renewable energy and energy efficiency, information and knowledge, better mobility, and finance and investments. The goal of the roadmap is to achieve ecologically sustainable economic progress that fosters low-emission, socially inclusive development. Key to the successful conclusion of a strategy on Green Growth in Cambodia was that the government's vision for Green Growth was closely aligned with the popular perception of the adverse health effects of the recent development pathway.

3. Setting targets

Establish targets aligned with domestic priorities, such as economic output, poverty reduction, employment, emission reduction, industrial growth, and natural resource protection.

Setting clear targets is an important step towards translating a high-level vision for green growth into a specific, actionable strategy. Targets can include economy-wide performance goals such as increased employment and economic output, or reduced GHG emissions, as well as sector specific goals. Such sector targets break down a green growth vision into specific, measurable, actionable, relevant, and time-bound components. These can be taken on by different ministries or political leaders. Developing specific and measurable targets can help focus and allocate efforts and resources, and enable progress to be measured and communicated.

While a review of literature reveals that the full range of targets which countries have chosen to adopt in their green growth plans and strategies is quite broad (Zadek and Forstater, 2009), experience with setting GHG emission reduction targets is the most well-established. This is in part because GHG reduction efforts are often at the heart of green growth programs, given that emissions reduction also leads to resource efficiency and clean technology development. In the case of developing countries, this is probably also due to the prominence of the UNFCCC process and the opportunities it affords to pursue external sources of finance.

The literature suggests that for targets to have *impact* they must be politically accepted and be seen as both credible and feasible. In setting targets, it is important to include a broad group of stakeholders to input, review and validate assumptions. While there are technical aspects, setting targets (and associated baselines) is fundamentally a political decision. A *robust* target needs to balance ambition with political feasibility and resource availability. The credibility of a target reflects the level of commitment. The *efficiency* of a target first and foremost relates to whether it adequately reflects progress on the goal it measures, relative to the cost burden it may impose on government, business, and society. The choice of scope is important here too: practical considerations can dictate a reduced scope, for example where the overall goal is emission reduction but the target is set in relation to energy, electricity supply, or renewables. This approach may be practical in aligning the target with a particular policy intervention, but can come at the expense of efficiency in achieving the overall goal.

3.1

Indicators and scope

The most common targets that countries use include those associated with economic output, poverty reduction, employment, GHG and other pollutant emission reductions, industrial growth, and natural resource protection with wide variance in how they are combined and timeframes used.

Case 6:

Green growth target setting in Mexico

Mexico published a Special Program on Climate Change in 2007, with a goal of reducing 50.5 MtCO₂e/year by 2012 compared to its baseline scenario. In June 2012 the strategy was incorporated into the General Law for Climate Change supported by all political parties, with specific goals of reducing 30% of GHG by 2020 (from BAU) and by 50% by 2050 from base year 2000, and of reaching 35% of clean energy generation by 2024. This General Law for Climate Change also states that all specific mitigation goals need to be delivered with budgets, indicators, and Measurement, Reporting and Verification (MRV), and will be regarded as first initiatives towards green growth.

The current Administration, elected in 2012, set a specific objective of promoting green growth in its National Development Plan. In 2013, it published the National Climate Change Strategy '10-20-40 Vision' specifying short-, medium- and long-term objectives with associated intermediate targets. (Federal Government of Mexico, 2013)



Setting targets requires first developing metrics and indicators that describe the various aspects that need to be measured in a transition towards green growth. The OECD Green Growth strategy devised a conceptual framework and selected an initial set of 120 indicators, divided into the following four categories (OECD, 2011 and GGKP, 2013), which are described further in [Chapter 9: Monitoring and evaluation](#). These indicators monitor:

- The **environmental and resource productivity of production and consumption**;
- The **natural asset base** including renewable and non-renewable natural resources stocks, biological diversity and ecosystems;
- The **environmental dimension of quality of life** capturing the direct impacts of the environment on people's lives;
- The **policy responses and economic opportunities** which can be used to help discern the effectiveness of policy in delivering green growth and where the effects are most marked.

One example of a country that has established legally binding greenhouse gas emission reduction targets, and mainstreamed them into national development planning is Mexico (Case 6).

In addition to being informed by quantitative analysis, green-growth-related targets often carry a strong political element. Many examples suggest targets chosen as a politically-attractive or round number, rather than the one based directly on analysis of abatement costs (An example includes the EU's 20-20-20 targets which were based on underlying analysis but then rounded (Case 7).

Although the EU is unique due to its supra-national decision-making and legislative structure, this package nevertheless represents an important example of green growth targets based on robust analyses, transformed into an easy-to-communicate format that can be used to build a broad constituency of support across political parties and other stakeholders. The EU process of allocating targets to member states through effort-sharing decisions is also an example of how an overarching target can be cascaded down to smaller jurisdictions. In a similar fashion, Indonesia's government has set a national target for GHG emissions reductions (a 26% unilateral reduction by 2020 versus BAU and a reduction of up to 41% with international support) and has subsequently tasked ministries and provinces to develop sub-national targets. In addition to this, there is the possibility of tying national budget allocations to targets as an incentive (Case 8)

When establishing a target, governments typically consider the ambition and effort it implies, the assumptions underlying the counterfactual business as usual scenario, comparison with other countries and the availability of financial resources

Case 7:

EU targets for 2020

The **European Union** set parallel targets for GHG emissions reduction, renewable energy, and energy efficiency as part of its Energy Policy for Europe (EPE), adopted by EU heads of state through the EU Council in 2007 (EU, 2007). The policy sets 20% targets for all three pillars for the year 2020. These targets were proposed separately and based on extensive technical and economic analyses commissioned by the European Commission such as the Renewable Energy Roadmap (EC, 2006). Nevertheless, round number and easily quotable "20-20-20" package that was finally enshrined via three EU Directives in 2009 was clearly set with political and communication objectives in mind. Although the three targets of the package were communicated and acted upon independently, they are of course related (Sterk et al., 2013).

Case 8:

Indonesian targets for emission reduction with and without international support

The **Indonesian** development plan contains a large number of targets, including targets relating to life expectancy, economic output, and the operationalization of a climate early warning system. Even though climate change mitigation actions are mentioned, no specific targets for emissions reduction are identified in the development plan. However, under the UNFCCC process, the president announced a target of 26% emissions reduction relative to BAU by 2020, rising to 41% with sufficient financial support from other countries. To achieve its unilateral target, Indonesia has prepared a National Action Plan For Reducing GHG Emissions (Rencana Nasional Penurunan Emisi Gas Rumah Kaca; 'RAN-GRK') that provides the basis for ministries and regional governments to implement mitigation activities.

Indonesia is now developing an approach for allocating budgets to national line ministries and agencies, as well as provincial governments to support their efforts to achieve these targets.

(WRI, 2012). Short-term political priorities also carry weight in the final decision.

Using the examples of GHG-related targets put forward under the UNFCCC process (Prag et al., 2013), green growth targets can be set using four different approaches:

- i) Absolute change measured against a historical base year level (e.g. change in GDP, employment, emissions);

- ii) Absolute change against a future projected level (usually 'business as usual');
- iii) Change in a ratio of variables (e.g. emission intensity per unit GDP, share of population below poverty line)
- iv) Achieving a specific fixed goal (e.g. middle income status, carbon neutrality)

In the case of emissions, emerging economies may choose intensity-based targets as they are able to accommodate growth in GDP while reducing emissions per unit of output (WRI, 2012). In all cases, targets may be stated either in terms of single numerical values or in terms of ranges of values (WRI, 2012). Targets set relative to a future projected level will have uncertain environmental outcomes because the total emissions mitigation impact implied by the target is dependent on the assumptions included in the baseline scenario (see section 3). If baselines are updated then it is not always clear if the target will now apply to the new baseline. Furthermore, if the baseline changes but the numerical target level remains the same (e.g. 20% reduction on BAU); this can alter the expected environmental benefit of meeting the target.

Intensity targets can make it difficult to assess the level of ambition, because it is often unclear what improvements

could be achieved in a business as usual scenario. This is especially true in fast growing economies with economically viable resource efficiency improvement opportunities. On the other hand, in countries with rapidly changing economic circumstances, absolute targets may quickly become either unreachable or too easy to achieve.

In Vietnam, targets for GHG emission intensity, green technology use, waste treatment, and public transport use are set in relation to the base year 2010. Consequently, no additional 'reference scenario' or baseline is needed. Vietnam's approach also demonstrates how targets related to tangible results such as infrastructure and technology use can be more readily understood and communicated to businesses and consumers (Case 9).

The Republic of Korea is an example of a country where a baseline scenario has been updated to reflect lower expected emissions, but the nominal target in relation to the baseline remains the same. In effect this means the absolute emission reduction implied by the target has been revised upwards (Republic of Korea, 2012). In Mexico, the baseline has been updated (MLED, 2013) but the national goal may still be measured against the old baseline, in the absence of an official statement from the government in this regard. Some plans refer to global necessary cuts indicated by science, as



Case 9:

Targets for green growth in Vietnam

The green growth strategy of **Vietnam** contains the following targets (Government of Vietnam, 2011a, 2011b, 2012a, 2012b):

- Reduction of greenhouse gas emission intensity (GHG/GDP) by 8-10% between 2011 and 2020, which corresponds to a reduction of energy consumption per GDP of 1 to 1.5% per year.
- Greening of industrial production: By 2020, 50% of applied technologies will be green technologies and 42-45% of GDP will be formed by production of advanced and green technologies. Moreover, industrial investments in environmental protection and enriching natural capital will reach 3-4% of GDP.
- Greening of lifestyle: By 2020, 60% of the Vietnamese grade III cities and 40% of the grade IV-V cities and villages will comply with regulatory standards for waste water collection and treatment systems. In large and medium cities the share of public transport will reach 35 to 45%. Half of these cities will comply with green urban standards.

well as some calculation of a national 'fair share' (Zadek and Forstater, 2009). For example Mexico, Guyana and South Africa refer to global 'required by science' targets.

Practice shows that it can be useful to break down the targets. One overarching target (such as decarbonizing the economy) can be appealing, but with multiple objectives, individual and specific targets are needed. This calls for intelligently cascading targets into priority technologies and sectors. Analysts should be careful that multiple targets are consistent or at least non-conflicting.

3.2

Policy integration

National priorities determine whether a country will target all major sectors or just specific areas of interest (ESMAP, 2009). According to OECD (2012), there are at least two possible ways to integrate green growth targets into policies:

1. A 'green growth mainstreaming strategy', which incorporates green growth targets into existing plans and strategies. This involves building on existing policies, initiatives, and institutions so that they work together better, with a focus on those which have proven effective or promising for green growth to date;
2. A 'stand-alone strategy for green growth', which focuses on key technologies and investments and develops a time-bound plan with associated targets.

Full examples of mainstreaming are rare. Some elements exist in economies with a long tradition of central economic planning, but none can be said to have fully mainstreamed green growth. The second approach can be more feasible and could deliver equivalent results as long as green growth targets are designed to reinforce development goals. Some of the examples described later in this section, such as Ethiopia or South Korea, serve as an illustration for the second approach. Targets for specific technology types, such for wind power capacity are also an example of the second approach.

Each country's economic circumstances, different stage of development and relative priorities are perhaps the most important factors which determine what targets will be set and pursued. For rapidly developing economies with high power use, such as China, India, South Africa and Mexico, it makes sense to focus on transforming the power sector and improving energy efficiency, while more advanced economies may pursue economy-wide mitigation opportunities (ESMAP, 2009 and Zadek and Forstater, 2009). As an example, Mexico is considering an energy sector reform that will dramatically change the energy mix of the country, coupled with a proposed carbon tax.

China has taken a mainstreaming approach, integrating environmental targets into legally binding national five year plans, and negotiating province and city targets. The need for

Case 10:

Green growth targets in China

China has set multiple targets related to green growth including reductions in energy consumption (coal) per unit of GDP; water consumption; chemical oxygen demand; emissions of sulfur dioxide, ammonia nitrogen and nitrogen oxide; carbon intensity; as well as increases in non-fossil energy and in forest coverage rates. The carbon, non-fossil, and forest targets are in line with China's 2020 goals under the UNFCCC process, though there is no formal link. The target-setting approach in China is influenced by the country's scale and diversity. Being very large and heterogeneous, effective target-setting in China requires strong engagement of local governments. Targets in the 12th Five Year Plan (FYP) are legally binding and set nationally and then allocated province by province. This process for the 12th FYP was more bottom-up input than before, as a means to set realistic, attainable targets based on experience. For example, the energy intensity target followed a three stage consultation process between the 31 provincial governments and the central government. Targets were flexible enough to be adjusted by province depending on the stage of development. Some provinces in the far west, which are still in early stages of development, for instance, have lower targets (China Dialogue, 2011).

This process sought to learn from the 11th FYP, where for example provincial energy intensity targets were mostly set close to the national target of 20% reduction, resulting in some provinces enacting drastic, last-minute measures to achieve goals. Another lesson from the previous FYP is to have a stronger review process for provincial GDP growth targets in light of environmental goals, with the aim of 'greening growth' as well as meeting pollution control targets. In parallel, achievement of environment-related targets has become more important in measuring the performance of provincial government officials.

targets to be set in light of local potential and constraints was underlined by the experience of inflexible targets in the 11th Five Year Plan (Case 10).

The cases of China and Ethiopia illustrate an approach combining climate change considerations with national development priorities and aligning the 'green growth' targets and strategy to existing development plans. Note that setting green growth targets is usually not fully integrated and mainstreamed, but as discussed above most countries have separate processes to set targets associated with green growth engines and then seek to integrate implementation with current development plans.

Allocation of national and sub-national budgets linked with targets can be an effective way to establish accountability and to motivate and support action to achieve targets. Indonesia, China, the State of California, and others are demonstrating such processes for linking budget allocation to target achievement.

Because of the differences in priorities and availability of good quality background analysis, some countries have developed single sector plans and others deal with multiple sectors including energy, forestry, agriculture and land-use, transport, and infrastructure (Zadek and Forstater, 2009). For example Guyana's plan has a strong focus on forestry, while China, India, South Africa and Mexico focus on power sector transformation and industry energy efficiency.

3.3

Timescale of targets

Targets typically need to include a specific time dimension. A short-term goal is generally considered any goal with a timeframe of less than 10 years, while long-term goals typically have a timespan of around 20-30 years (WRI, 2012). When a government sets targets with respect to a certain baseline, the timeframes for the two must be connected. A notional target may be seen as uncertain by private sector investors until it is backed up by specific policies and legislation.

Governments should link short- and long- term goals, for example combining a 2050 'vision' with intermediate 'targets' in 2020 and 2030. On climate change, most plans combine a long-term vision with short-term planning within a 5-10 year window, which reflects the timeframes discussed in international negotiations on climate as well as most governments' policy horizon. Case 2 illustrates this point with the example of Denmark.

India and China are integrating long-term climate change strategies into their 5-year development planning cycle. Mexico applies a long- and a short- term vision through a vision and target for 2050 combined with a 6 year action plan for each administration.

As in Mexico and China, the credibility and achievability of the targets is strengthened by adopting them in a legal framework.

Use of intermediate targets and well-articulated procedures for regular updates can enable ongoing review of progress and adjustments of green growth plans over time. Setting intermediate targets can also help by laying out a pathway

towards the eventual goal, and it can give stakeholders the confidence that periodically the targets are scrutinized and reviewed. This is the case, for example, in China where the process is parallel to the national five year planning cycle.

A further timing issue is the period over which targets apply. Setting a target that measures only a snapshot of performance in a particular year can be at risk of being distorted by unpredictable events during that particular year. Targets that cover multi-year periods (e.g. average or total performance over 2021-2025) can be more robust in this regard.

3.4

Engagement and communication

Setting and communicating credible targets requires engaging with stakeholders. In practice, this starts before the targets are set. Involvement can range from data-collection to analysis and discussion. Each country has pursued this engagement with different emphasis, enthusiasm and sequencing. A more detailed analysis of best practices in stakeholder engagement processes is presented in [Chapter 1: Planning and co-ordination](#)

Across the literature and case studies, a number of good practices emerge:

- **Flexibility in target setting improves efficiency, provided that overall effectiveness is not compromised.** A target-setting process that is flexible enough to address stakeholder concerns can be efficient in terms of winning support and gaining political feasibility, provided that this does not undermine the underlying green growth objectives. Flexibility also relates to propagating and differentiating the targets to sectors or a subnational level, such as provinces, states, or districts. This also allows for an initial focus on key sectors or provinces to gain experience. China presents a good example of engagement of subnational levels of government in target setting.
- **Establishing end-use targets (e.g. infrastructure deployment, technology use) can build business and consumer support and acceptance and ensure practical results.** Vietnam has taken such an approach. The EU targets for renewable energy and energy efficiency, combined with Member States' own policies to help achieve them, have provided key investment incentives for business.

4. Baselines and reference levels

Balance purpose and practical considerations in establishing the basis for developing and communicating baselines.

Baselines are used to inform policy design and to provide a basis for setting targets and assessing the impact of policies. While it is difficult to assess baselines in isolation from targets, considering their specific elements can inform best practices. It is possible to establish targets without developing a baseline, for example by measuring against a historic or arbitrary reference level. However, more robust baselines inform and lend credibility to targets.

Baselines are by their nature uncertain, as they tell stories about the future. Literature suggests that for baselines to be credible, it is important to draw on a broad group of stakeholders in developing the baseline and to ensure transparency about the assumptions used. As with targets, baseline setting is both a technical discipline and a matter of political choice. Robustness of a baseline can be ensured by choosing the right scope and tools, the choices for which are critically dependent on availability of data and human capacity. Whether a baseline is efficient depends on its appropriateness in use for policy design or measurement, and the resources invested in its establishment.

Note that in many cases it is difficult to assess the impact and robustness of a baseline without understanding the relationship to the target.

4.1

Factors that influence baseline development

While the concept of baselines is not new, and many baselines have been published covering factors such as forest cover, fisheries, biodiversity, and water availability as well as GHG emissions, there is not a deep field of literature on best practices for establishing a baseline. There is a small growing set of literature focusing on GHG emissions baselines, including work by the OECD and the Danish Energy Agency (DEA, OECD, and UNEP Risoe, 2013; Clapp and Prag, 2012; Prag and Clapp, 2011). Approaches to baselines using modeling tools require specific assumptions and data sets as outlined by Stanton and Ackerman (2011). As a more practical handbook, the GHG Protocol Mitigation Accounting Initiative by the World Resources Institute (2013) has released a draft standard for setting public GHG mitigation goals that includes step-by-step guidance for baseline development. There is also guidance for determining historic reference emission levels and projecting them into the future for REDD+ (e.g. UN-REDD, 2011).

Even when focusing on particular policy objectives within the overall green growth framework, many factors influence the robustness and transparency of a baseline. It is therefore useful to break it down into several elements: definition

(including the area of green growth being focused on), methodology, and transparency and application of baselines.

Table 1 provides an overview of the influences on each element of a baseline, which are briefly discussed in the following subsections. Practical examples of some of these influences can be seen in the case studies.

4.2

Defining a baseline

The baseline **scenario** relates to the story line it tells, which is influenced by the timeframe, coverage of sectors and indicators, and the inclusion and treatment of policies. Often baselines are projections of business-as-usual; reflecting existing policies and trends. A baseline can also reflect a static, historical reference level.

It has been suggested in academic literature that best practice in assessing the effect of proposed government intervention is to define two separate projections. The first being a baseline projecting business-as-usual, which incorporates all policies that have already been fully adopted, and the second being a projection of the key variables that includes new green growth policies (Strachan, 2011). The difference between the two would represent an estimation of the effect of green growth policies.

The incorporation of policy impacts in baselines is not always clear. It is useful to distinguish between policies that have already been implemented, and those that are still in the planning phase. To clarify which policy impacts are included, baselines should indicate a point in time beyond which new policies are not included, and also how projections of policy impacts are determined, such as those based on frozen impact trends or extrapolated penetration of impacts (Clapp and Prag, 2012).

The **scope** or coverage of a baseline is typically influenced by prominent sectors in the economy, and the type of strategy or target that a country is pursuing. In most cases, governments will include some basic assumptions on socio-economic growth such as GDP, employment, poverty headcount, and of environmental factors such as GHG emissions and air pollution. Additional attention and detail is usually given to dominant sectors.

The scope of the baseline may also be impacted by what data and tools are available for certain sectors, and the extent to which resources are available to develop and manage those tools. Countries are more likely to have developed tools and data for the energy sector. For more diverse sectors such as land-use and transport, models and data are less prevalent. For this reason, the land-use sector is sometimes excluded from a baseline even if it represents a significant share of a country's emissions or growth. An example is the baseline for India which excludes the agriculture sector which accounts for approximately 20% of India's GHG emissions (DEA, OECD, and UNEP Risoe, 2013).

Table 1:

Factors that influence baseline development

Baseline element		Influences
Definition (Section 4.2)	Scenario	<ul style="list-style-type: none"> • Focus of green growth strategy/target • Data availability • Complexity of policy impacts • Timing of policy implementation
	Scope	<ul style="list-style-type: none"> • Data availability • Policy or target timeframe
	Timeframe	<ul style="list-style-type: none"> • Policy or target timeframe • Political preferences
Tools and methods (Section 4.3)	Tools	<ul style="list-style-type: none"> • Resource constraints • Anticipated policy questions • Political preferences
	Data and assumptions	<ul style="list-style-type: none"> • Data availability • Political preferences
Transparency and updating (Section 4.4)	Stakeholder input and review	<ul style="list-style-type: none"> • Political preferences
	Updating	<ul style="list-style-type: none"> • Data availability • Political preferences

The optimal choice of tools and methods depends on the country context, the availability of resources, and political preferences. In South Africa and Mexico, resources and capacity together with political will enabled a fairly complex modeling of GHG baselines. Other countries choose a more simple approach. In Brazil, a historic reference level for deforestation was chosen for simplicity (see Case 12 on page 74), and in Ukraine a simple tool was chosen to ensure transparency and transferability of the baseline development tool (Case 11).

Setting a baseline is both a technical and a political exercise, and choosing a baseline that combines impact, robustness, and efficiency balances both. Ethiopia has put forward a baseline that reflects a plausible mid-point between aspirational government projections for GDP growth and more conservative forecasts, which has given it a degree of credibility to all stakeholders. In Kazakhstan, the government's choice of year for their Kyoto Protocol baseline was viewed by UNFCCC negotiators as skewed to maximize the emission reductions of the country and therefore more difficult to accept. In addition, donor preferences might be influential in the case of baseline development for developing countries.

The timeframe of a baseline reflects the period over which the baseline projection will be made. For some baselines, a long-term horizon (e.g. 30 years or more) is useful for planning policies with impacts on long-lived infrastructure. For others, a short-term policy planning timeframe, (e.g. 10 years) is more useful. Other political or financial concerns may

also play a role in the timeframe of a baseline, particularly if a single-year reference level is used and highlights particular circumstances of a country at that time.

4.3**Tools and methods**

Many tools can be used to develop green growth baselines. Available analytical tools range from simple projections based on emission factors, to detailed sector-specific models and macro-economic models based on GDP and population projections. Qualitative information from stakeholders can also be used to supplement and inform quantitative tools.

Simplicity and transparency are valuable for credibility and updating. Complex models should only be used if they are necessary to address particular policy questions. The Ukrainian experience can serve as an illustration of a practical approach (Case 11).

Historic data provided by a national emissions inventory is a useful starting point for projecting emission trends into the future. A simplified approach is to develop economic and emission trends by sector for an economy. The disaggregation of sectors depends on the information available, but in general an '80/20' approach is efficient, in other words, focusing on the sectors that produce the most economic growth and emissions (MLED, 2013b). In projecting future economic activity and emissions from each sector, technical

and sector-specific assumptions such as projected fuel prices and electricity consumption, as well as socio-economic assumptions on economic and population growth, will need to be made.

A more complex approach is to use models for the priority sectors. Modeling tools can take a bottom-up approach, focusing on a specific sector or provide a top-down representation of the full economy. A range of models from relatively simple and transparent models to relatively complex macro-economic models exists and varies regarding licensing and cost. For example, the Long-range Energy Alternatives Planning (LEAP) is one that is available free of charge for developing countries (SEI, 2013). Additional models that can also be used to develop baselines are elaborated in the [Chapter 4: Prioritization of green growth options and pathways](#). Table 2 gives an overview of quantitative approaches to baseline development.

The anticipated policy questions can give an indication as to which models are useful and what level of detail is needed. Model choice is also subject to which models are readily available or adaptable to country circumstances and data. The developing country experiences highlighted in the recent report by Danish Energy Agency, OECD, and UNEP Risoe (2013) suggests resource constraints are often a key factor in model choice, and many countries choose to adapt readily available models.

A simple approach or tool can suffice for countries where resource and data constraints are significant. Some countries choose to incorporate multiple modeling approaches to be

Case 11:

Baseline for greenhouse gas emissions in Ukraine

Ukraine is considering a future carbon emissions trading scheme and weighing modeling approaches for analyzing baseline and market-based policy scenarios to support their decisions. In considering the most appropriate modeling tools for Ukraine's State Environment and Investment Agency, UNDP project partners performed a review of tools and models that either had already been adapted, or could be adapted to reflect Ukraine's economic and emissions profile. The greater weight was placed on the *simplicity and transferability of a baseline development tool to the Agency* (UNDP, 2011). Thus the ultimate decision on the baseline and policy modeling approach for Ukraine may not necessarily reflect the most detailed tool, but rather reflect the practical circumstances faced by the implementing agency.

able to examine both detailed aspects of a particular sector and more macro-level economic trends and policy impacts. While there is no one 'correct' modeling approach, comparing multiple approaches can help determine which results are more robust, and can help establish bounds of uncertainty.

Table 2:

Types of quantitative tools and approaches for development of scenarios and baselines

Tool type	Description	Policy impacts modeled
Projected trends	A projected trends approach uses emissions factors to project emissions trends.	Emissions
Bottom-up models	For example energy system interactions, technology cost, and environmental performance	Emissions, and low-carbon technology deployment in a specific sector
Top-down models	Top-down models represent the economy as an integrated whole. One example is Computable General Equilibrium (CGE) models that simulate an aggregate economy and its supply and demand through a balanced price mechanism.	Emissions, and economic structure and processes. CGEs model macro-economic impacts of climate change policy (e.g. GDP, terms of trade)
Hybrid models	Hybrid models combine both bottom-up technology detail (e.g. in the electricity sector) and some degree of top-down economic integration.	Technology deployment and some economic impacts

Case 12:**A pragmatic reference level for Brazil**

The case of **Brazil** is interesting, because it chose a pragmatic approach of setting a simple deforestation baseline in a highly complex context. Brazil has a large extent of tropical forest and rising deforestation rates (Government of Brazil, 2009). In choosing a national baseline (and targets) for deforestation, Brazil was faced with the complexity of the drivers of deforestation, and their interaction. Brazil was keen to progress on a national deforestation target and quickly establish a performance-based funding model for the Amazon Fund. In favour of efficiency, the government has chosen a simplified approach to the development of their deforestation baseline. Brazil uses a national historic reference level for

the rate of deforestation, rather than a detailed projected baseline.

Brazil has some of the most sophisticated data and modeling. However, the historic baseline is chosen for simplicity and to overcome political barriers to developing incorporating detailed state baselines into the national framework. It presents a good example of a situation where a simple and easy to communicate baseline is preferable over a more technically sound and precise one. It is clearly efficient, but it is more difficult to assess whether this approach is robust, as the linear rate has not been compared with the results of more complex modeling tools.

Data and assumptions for baselines can come from domestic or international sources. National or domestic data sources can reflect local knowledge that may not be captured in international projections, and make acceptance by domestic stakeholders easier. Gaps in local data for projections can be filled in with international data sources, such as IMF GDP projections or IEA energy price projections. Recent developing country experiences indicate a trend towards incorporating national data sources when available for GDP, population and energy price trends (DEA, OECD, and UNEP Risoe, 2013).

A range of baseline scenarios provide an efficient approach to addressing uncertainty, by reflecting several plausible future pathways. South Africa used such a range of scenarios.

4.4**Transparency and updating**

Transparency in baseline development can improve credibility with national and international stakeholders. Involving them through targeted meetings at an early stage can help to build acceptance among key industry groups. Stakeholder meetings to discuss baselines can also be helpful in exposing and 'testing' the baseline process to stakeholder interests. Thus a balanced representation of stakeholders and a transparent process can help manage influences on a baseline (Clapp and Prag, 2012). Some suggestions for greater transparency and learning from good practice have been put forward for discussion for GHG baselines – for example, in regards to clarifying scope and assumptions; treating uncertainty; consultation and review; and updating baselines –

which also apply broadly to other elements of green growth baselines (Clapp and Prag, 2012 and DEA, OECD, and UNEP Risoe, 2013).

In Mexico, scenarios and the scope of the baselines are chosen to match the storyline they tell and the policy targets and timeframes to which they relate (see Box 13). The case also shows that comparative analyses can improve the robustness and value of a baseline, by testing the impact of certain assumptions and through use of alternative analytic approaches.

The above cases illustrate that there is no such thing as a right or wrong baseline: baselines can tell a story about the future (Mexico, Case 13), provide an agreed reference to which a green growth pathway is compared (Brazil, Case 12), or provide an historic reference level that contributes to understanding a country's green growth target (Kazakhstan, Case 14).

Updating of baselines includes review and adjustments over time. Review and updates of projected GDP assumptions are especially important for economies with fluctuating economic growth rates. Careful consideration of the uncertainty of a baseline can also be a way to take a more transparent approach to baselines. All projections are uncertain, and can be highly sensitive to specific assumptions, such as energy prices or GDP growth. The treatment of uncertainty varies across baselines, from simple approaches such as sensitivity analysis on specific variables, to more complex approaches such as Monte Carlo simulations to bound uncertainty across a range of variables. Baseline and model comparison exercises can highlight areas of convergence and uncertainty.

Case 13

Green growth baseline setting in Mexico

Mexico, through the then National Institute of Ecology (INE), constructed an official GHG emissions baseline in 2009 together with a Marginal Abatement Cost Curve (MACC). This technical work supported the country's pledge in Copenhagen to reduce GHG emissions by 30% by 2020 (INE, 2009). This effort, however, faced some concerns mainly from the private sector regarding the conservative approach used for the baseline projections. Alternative analysis with different assumptions indicated higher projected 'BAU' emissions. The first important lesson learned was: it is fundamental that all stakeholders should have an opportunity to be involved in the construction of the national baselines to avoid later disagreements and complications.

The government was keen to ensure transparent and broad stakeholder involvement in the process of updating the emissions baseline and MACC analysis, so when the original baseline was updated in 2013 (MLED, 2013 and 2013b) the

outcome was well received by all parties, being fed into the newly published National Climate Change Strategy (Federal Government of Mexico, 2013). This demonstrated that Mexico has a robust and transparent approach to maintaining a green growth baseline that reflects recent economic and demographic trends and includes GDP, employment, GHG emissions, and other factors.

Mexico is the only case where a legal framework has been established that supports regular updating of these key products (DEA, OECD, and UNEP Risoe, 2013). Mexico has engaged in a comparative study aimed at understanding the differences between Mexico's own baseline (MLED, 2013) and that generated by using a different model (Prospective Outlook on Long-term Energy Systems (POLES) model). This baseline comparison exercise has contributed to the credibility of the new Mexican baseline and should be viewed as a good practice. (DEA, OECD, and UNEP Risoe, 2013).



Case 14:

Green growth baseline setting in Kazakhstan

In **Kazakhstan**, the choice of their GHG emission reference level, which in this case is a single base year, reflects the political desire to show the maximum impact of policies. The 1992 baseline year was selected to show a high emissions level, before the full impact of the economic slow-down of the former Soviet Union was felt in Kazakhstan (WRI, 2011). However, this became a point of contention in the Kyoto Protocol discussions, as the base year was chosen by Kazakhstan in their own self-interest to maximize their emission reductions. *A base year chosen to reflect a midpoint in economic circumstances may have been viewed as more robust.*

Next steps

This chapter discusses how governments develop a vision for green growth and how they establish associated targets and use baselines to establish and measure targets and policies. There is only limited practical experience, and long term effectiveness cannot be assessed at this moment. Although evaluating and ranking countries' processes and approaches is outside the scope of this study, experts indicate that there is still much to learn and improve.

In our view, the most pragmatic way forward is to step up the active sharing of experiences among experts in the development of successful high-level visions and for target and baseline setting. Our hope is that practitioners, political leaders, governments, and citizens around the world can use these examples to become more comfortable with the concept of green growth and to help propel it to the mainstream.

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Chapter 3

Assessing and communicating benefits of green growth

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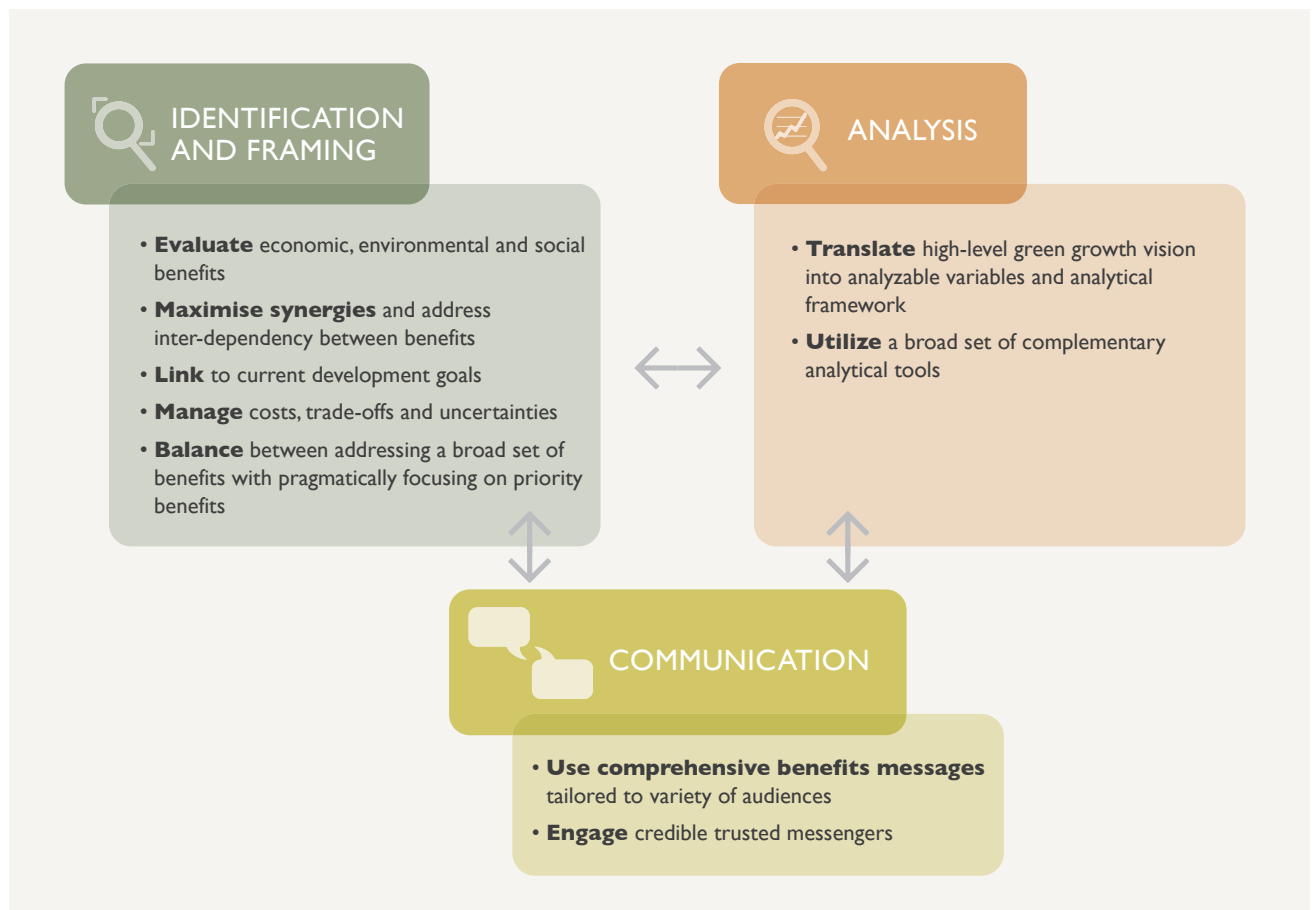
Governments pursuing green growth strategies aim to achieve sustained economic growth alongside broader environmental and social objectives. They focus on leveraging the synergies between these three dimensions, while managing the trade-offs efficiently. This often involves transformational change, especially the de-coupling of economic growth and improvements in social welfare from natural resource depletion, and the development of climate resilient growth and societies.

There is no uniform model of green growth, nor a set of universal aims or benefits. Green growth must be defined locally, based on domestic preferences and circumstances, and the pathway to its achievement will vary accordingly. This chapter explores the potential benefits of green growth. It does so in three parts:

- **Identifying and framing benefits** looks at the potential benefits of a green growth pathway, and how countries have sought to identify and frame the opportunities
- **Analyzing benefits** looks at the tools and approaches that can be used to analyze the benefits of green growth
- **Communicating benefits** looks at how to communicate the benefits of green growth in a world of vested interests and diverse stakeholders

Figure 1:

Identification, analysis, and communication of benefits



The key conclusions we have reached are:

Green growth involves maximizing synergies between environmental, social, and economic development outcomes and managing the costs, trade-offs, and uncertainties.

- A green growth strategy pursues overall benefits across economic, environmental and social outcomes. Reducing the likelihood and impact of climate change is only one potential benefit. Other synergies can lead to improvements in attracting investment in innovation, creating green jobs and industries, conserving natural capital and advancing sustainable rural livelihoods.
- Decision-makers can set out a systematic vision that identifies desired outcomes, costs and benefits, and a pathway for achieving them. This works best where green growth is integrated into the primary development plans as in Ethiopia and Korea, and where the aligned benefits reinforces policy coherence and strengthens the case for green growth.
- Decision-makers can also identify benefits (and costs) by applying a green growth lens to specific policies, programs, and investments. This however, will not necessarily be sufficient to enable more transformational shifts to a country's development pathway.
- A green growth framework should facilitate the management of trade-offs, and the distribution of benefits and costs to different parties. Considering trade-offs over time is important – choices critically depend on treatment of uncertainty, risk, and the discount rate.

While integration of a full set of green growth outcomes and benefits is desirable, focusing on a key sub-set is more pragmatic.

- It is common to focus on a key set of outcomes and benefits, tailored to the specific sector or local conditions. This allows decision-makers to focus on the most critical issues related to their sector or geographic area.
- A broad enough set of benefits must be assessed to allow robust decision-making. Focusing only on politically immediate or easily measured benefits may conceal the full costs and benefits and overlook the possibility of transformational shifts. A focus on climate change related issues is critical, but generally too narrow.
- Similarly, care should be given not to 'cherry pick' benefits to paint an over-enthusiastic picture, or overly simplistic green growth story.

To create a robust assessment of green growth benefits, the high-level vision on green growth must be translated into a set of targets, and subsequently a concrete set of analyzable variables.

- Although analysis should reflect (and in turn help inform) the priorities set out in the green growth vision, there is often a missing link, where the green growth analyses reflect a very partial treatment of the green growth vision.
- For countries considering green growth, experience from other countries can be a quick and compelling way to demonstrate the likely green growth benefits, and can help guide both the vision and the analytic approaches prior to a more in-depth assessment.
- It is important to prioritize specific green growth benefits as part of a country's vision, and in many cases priorities are not explicitly or sufficiently laid out before conducting analyses. The end result is often incomplete or delayed policy action.

An effective analysis of benefits requires a broad, though not necessarily complex, analytic framework that integrates a number of complementary approaches.

- Many countries have employed 'extended' cost-benefit analyses in addition to other approaches such as macroeconomic assessments and isolated assessments of individual benefits. This can be a very effective way to achieve quick wins, and for most countries it is an important starting point to demonstrate the value of green growth and show results.
- Despite their limited practical uses, macroeconomic assessments can provide an economy-wide perspective and overall confidence in the economic, social, and environmental soundness of a green growth pathway.
- Sector models that integrate broader green growth benefits and mainstream sector aims are the central elements of a green growth analytic framework and those with the closest link to policy action.
- Around a core sector-level assessment, most countries build additional analytical layers, including analyses of natural systems and various 'bolted-on' analyses tailored to assess specific benefits of interest. This helps build a robust narrative on green growth.
- It is a significant advantage to have a strong set of coordinating institutions that ensure the full benefits case can be drawn together from different analytic efforts, and that new efforts can be guided to tackle the major challenges and knowledge gaps.

Engage credible and trusted messengers in presenting tailored, robust, and balanced messages to offer evidence-based arguments for deviating from business as usual.

- The transition to a green growth pathway, deviating from business-as-usual, may be perceived as threatening to individuals, companies, and countries. Therefore, messages on the benefits of green growth must be compelling, backed up with robust, transparent and credible analysis that can withstand attack by vested interests.
- Messages about benefits and impacts of green growth should address the full spectrum of value groups who will have different entrenched interests. This requires a range of communication materials, specifically designed to resonate with all groups and answer their key concerns, and with a level of detail appropriate for the audience.
- Evidence suggests that people are most likely to trust a message if it is delivered by somebody with whom they feel a cultural or ideological affinity.
- Resistance to a green growth transition can be countered by presenting a balanced view of the transition, with clear messages on the winners, losers and trade-offs that are expected.

1. Introduction

If green growth strategies are to have traction, the potential benefits need to be identified and measured. While governments often state their objectives in terms of social, economic and environmental outcomes, there is still a gap in integrating these broad objectives into policy and action (World Bank, 2012).

This chapter examines how some countries have identified, analyzed, and communicated benefits so they can be incorporated into their development framework, and what approaches have proven to be particularly effective. We explore international experience across three sub-questions:

- **Benefits:** What potential benefits of green growth have been identified?
- **Analysis:** Which analytical and consultative approaches are used in assessing the net benefits of pursuing green growth strategies?
- **Communication:** What approaches have been effective in communicating the benefits of green growth?

It is important to be explicit and upfront about the limitations of this chapter. The first caveat of the assessment is that it does not comprehensively assess actual benefits achieved. This chapter is primarily concerned with the assessment of

benefits *ex-ante* and thus before the implementation of a strategy. By clarifying the potential benefits of green growth, and using them to guide policy decisions, the hope is to ultimately motivate implementation, and the realization of these benefits. The second caveat is that this chapter is not a comprehensive assessment of all countries, but acts as a guide to current practices – therefore any conclusions are limited by the scope of the assessment.

The case studies include:

Country	Case
European Union (EU)	EU Roadmap for moving to a low-carbon economy in 2050
United Kingdom (UK)	Climate Change Act (2008) and wider green growth benefits
India	Integrated rural energy programs
Ethiopia	Climate Resilient Green Economy (CRGE)
Mexico	National Climate Change Strategy

What do we mean by green growth benefits (and other key terms)?

Green growth is closely aligned to sustainable development. The basic premise of sustainable development is that future generations should not be any worse off than the current generation, and that there must be a balance between economic, environmental and social sustainability. Substantial effort has been made to translate that broad statement into a coherent intellectual and policy framework that defines sustainability, recognizes the interrelationship between stock (wealth) and flow (growth), accounts for equity (inter- and intra-generational equity), and values natural assets and integrates them into conventional economic indicators (e.g. value of biodiversity loss as part of GDP accounts) (Atkinson et al., 2007; and Rennings and Wiggering, 2007).

Proponents of green growth put a particular emphasis on: (i) the imperative of achieving economic growth as a key driver of increased welfare; (ii) the strong interactions between the three dimensions of economic, environmental and social sustainability, the potential for synergies, and the need to weigh trade-offs in light of these interactions; and (iii) the need for transformational changes to the conventional development pathway in the context of emerging technologies, historic path dependencies, and impacts of future climate change. Green growth offers 'strategic and analytical merit' vs. alternative paradigms to facilitate a response to environmental problems (Bowen and Fankhauser, 2011).

In order to understand the potential benefits of green growth it can be useful to employ a **value creation framework**. Such a framework considers the drivers of economic growth and associated economic, environmental and social outcomes. It also helps structure a green growth modeling approach. A robust green growth value creation framework should consider:

- **Comprehensive well-being**, valued across the priority green growth goals. This means focusing on welfare indicators that go beyond GDP growth.
- **Comprehensive wealth**, or the full asset base of the country, includes natural capital, human capital, and technological assets.
- Current **productivity** or **efficiency** of value creation (economic, environmental, and social).
- Workings of the **natural system** and the **ecosystem services** created by that system.
- Dynamics of **innovation** or **technology progress**, where 'technology' is broadly defined.
- **Socio-economic context**, such as the extent of labor mobility, cyclical unemployment.

Our 'value creation framework' is based on a standard 'production framework' used often in the growth literature and that was applied to green growth in Hallegatte et al. (2011). Here we supplement it with a more robust treatment of natural systems. A similar framework is used in GGKP (2013).

Throughout the chapter, we refer to a '**conventional development pathway**' by which we mean a development pathway defined predominantly in terms of optimizing per capita GDP growth using economic analysis, and using a typical discount rate (e.g. 3% per year) for discounting future value. Although few countries explicitly pursue such a narrow growth vision, it is used here as a 'straw man' to compare to a green growth pathway.

2. Identifying potential benefits of green growth

A green growth development path offers a broad range of benefits relative to a ‘conventional’ development path where environmental and social sustainability are not considered. However, capturing these benefits requires both leveraging synergies and managing costs and trade-offs, and may need to start from a key subset of priority benefits.

A green growth development path offers a broad range of benefits. In addition to increased GDP and employment, green growth benefits also cover reduced pollution, reduced poverty, and improved access to basic services. Table 1 outlines an example categorization based on the value creation framework outlined in section 1.

Although a government may identify a broad set of potential benefits, it is only practicable to focus on delivering a more limited set, with clear divisions of responsibility and co-ordination. In practice, decision makers find it useful to determine a manageable set of benefits to most actively pursue and communicate. They also identify specific actors, such as key ministries, to lead the policies to unlock these benefits. Prioritizing a set of benefits and drivers of synergies narrows the set of green growth benefits modeled, and reduces the demands on limited time and capacity. However, this presents the problem of ‘cherry picking’ benefits that are in political focus or easier to deliver. Selective discussion of benefits or costs can also shift the focus away from long-term welfare, for example ignoring measures that have short-term costs and unclear future benefits.

Another reason to focus on a relatively small set of benefits in key sectors is limited data availability (UNDP, 2012). In low-income countries limited data availability means that core outcomes of policy interventions, rather than a comprehensive sets of benefits, are measured and tracked. For example, it is difficult to get the data required for a thorough assessment of risks to biodiversity in forest areas, however, a focus on benefits such as carbon mitigation and reduced silting of rivers can be enough to demonstrate the advantages of preserving forest cover.

2.1

Identifying benefits aligned to development goals

Green growth goals are defined in an integrated way across economic, environmental, and social dimensions, generally over a longer time horizon than conventional medium-term economic goals. As such, the outcomes pursued by governments set on a green growth pathway are broader than those pursued in following a conventional growth pathway or even a ‘low carbon’ pathway. Goals tend to focus on enabling economic growth while responding to climate change, but also others include elements of environmental

and social protection, as well as quality of economic outcomes (for example economic inclusiveness and job creation) (Stiglitz et al., 2009).

The domestic political system determines the desired development outcomes, including the inherent value given to some natural assets, and the expectation of minimal levels of individual well-being, equity, and fairness. Practically, this determines the emphasis given to particular economic, environmental and social benefits, and impacts the weighing of synergies and trade-offs.

- **Holistic green growth goals.** Countries can use an overarching ‘vision setting’ process to identify desired outcomes and benefits, and a pathway for achieving them. This works best where green growth is fully integrated into the primary development vision, and the process is stakeholder-led.
- **Piecemeal green growth.** The green growth ‘vision’ is not required to be ‘top down’ and the benefits can be focused on sectors, investments or specific policy areas without an overarching economy-wide plan. For example, a program that seeks to close gaps in energy access will deliver economic, social and environmental benefits, without requiring a broader green growth plan. This piecemeal approach, however, is less likely to lead to transformational shifts in an economy.

Aligning green growth benefits with core development goals reinforces policy coherence, and strengthens the case. In Ethiopia, the achievement of middle-income status and the Millennium Development Goals are the key policy ambitions of the government – as set out in the its 5-year development plan – the Growth and Transformation Plan (GTP). This plan targets agricultural productivity improvement, industrial development, infrastructure growth, and specific measures to promote poverty reduction and inclusion (MOFED Ethiopia, 2010). The national development plan focuses primarily on economic and social development benefits while recognizing the environment as an important enabler. In pursuing green growth, Ethiopia’s government chose to explicitly supplement the GTP with the Climate Resilient Green Economy (CRGE) plan to align the GTP’s economic and social goals with additional benefits related to GHG mitigation and climate resilience (FDR Ethiopia, 2011b). By considering a broad set of green growth benefits, the government took fuller account of the country’s natural resources as a driver of these benefits, and drew attention to specific issues hampering the realization of these benefits, including the scarcity of specific skills, the shortage of capital and the need for improved market integration.

South Korea also adopted green growth strategies into its 5-year development plan (for a full account, see Korea Presidential Committee on Green Growth, 2009).

Table 1:

Concrete examples of potential benefits in each of the six categories of the value creation framework

1. Comprehensive well-being	2. Comprehensive wealth	3. Comprehensive wealth
Economic <ul style="list-style-type: none"> • Increased GDP, both per sector and per capita; higher median income and lower unemployment • Improved terms of trade/competitiveness • Energy, food and other resource security • Increased economic stability • Reduced risk of catastrophic economic damage 	Economic <ul style="list-style-type: none"> • Increased stocks of physical capital • Reduction of stranded assets • Resilience of assets to natural hazards • Increased resilience to exogenous shocks (price) • Improved net savings • Improved foreign currency reserves 	Economic <ul style="list-style-type: none"> • Land-use efficiency (or yields), including both large and small scale production • Water efficiency (e.g. reduced leakage, advanced irrigation) • Energy-use efficiency (e.g. buildings, industrial, transport, etc.) • Energy-supply efficiency (e.g. plant efficiency, engine efficiency, etc.) • Labor productivity, especially for low-income labor or vulnerable populations • Mineral and other natural resource use efficiency (e.g. iron and steel, clinker, timber, fertilizers, etc.) • Food-use efficiency (e.g. reduced food waste) • Space-use efficiency (e.g. to reduce travel, etc.)
Environmental <ul style="list-style-type: none"> • Increased preservation of natural environments • Reduced pollution/contamination • Reduced waste landfilled • Increased biodiversity • Reduced risk of catastrophic environmental damage (like climate change) 	Environmental <ul style="list-style-type: none"> • Land/soil stocks (e.g. agriculture, coastal zones) • Water (slow- or non-replenishing) • Atmospheric assets (ozone layer, low GHG atmosphere) • Fish stocks • Natural raw material stocks (e.g. forest timber) • Other natural resources 	
Social <ul style="list-style-type: none"> • Poverty reduction • Improved access/affordability of basic services (energy, water, sanitation, etc.) • Reduced income inequality • Improved security and health • Equitable access to resources and opportunities (for vulnerable groups) • Civil and/or political participation • Reduced vulnerability to ecological risk 	Social <ul style="list-style-type: none"> • Improved education and literacy levels • Improved health levels • Preserved cultural heritage • Robust and stable governance and institutions 	

The UK Government (HMG, 2011) sets out its green growth plan centered around four pillars: (i) low-carbon and low pollution growth; (ii) natural resource efficiency; (iii) resilient growth; and (iv) exploitation of comparative advantages. In addition, a separate approach, emphasizing international responsibility (rather than nationally specific benefits) was devised for GHG mitigation, broadly equivalent to an 80% reduction in by 2050 relative to 1990 (UK Committee on Climate Change, 2008). While mainstream government plans are meant to consider all four pillars and their related benefits, only climate change goals and benefits are integrated through a coordinated process, with central guidance, targets, and monitoring (by the Department of Energy and Climate Change and the Committee on Climate Change) accompanied by sector implementation (in areas such as transport and energy). Although considering a limited set of green growth benefits, this co-ordination process

has been effective in ensuring these goals were consistently aligned across sectors.

In Mexico (Federal Government of Mexico, 2013), the low-carbon focus has been broadly similar to that of the UK, albeit with a different institutional framework and country-specific objectives. With the new National Development Plan (2013-18), green growth has been incorporated as a cross-cutting vision, although the extent of green growth benefits considered is still to be determined, as ministries will determine these benefits in a 'bottom-up' fashion.

India's Integrated Rural Energy programs (IREP) offer an example of a government initiative, which aims at achieving social, environmental, and economic benefits together. The programs were initiated after the two oil shocks in the 1970s to enhance national energy security and access and to provide affordable, clean energy options to rural populations (Bhattacharya, 2006; Deo et al., 1991; Bansal et al., 2013).

4. Natural system & ecosystem services	5. Innovation and technology progress	6. Socio-economic context
<ul style="list-style-type: none"> • Soil retention or replenishment (e.g. reduced land degradation or soil run-off) • Natural resource production (e.g. timber and medicinal plants) • Fresh water flow and purification (e.g. through better forest/vegetation cover) • Natural air and water pollutant removal • Natural buffers against extreme events • Habitats and genetic diversity 	<ul style="list-style-type: none"> • Engineering, science, and technology capacity, especially in clean/green related areas • Investment in RD&D, especially in technology areas with large potential co-benefits and spill-overs • Legal frameworks for intellectual property rights • Technical standards for technologies with large network effects • Access to risk capital for entrepreneurs, especially those with triple bottom-line businesses 	<ul style="list-style-type: none"> • Engineering, science, and technology capacity, especially in clean/green related areas • Investment in RD&D, especially in technology areas with large potential co-benefits and spill-overs • Legal frameworks for intellectual property rights • Technical standards for technologies with large network effects • Access to risk capital for entrepreneurs, especially those with triple bottom-line businesses • Increased financial sector lending, especially to sectors with high capital needs • Increased employment, especially among vulnerable populations

The program links immediate and near-term issues, such as energy access (Bhattacharyya, 2006), indoor air pollution mitigation (Shukla, 1997a), resource enhancement, and rural employment with long-term concerns, such as GHG mitigation and natural resource conservation (Shukla and Moulik, 1986; and Shukla et al., 2007).

Some governments put particular emphasis on using green growth policies to respond to specific high-priority economic issues. This includes using green investment as a stimulus for the economy in recession (Zenghelis, 2011), considering how green growth policy should respond to macroeconomic shocks (UK Committee on Climate Change, 2010), the role of innovation and new technology advancement (UK Low Carbon Innovation Co-ordination Group, 2014), or how to decouple economic growth from natural resource consumption.

2.2

Considering synergies and trade-offs

When comparing a green growth pathway to a conventional pathway, we are concerned ultimately with the net benefits (benefits net of costs and taking into account risks). To achieve the net benefits of green growth, governments develop strategies to maximize synergies and manage trade-offs. They also take future uncertainties and risks of extreme events into greater consideration, compared to conventional discounting approaches.

Synergies. The benefits of green growth depend critically on finding win-win opportunities. These 'synergies' may derive from correcting externalities and addressing market failures like public goods, asymmetric information, the lack of price on environmental services, and spill-over effects of R&D.

Synergies may also derive from the correction of government failures like imperfect property rights. Finally, synergies may derive from the correction of 'irrational' human decision-making such as immediate loss aversion. Below are four important synergies critical to achieving green growth benefits.

- **Increasing the overall resource efficiency of the economy.** Improving the efficiency of use of land, water, energy and other natural resources increases the productivity of the economy, enabling growth. It also reduces vulnerability to resource price fluctuations, and preserves natural assets for future growth.
- **Full valuation of 'environmental goods and services'** (such as clean air, watershed services and natural buffers such as mangroves). This increases the quality and quantity of inputs to growth, and the direct consumption of such environmental goods. For example, the reduction of air pollution has large economic, social and environmental synergies. Valuing the contribution of the natural environment to GDP is also on the agenda of policymakers (for example, through the Wealth Accounting and Valuation of Ecosystem Services partnership, <http://www.wavespartnership.org/>). In the private sector, businesses have started to assess and report on the economic, social and environmental impact of their operations, and investments (for example through the Round Table on Sustainable Palm Oil and the Better Cotton Initiative).
- **Innovation and adoption of technologies with economic, social and environmental returns.** Technology breakthroughs can radically change the relationship between economic, environmental and social factors. Such breakthroughs tend to have positive spill-over effects on the economy as a whole. As such governments are pursuing green innovation policies to generate returns to society that go beyond short or medium-run return to an individual innovator (see for examples Aalbers et al., 2007, Hultman et al., 2013; UNDP, 2012).
- **Overcoming or avoiding lock-in, especially with relation to infrastructure or network technologies that are no longer optimal.** The nature of economic growth is subject to a great deal of inertia or path dependency. For example, centuries of fossil fuel use have created an energy system that is now locked-in to their use, with significant sunk costs (Foxen, 2002). More broadly, such lock-ins include changes in established societal behaviors, such as eating habits, housing arrangements, and mobility norms. Preventing lock-in of investment, skills, and infrastructure into assets that risk becoming 'stranded' (due to technological obsolescence or high and potentially un-insurable physical risk exposure) can set a more robust long-term basis for growth.

Trade-offs. Any green growth path inevitably involves trade-offs (Dercon, 2012). Even when net gains are achieved, there are winners and losers in any transition. Ideal policies are those where the net benefits are largest, and where losers are compensated, for example through side-payments, thereby making everyone better off (Greenwald and Stiglitz, 1986). In practice, this can be difficult to achieve since green growth benefits are often harder to measure and spread into the future, while costs are more immediate.

Dispersed and hard-to-measure benefits. In some cases, the benefits of green growth are spread across a large number of beneficiaries, and may not be easily measured by the beneficiary (e.g. improved health through reduced air pollution) or are not easily traceable to green growth policies (e.g. lower costs owing to improved home energy efficiency). In contrast, the costs often affect particular sectors quite concretely (e.g. coal or heavy industry). This large difference in how benefits and costs are realized and distributed can undermine the achievement of overall net benefits, and requires explicit recognition and response in how green growth benefits are framed.

Inter-temporal trade-offs. Trade-offs between current and future generations are another challenge for framing green growth. The relationship between the environment and the economy often involves actions today creating long-term risks through environmental degradation, climate change and ecological catastrophes. The treatment of costs, benefits and uncertainty over time is critical to determining the 'net present value' of different courses of action:

- **Treatment of uncertainty and risk.** A key factor in green growth is reducing the risks of large-scale environmental and subsequent economic and social, damage. This requires particular treatment owing to the large uncertainty in the physical and ecological processes affecting economic growth (Pindyck, 2007).
- **Treatment of the discount rate.** Conventional economic approaches heavily discount future net benefits, meaning that future generations are not substantively factored into current decision-making (Arrow et al., 2012 and Schelling, 1995). It is argued that in order to account for the possibility of catastrophic climate change discounting approaches should put more weight on future risks and benefits (Stern, 2006 and Weitzman, 2011).

Governments have examined a range of synergies and trade-offs, in line with their country context and policy priorities. Generally, the assessment of such interactions is growing in breadth and depth.

At a sector level, it is now standard practice to examine the synergies and trade-offs between GHG mitigation, energy efficiency and energy cost at an aggregate level, most often in the form of a marginal abatement cost-curve (Ekins et al.,

2011). However, many countries have moved to a more in-depth and sophisticated assessment of interactions.

In the case of the UK much of the policy debate centers on the synergies and trade-offs involved in the energy system transition. In particular, whether to rapidly decarbonize the electricity supply and shift more energy use towards electricity and away from direct fuels, or alternatively to increase the use of gas in the medium term and then move to low-carbon power (UK Committee on Climate Change, 2013a). There is considerable uncertainty as to which option offers the most cost-effective route to achieving GHG targets and other green growth objectives, which is a common argument of climate policy more generally (Helm, 2011). This highlights the complex nature of some synergies and trade-offs, and that choices are not inevitable once all information is available.

The UK government also assessed the macroeconomic impact of its low-carbon pathway, showing a reduction of 1-2% of GDP in 2050, taking into account the benefits of efficiency gains and savings, as well as costs (UK Committee on Climate Change, 2010). The analysis shows there are 'cost negative' opportunities in most sectors but to meet the overall target higher cost interventions are also needed, which act as a drag on domestic economic growth. However, this focus on GHG mitigation and its economic impacts does not consider the benefits of reductions in local pollution, broad natural resource efficiency, technology innovation, or comparative advantage (as laid out in the UK's broader economic plans). The absence of this broader green growth perspective means the full benefits are not fully accounted for, and the relative short-term costs could be overstated.

Ethiopia's analysis of green growth considers a broader set of synergies, particularly in the agricultural, water, and energy sectors. In the agriculture sector, land, water, and resource productivities are emphasized in combination with reduced vulnerability to climate variability (FDR Ethiopia, 2013). It was calculated that these synergies would result in an increase in economic output and jobs, enhanced food production and security, and more stable export income (such as through crop diversification). In energy, the analysis assesses benefits such as energy access and reduced economic vulnerability, energy security, GHG emission abatement, improved competitiveness and terms of trade (via energy export potential), and improvements in energy and water efficiency in the energy generation and supply system. At the same time, the government faces trade-offs in making policy decisions. Population growth puts a strain on natural resources, through increased demand for biomass for energy and water. Agricultural expansion may improve incomes for the rural poor but also drive deforestation and GHG emissions, creating trade-offs between the two sets of policy goals. These trade-offs can be managed through increasing the

productivity of agriculture and providing economic incentives for forest preservation (for example through REDD+).

Korea's green growth policies are based on a holistic view of the synergies of following such a pathway. Korea's development objectives are to ensure continued economic growth, to address major environmental problems (air, water, and noise pollution, and soil contamination), and to promote social integration. Green growth was framed as a core response to these problems focused on three pillars (a) climate change response and energy security; (b) engines for future growth; and (c) contribution to international action on climate change (Korea Presidential Committee on Green Growth, 2009). Energy security is a key concern for Korea, which has high demand for energy from its major productive industries, such as steel and chemicals and is 97% dependent on energy imports. It is vulnerable to international price fluctuations. The government also recognizes the opportunity to develop exports in emerging green technology areas. As the government looked to develop a green growth strategy, it focused on ensuring its low-carbon strategies also met its energy security, technology innovation, and social welfare goals.

Governments have also sought to deal with the losers from green growth transitions. High-carbon and heavy industries in countries with strong regulations, green taxes, and targets, could be less competitive in international markets. The UK government carried out an assessment of the impacts of green policies on key industries (done in collaboration with those industries), and established a set of policies designed to mitigate the impacts on competitiveness (UK Committee on Climate Change, 2013b). There are also political risks if policies increase costs to consumers, such as fuel or food costs. In the UK the analysis shows that green energy policies can reduce average fuel bills through a near term emphasis on energy efficiency, while innovation can reduce the longer term impact on costs (UK Committee on Climate Change, 2013b). Nevertheless, it has proven difficult to communicate these benefits so as to increase political acceptability.

Much has also been done to assess trade-offs over time, especially the interaction between environmental protection and long-term growth (Hepburn and Bowen, 2012). UNEP (2011) carried out an analysis of global investment pathways which shows that a transition to a green economy provides higher GDP growth and social benefits over the long run due to improvements in soil quality, lower water stress, and reduced dependence on fossil fuel. However, there is a drag on growth in the short and medium term with 'only marginal differences' in poverty reduction. Overall, investment in green growth presents a challenge to policymakers in terms of managing short-term costs for long-term benefit.

3. Analyzing green growth benefits

An analytical approach to assess green growth benefits inevitably requires value judgments. Analytical tools and methods are vast, but modeling benefits ‘correctly’ goes well beyond analytical robustness, and considers issues of data availability, capacity to undertake analysis, and the use of tools appropriate to the policy requirements.

A robust approach to analysis and consultation is critical to assessing and showing the benefits of green growth. The benefits of green growth are the key criteria that countries use to identify and prioritize options for achieving a green economy. A narrow analysis of short-term cost-effectiveness does not lead to a policy decision that will result in longer-term benefits in broader development context.

There is a range of analytic approaches available to support decision-making, which vary in terms of the benefits they are able to assess. A single approach will almost never assess all of the benefits of interest, and it is generally necessary to construct an overarching analytic framework, integrating a number of complementary approaches.

A guide to choosing specific modelling approaches is covered in [Chapter 4: Prioritization of green growth options and pathways](#). This section is an introduction to the key layers of analysis, and what they can provide in terms of understanding the benefits of green growth. The focus is to examine how a country’s green growth vision and the concrete benefits of interest can guide the choice of an analytic framework.

We focus on analytic approaches that are forward-looking, in line with the chapter’s focus on assessing the potential benefits of green growth as a guide to future policy decisions. We do not look at evaluative approaches that appraise the benefits of past policies. By way of illustration, Table 2 shows a mapping of benefits to suitable analytic methods.

To ensure the analytic framework serves the purpose of policy-makers, it should align analytic outputs with the country’s vision and goals for green growth. This step is easier if the vision is focused on a manageable set of benefits (Table 2). In many cases priority issues are not explicitly laid out before moving forward with analysis, resulting in incomplete or delayed policy action. Strong alignment of the green growth vision with the analytic framework can also make it easier to identify and assess indicators for monitoring and evaluation as the analytical outputs can be used to set targets and then subsequently tracked (see [Chapter 9: Monitoring and evaluation](#)).

3.1

Assessment of core sectors

Sector models are the central element of a green growth analytic framework. Examining net benefits associated with behavioral options, and understanding the main interactions between them, requires ‘bottom-up’ assessment of impacts of green options in areas such as agriculture, transport, and energy. Sector-level models allow for goals such as the provision of cheap, reliable and secure electricity or transport, to be considered alongside broader environmental and social goals. This is critical since policy tends to be operationalized at the sector level, and policy recommendations are only credible when they clearly address policy-makers’ core departmental goals. Sector models are most useful for examining environmental and social outcomes that directly relate to the provision of the sector’s economic goods and services, and are limited in their ability to incorporate the benefits related to comprehensive well-being. Sector-level assessments need to be supplemented in a number of ways to get a full picture of the potential benefits of green growth.

3.2

Integrating natural systems

For assessing the full set of environmental benefits (e.g. those related to biodiversity, natural assets or stocks) and economic-environmental interactions (e.g. the impact of natural disasters and climate change), it is necessary to look at models of natural systems. This is most critical in the forests, agriculture, animal husbandry, and fisheries sectors; in the energy sector in considering the nexus between energy generation and water resources; and in other major infrastructure sectors in relation to climate resilience. Robust and credible modeling of natural systems (whether spatial eco-system services or climate modeling) involves a significant leap in analytic complexity and requires capacity. Systems of models that assess climate change risks and their impacts on water availability and agricultural productivity have been successfully developed. Similarly, systems of models have been developed to assess the eco-system service impacts related to deforestation (van Paddenburg, et al. 2012).

3.3

Supplemental analysis of key benefits

Some key benefits cannot be modeled through sector or natural systems models. Perhaps the two most common benefits assessed through supplemental analysis are (i) improved health through reduced pollution (World Bank, 2007); and (ii) short-term employment benefits or green jobs (ILO, 2013). Supplemental analyses can also be used to look at potential poverty reduction and other benefits

to vulnerable groups, industrial development, and more qualitative benefits such as political participation or protection of cultural heritage. Some analyses require significant stand-alone modeling efforts, while others may involve more qualitative assessment tools. Natural system models can also be supplemented by direct impact assessments, such as the benefits of reduced soil erosion and silting on the efficiency of river transport (van Paddenburg, 2012).

3.4

Separate treatment of key synergies

Given the emphasis on benefits from green growth through synergies, it can be worth doing a separate analysis on how to achieve those. Two factors most often given separate treatment are (i) the efficiency of production, especially resource productivity (McKinsey, 2011); and (ii) innovation or technology progress (UK LCICG, 2014). Although resource productivity is generally considered in sector-level models, it can be difficult to capture across sectors. The most common example of an analytic approach based on resource productivity across sectors is a marginal abatement cost curve (MACC) which helps prioritize options for reducing greenhouse gas emissions based on their marginal economic benefit or cost. Although innovation may also be incorporated into sector-level models, these fail to capture the full dynamics of innovation or the cross-sector synergies. Identifying synergies through innovation is complex, and generally requires an analytic framework of its own. Initial attempts exist (see the UK LCICG, 2014), but additional analytic approaches are required.

3.5

A macro-economic framework

Macro-economic models are required to assess the economy-wide benefits or costs of a green growth pathway. Standard macro-economic models capture benefits related to aggregate GDP, long-run employment, economic stability and fiscal or trade balances. System dynamics and integrated assessment models can be used to examine the broad interactions of economic and social factors with global environmental outcomes. A plethora of such top-down models have been designed to deal with varying situations. Such macro frameworks can provide overall confidence in the economic, social, and environmental soundness of broad policy direction (Stern, 2006), and they can be a necessary validation, especially for Ministries of Finance in the case of macro-economic models. However, the results vary radically depending on the type of model used and their practical use in assessing the benefits of green growth, and prioritizing concrete (usually sector-level) actions is limited.

3.6

Bringing the analysis together

As illustrated, a robust analytic framework to assess green growth benefits will involve multiple, complementary approaches. To assess the benefits of a proposed green growth pathway, it is important to be able to synthesize across analytic results. Often, the unifying thread of the vision (and envisioned benefits) is pulled apart in the detailed process of analysis, and a comprehensive picture of benefits is rarely stitched back together. Nor is such a synthesis used to allow feedback and adjustments to the visions, goals, and analyses.

What can be observed across all country case studies reviewed is that it is not feasible, or indeed advisable for governments to focus on all possible benefits in developing their green growth strategies. Governments often concentrate on how green growth can accelerate broader (existing) development ambitions. For example in Ethiopia, the national GTP and CRGE strategy do not look in depth at broader eco-system services and environmental benefits, nor a full set of macro-economic benefits and trade-offs from following a green growth path. A focus on core GDP growth, jobs growth, poverty reduction, energy, food, and water access, GHG emissions and climate resilience provided a broad and robust set of goals to achieve green growth, especially when supplemented by the government's coordinated sector-level planning process to ensure that efficient and effective solutions are delivered.

Creating a synthesized plan for green growth with optimal benefits (whether at the sector or economy-wide level) is as much an art as a science, and there will never be an exact formula. This should not be a deterrent to draw together a comprehensive picture, since this is the only way to make the case for green growth, whose advantage as a development paradigm relies on achieving multiple benefits. [Chapter 4: Prioritization of green growth options and pathways](#) discusses how diverse approaches can be synthesized, including through pathway analysis and Multi-Criteria Assessment (MCA) frameworks, and how issues of uncertainty and risk can be incorporated.

Finally, a critical question in determining the benefits of green growth is how and whether to do so in comparison to some 'baseline' or 'business as usual' reference case. [Chapter 2: Establishing vision, baselines, and targets](#) goes into detail about establishing a baseline in a country's analytic approach. Two things are important to highlight here. First, a baseline is itself speculative, and there is leeway in how it is set. How one handles this leeway can drive the results of the benefits assessment, and hence requires significant attention. Second, it is not always necessary or productive to set a baseline. Simply comparing various options can be a more flexible approach to assessing the relative benefits and costs of different pathways, especially when considering multiple

Table 2:

Benefits and analytical approaches

Benefits		
Categories	Examples	Benefits valuation – concept and methods
Economic impacts	<ul style="list-style-type: none"> • GDP • Income • Employment • Energy security 	<ul style="list-style-type: none"> • Resource use efficiency (e.g. Energy/GDP) • Financial return
Environment impacts	<ul style="list-style-type: none"> • GHG emissions • Local pollutants • Natural resource use 	<ul style="list-style-type: none"> • Environmental intensity (e.g. CO₂/GDP) • Quality of life • Statistical value of life • Disability adjusted life years (DALY) • Environmental impact assessments
Social impacts	<ul style="list-style-type: none"> • Poverty reduction • Access to basic services (health, education, etc.) • Social capital 	<p>Social Cost-Benefit Analysis: e.g. infrastructure projects</p> <ul style="list-style-type: none"> • Social costs from displacement of people • Social benefits from socio-cultural integration <p>Social network</p> <ul style="list-style-type: none"> • Mitigation of risks and transaction costs • Social impact assessments
Climate events	<p>Reduced risk of</p> <ul style="list-style-type: none"> • Food security • Biodiversity loss 	<p>Scenarios analysis</p> <ul style="list-style-type: none"> • Projections of alternate futures; not predictions • Back-casting method • Dynamic/sequential decision making • Iterative risk management <p>Co-benefits (co-costs and risks) assessment</p> <ul style="list-style-type: none"> • Indicators and their measures • Multi-criteria analysis • Insurance
Asset stocks and eco-system services	<ul style="list-style-type: none"> • Eco-service systems (e.g. honeybees and orchards) 	<p>Economic value of environmental services</p> <ul style="list-style-type: none"> • Direct use values • Indirect use values • Option values • Non-use values <p>Economic valuation methods for ecosystem services</p> <ul style="list-style-type: none"> • Contingent valuation (Willingness to Pay) • Travel cost • Hedonic property value • Change in productivity • Benefit transfer
Technology progress	<ul style="list-style-type: none"> • R&D investments • Technology trade 	<ul style="list-style-type: none"> • Lifecycle assessment • Learning curves • Innovation system / technology transfer decision frameworks

Major Cross-Category

Analytical approaches**Direct impacts****Partial and system – feedback/uncertainties****Single event calculations**

- Direct jobs calculator
- Net present value
- Fuel demand shifts
- Infrastructure demand and levels

- Input/output (partial equilibrium) models
- Disaggregated consistency models (Revised Minimum Standard Model Extended – RMSM-X), etc.)
- Computable general equilibrium (CGE) models (e.g. General Algebraic Modeling System – GAMS)
- Macro-economic models (e.g. EViews, etc.)
- Energy, transport, etc. system simulations or agent-based models
- Energy, transport, etc. system optimization
- Real options analysis

- Marginal Abatement Cost (MAC) curves, water demand/efficiency curves
- Environmental impact assessments

Integration with social and economic models

- Direct health impacts of pollution
- Direct service provision calculations
- Vulnerability assessments
- Social impact assessments

Integration with environment and economic models

- Average climate event outcomes (derived from system models)
- Expected value at risk
- Geographic Information System (GIS) mapping

- Earth system models of intermediate complexity
- Atmosphere-ocean general circulation models (Met Office Hadley Centre Regional Climate Model – HadCM3, Educational Global Climate Model – EdGCM, etc.)
- Dynamical downscaling regional climate models (HadRM3, Regional Climate Model – RegCM3)
- Statistical downscaling regional climate models

- Natural capital (SEEA)
- Direct stress calculations**
- Deforestation rate
 - Soil erosion level/rate
 - Water level change
 - Fish extraction

- Crop models (e.g. Infocrop, etc.)
- Water resource models (e.g. Soil & Water Assessment Tool – SWAT, etc.)
- Land-use change models (e.g. Land Change Modeler – LCM, etc.)
- Integrated eco-system service models (Artificial Intelligence for Ecosystem Services – ARIES, Integrated Valuation of Environmental Services and Tradeoffs – InVEST, etc.)

- Technology improvement curves

- Endogenous (build-rate linked, etc.)
- Exogenous (Monte-Carlo simulation, etc.)

- Integrated assessment model across climate system and economic value (e.g. Dynamic Integrated Climate-Economy – DICE, etc.)
- System dynamics models (Threshold 21, Partial Differential Equations – PDE, etc.)
- Energy system, GHG emissions and local pollution levels (e.g. Markal-Times)
- Integrated Water Resource Management approaches

criteria, both quantitative and qualitative. In the case of most mainstream economic decision-making, it is rare to set a hypothetical baseline as a way of making a decision. It is more common to consider the pros and cons of various options.

All governments we looked at have employed a variety of analytic approaches, demonstrating various levels of sophistication and breadth of analysis and differing in the extent to which they have drawn together the results into a comprehensive picture.

Many countries have employed extended cost-benefit analysis approaches to identify the benefits of green growth when applied to existing development plans. This can be a very effective way to demonstrate the value of green options and show results quickly. The Government of Indonesia has recently undertaken a fairly comprehensive assessment of its major infrastructure plans, including rail and port infrastructure, energy infrastructure, major urban infrastructure, and large industrial infrastructure (BAPPENAS, 2013). Similarly, various national governments have partnered with multi-lateral development banks to assess the benefits of greening planned investments and to adjust those investments accordingly (EBRD, 2012)

Most governments also have some version of a comprehensive analytic framework, although in most cases it is a gradual, only semi-coordinated process of understanding the potential benefits of green options for the economy. We look at two cases at the relative extremes of economic development, and technical capacity: Ethiopia and the UK.

In Ethiopia, a set of macro analyses were used to spark interest in green growth. An Integrated Assessment Model was used to assess the loss of GDP from climate change impacts in the agriculture and energy sectors. It set out the risks to key outcomes caused by current climate and future climate change and then assessed options to address the risks. The benefits (and costs) of each option were assessed using multiple criteria that ranged from economic cost-benefit ratios, to qualitative assessments of the benefits for biodiversity and poverty reduction (FRD Ethiopia, forthcoming). It is an example of how an analytic approach can combine sector-level modeling with natural systems modeling in order to account for the role of eco-system services in driving economic, social, and environmental outcomes and identify the benefits of a greener economy.

In relation to low-carbon development, the CRGE used a relatively basic, spreadsheet-based sector analysis to assess a core set of green growth benefits related to GHG emissions reductions, economic efficiency, and short-term green jobs. Across sectors, a strong focus was put on MAC curves to define green growth priorities (FDR Ethiopia, 2011a). The analysis did not represent a comprehensive sector-level assessment, because benefits related to core goods and service provision such as electricity reliability and availability, net export opportunities, and improved incomes especially for low-income workers, were only roughly estimated.

The CRGE analysis of net benefits was, however, effective in moving the country from 'interest' to 'commitment' by showing that a green growth pathway was beneficial to the achievement of Ethiopia's overall development objectives.

The UK has a sophisticated, multi-layered analytical framework to analyze green growth benefits, having developed different approaches over many years to assess different benefits. Nevertheless, the focus remains primarily on climate change (and the direct 'co-benefits' of low-carbon investment), with broader green growth benefits not fully incorporated. Analyses have been used to make the argument for green growth benefits, and to influence the direction of policy. A key lesson from the UK case is the value of having a strong set of coordinating institutions to ensure that the full benefits case can be drawn together from different analytic efforts, and that new efforts can be guided to tackle the major challenges and knowledge gaps.

Macro analyses were used to provide confidence in the soundness of green growth, including a Treasury-led analytic exercise (Stern, 2006). The UK Government has also developed and used a wide range of bottom-up sector-level models, with emphasis on the energy system (the core of a low-carbon pathway), as well as buildings, transport, industry, and other sectors. The UK government, primarily through the Department of Energy and Climate Change, has gradually increased the sophistication of its energy sector analysis, moving from spreadsheet-based analysis to models (e.g. Markal and ESME) that assess the net benefits from decreased pollution, energy security and general social welfare. They also incorporate more and more key uncertainties such as technological and price uncertainty, to test the robustness of some projections. A notable effort has been made to identify the benefits from innovation (UK LCICG, 2014).

One key lesson across both cases is that there is often a missing link between the analysis of green growth benefits and the goals set out in the green growth vision, with the former only partially reflecting the latter. For example, the UK's *initial* analytic assessment of the benefits of low-carbon development looked at GHG emissions, macro-economic costs-benefits, and energy security, while issues of energy service reliability and impacts on competitiveness were not fully incorporated. Ethiopia's Climate Resilient Green Economy Strategy thoroughly assessed some elements of green growth such as the net benefits of GHG mitigation and economic growth, and the net benefits of adaptation and economic growth and vulnerability, while largely leaving aside elements of broader resource scarcity, local environmental impacts, and macro-economic impacts. Although this made the analysis more manageable, the case for policy action sometimes lacked a robust assessment of the issues important to policy makers. However, this disconnect does tend to be remedied over time, as analytic gaps are identified and addressed through an iterative process.

3.7**Project-level ‘greening’**

This section considers approaches embedded in the broader planning process, where there is the possibility of long-run transformation. However, project-level analysis of green growth benefits is common. Extended cost-benefit analyses incorporating economic, environmental and social impact

assessments can serve as a flexible and relatively simple (i.e. spreadsheet-based) analytic framework for project level analysis. It is especially useful in the quite common situation in which a government wants to take initial steps toward green growth, and capture ‘quick-wins’. Such project level benefits analyses are limited: they generally don’t consider the breadth of synergies and trade-offs possible, nor do they allow for more transformational shifts in a development pathway.

4. Communicating the benefits of green growth

The communication of benefits should be integrated with context-specific framing and analysis. This should lead to comprehensive and tailored messages that are analytically robust, and delivered by credible messengers. To enable this, the green growth process benefits from engaging stakeholders from the outset, so that knowledge of the benefits and trade-offs is tailored by, and owned by, local stakeholders.

Technical and economic analysis can demonstrate that a transition to a more sustainable pathway of economic growth would deliver net benefits to society, as highlighted above. However, the move from analysis to action is not simple. One key challenge is communicating benefits in a way that makes a compelling case for change.

Public perception of issues related to green growth has become an area of increasing interest for politicians and academics. Since the 1980s, over 300 surveys of public opinion have been conducted on the subject of climate change alone (Brulle et al. 2011). Much of the literature on this subject points towards three main obstacles to communicating the need for sustainable economic growth.

In both developed and developing countries, the first major communication challenge is the complexity of this issue. Addressing environmental issues can create considerable and diverse benefits but these are often complex, abstract, uncertain, and difficult to calculate, especially in comparison to the related costs, which are often more visible and immediate.

The second major challenge is to overcome opposition from those who have invested in the status quo – for example in the extraction, refining, and distribution of fossil fuels – investments that risk becoming redundant in a new system.

The third obstacle to communicating green growth is that many sections of society are not receptive to messages about environmental protection, resource conservation or poverty alleviation – an issue that is particularly pertinent to the Western world.

Communication is most effective when using comprehensive benefits messages to address the variety of audiences affected by green growth, including tailoring messages to different value groups who will have different entrenched interests. Not only the message, but also the messenger is important: credible and trusted messengers, with compelling evidence-based messages are needed to make the case for deviating from business as usual.

4.1**Communicating complexity**

As outlined above, the benefits of green growth are often complex, abstract and difficult to calculate or communicate. By contrast, the related costs are often tangible and immediate.

This imbalance can be partly redressed by demonstrating the many complex benefits of green growth in terms that can be understood and experienced in people’s daily lives – for example, how energy efficiency can reduce household costs, or how reducing air pollution can improve health. The most effective communication strategies demonstrate these benefits at the individual level, using metrics that are tangible and relevant to the daily lives of the target audience – an approach that is more impactful than demonstrating impacts at the aggregate level (Rose, 2010).

In practice, communicators have had some success with demonstrating green growth benefits at the individual level. For example, when the EU’s climate commissioner Connie Hedegaard proposed a Europe-wide limit on emissions from new cars to meet environmental objectives, she also presented the financial benefits to individual motorists from reduced spending on fuel. As a result, consumer groups welcomed Hedegaard’s proposal for a 2020 emissions standard as a “win-win for environment and consumers” (BEUC, 2012).

Korea’s 5-year plan (2009-2013) engaged individuals via messages on how the strategy would impact their

everyday lives, delivered via presidential speeches, celebrity endorsements, and educational campaigns (Korea Presidential Committee on Green Growth, 2009).

Messages should also be delivered in a format that is relevant to the target audience. For example, while the EU's proposed 2030 goal for renewable energy was announced via twitter and the internet, India's Rural Energy Program was promoted via a number of different formats, including street theatre in local dialects.

The level of detail or simplification will vary for the different agents in this transformation. For example, the need for detail of government planners and analysts will be greater than that of the media and the general public. In practice, therefore, multiple communications materials will be needed.

4.2

Addressing vested interests

Green growth requires an economy-wide transformation, and this has met with opposition from those who have invested in types of infrastructure that risk becoming redundant. The Center for Public Integrity (2009) illustrated the high stakes around climate change mitigation and adaptation by documenting a 300% increase in climate change lobbying in the US over the course of President George W. Bush's second term of office. Green growth communication strategies have also often been countered in the past by opposing communications initiatives by vested interests.

The line of attack by vested interests has often been to create uncertainty and thereby weaken the case for political action, as described in the book *Merchants of Doubt*, (Oreskes and Conway, 2010). A key strategy has been to "keep the controversy alive" by spreading doubt and confusion even after scientific consensus had been reached. This is helped by the media's tendency to highlight controversy. A similar communication strategy has been adopted by those opposing regulatory action to prevent climate change (Lewandowsky, 2012; Boykoff and Olson, 2013; Whitmarsh, 2011; Hoggan and Littlemore, 2009; and McCright and Dunlap, 2007).

This means that green growth communications strategies will also require an underlying fact-base that is robust to challenges from vested interests. In practice, the most successful approach to countering challenges by incumbent industries has been to ensure that all analysis is presented in as transparent a manner as possible, with all assumptions clearly stated.

While projections of future environmental impacts are inherently inexact, credibility of projections can be increased by providing empirical analysis of past green growth initiatives. For example, empirical analysis has demonstrated that Denmark, Germany, Sweden, Britain, and the Netherlands have managed to reduce energy intensity, while retaining GDP growth (PwC, ECF 2013).

It should also be recognized that the transition to a more sustainable economic path creates both winners and losers, neither of which should be ignored. Hostility to this transition can be increased when the losers feel their case is not being heard; that the negative impacts are being glossed over, or that the messaging for green growth is too enthusiastic. As a related example, the UK's advertising watchdog forced the country's Department for Energy and Climate Change to withdraw two adverts for over-stating the scientific certainty around some specific climate change impacts (UNDP Watch, 2010).

Messages should therefore be balanced, clearly stating both the winners and the losers in this transition.

4.3

Responding to diverse audiences

Many sections of society – particularly in the developed world – are simply not receptive to messages about environmental protection, resource conservation, or poverty alleviation. Moreover, it can be difficult to overcome this apathy. There is substantial evidence that people are inclined to interpret information in a way that confirms their pre-existing beliefs, and reaffirms the alignment of their beliefs with those of their cultural group. Conversely, they are unlikely to interpret information in a way that puts them into conflict with the norms of their social group.

To quote from the Cultural Cognition Project at Yale Law School (Kahan et al., 2007): "*A long-standing body of work in social psychology suggests that individuals are motivated to fit their beliefs to those of people with whom they are intimately connected. Both to avoid dissonance and to secure their standing within such groups, they predictably seek out and credit information supportive of self-defining values and attitudes.*"

In Britain, for example, age, gender, and lifestyle have been shown to play a significant role in attitudes to the risk of climate change, and were found to be more important than either education or knowledge (Whitmarsh, 2011). In the United States, skepticism about climate change has been shown to be most prevalent among conservative white males (McCright and Dunlap, 2011).

Not only does this tendency mean that green growth benefits are ignored by large sections of society, but it also leads to the polarization of social debates, which can ultimately cause rifts along political lines.

At the heart of this controversy are differences in cultural outlooks over the importance of social and inter-generational equality and over the relationship between humans and nature. In many cases, opposition to environmental protection can be viewed as opposition to increased regulation, rather than a lack of concern about the environment. It has been demonstrated that certain cultural groups increase their

skepticism about environmental risk if they think it is likely to lead to increased regulation (Boykoff and Olson, 2013). The main importance of such cultural polarization is that it often translates to political polarization, which can become an obstacle to any departure from the status quo.

One common mistake by green growth advocates has been to simply increase the volume and the detail of their arguments. Polarization is unlikely to be reduced by increasing the availability of reliable scientific information – indeed the opposite can often happen. It has been demonstrated that the most literate and numerate individuals in a group are often those with the most polarized views on controversial risk-related issues (Hamilton, 2010, Kahan and Peters, 2013).

A second common mistake by green growth advocates has been to only highlight the messages that they themselves consider pertinent, such as environmental or social benefits, without considering the mindset of less receptive audiences (Rose, 2010).

In practice, successful communication strategies deliver information on a wide range of impacts in order to facilitate a more holistic social debate. Different benefits can then be brought to the fore to engage different audiences or venues. According to social psychologist Dan Kahan (in Irfan, 2011), the best approach is: *“To remove what makes it threatening to other people. It is about framing it in a way that does not antagonize or come across as an assault on one side.”*

For example, in the communication of India’s rural energy program – a program initiated to meet economic objectives – social benefits messages were also communicated. These messages included how women and children could save time in the task of collecting firewood, which might permit women to learn skills like handicraft and give girls time to go to school. A social message was also delivered that cleaner villages attract higher social standing in the neighbourhood. While these benefits may not be the core objective of the program, they can support acceptance.

Not only do different messages achieve differing levels of resonance with different cultural groups, but this also applies to the agent delivering that message: the messenger. Several studies have identified that individuals are more likely to accept information if delivered by messengers with whom they share a cultural affinity (Kahan et al., 2007). When individuals see that somebody who holds their ideology is willing to endorse a position, they are less likely to form a sub-conscious bias against that position. For example, the former chief economist of the World Bank, Nicholas Stern, lent much credibility to the green growth message among the business community by leading and disseminating his analysis for the UK government of the economics of climate change.

The credibility of a message promoting a green growth pathway can also be improved by engaging in two-way communications with stakeholders to ensure any policy framework is designed to account for their key concerns. South Africa’s Green Economy Accord in 2011 is an

example of how wide-ranging stakeholder engagement can lend credibility to a green growth initiative (Parker, 2011). Support was given by the business community; all three labor federations; youth cooperatives and civic groups. Although the Accord was largely a re-packaging of pre-existing commitments and was only a partial success, this newly found consensus did demonstrate and communicate wide-ranging buy-in for green growth.

4.4

The role of the media

The media plays a central role in communication, as a key gatekeeper for the flow of information to the public and policymakers. In recent years, the industry has gone through major upheaval, both due to increasing commercialization and due to the emergence of new information formats, such as online news services, blogs, twitter and other social media. Nevertheless, it is likely that news services will continue to play an important role in channeling information and providing a venue for public debates.

Journalistic norms play an important role in determining the balance of such debates and the level of polarization. The long-held norm of providing ‘balance’ has come under pressure in recent years. Increasingly media outlets have reduced staff to levels where there is insufficient time for thorough investigation and fact-checking. Thus, rather than finding the ‘true balance’ of a story, time-stressed journalists often resort to publishing views from either end of the spectrum, irrespective of how representative they are of the majority view or the scientific consensus (Davies, 2008). Such ‘false balance’ can increase cultural polarization on risk issues. Zehr (2000) argued that: *“Controversies make dramatic reading [...] On occasion, journalists may develop controversy where none previously existed, or sustain it by soliciting opposing arguments by expert scientists.”*

For example, around 97 per cent of peer-reviewed articles on climate change accept anthropogenic influence, and yet journalists routinely present the science as if it were controversial. In the paper *Balance as Bias*, Boykoff and Boykoff (2004) demonstrated that during 1998-2002, 53% of the articles in four US prestige newspapers gave equal coverage to views that climate change had natural causes or anthropogenic causes. In 2011, a group of prominent Australian climate scientists sought to give the media guidance with the following statement on how to interpret ‘balance’ within a scientific context: *“While balance is an appropriate conversational frame for the political sphere, it is wholly inappropriate for scientific issues, where what matters is the balance of evidence, not opinion.”*

In the book *Poles Apart*, Painter (2011) concludes that the presence or absence of skeptical voices is determined by a complex mix of processes within newspapers – such as

political ideology, journalistic practices, editorial culture, or the influence of editors or proprietors. This situation can be heightened by the tight control that can be exerted by both editors and newspaper owners. For example, one study found

that when the international news agency Reuters switched managing editors in 2013, coverage of climate change declined by nearly 50% (Media Matters, 2013).

Next steps

Ultimately achievement of improved welfare is the aim of green growth. For the achievement of economic and social development – environmental considerations are core. This means that in coming years the demonstration of how environmental considerations can deliver 'smarter' development must be shown. As argued in this chapter green growth will fundamentally need to be driven by self-interest, and the demonstration of benefits will assist in countries appreciating that green growth has strategic validity. This strategic validity is made difficult because benefits are often complex to demonstrate, sometimes involve relatively higher upfront costs, and often present a challenge to vested interests.

Trying to understand the full suite of green growth benefits is complex. This complexity means that striving to build a continued richer understanding of cross-sector and cross-country interactions in achieving green growth should remain a priority to build robust analysis. This robustness will be driven by strong analysis as green growth can never be a panacea - and will assist with making a transparent case for when green growth is appropriate highlighting where there are possible trade-offs and risks.

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Chapter 4

Prioritization of green growth options and pathways

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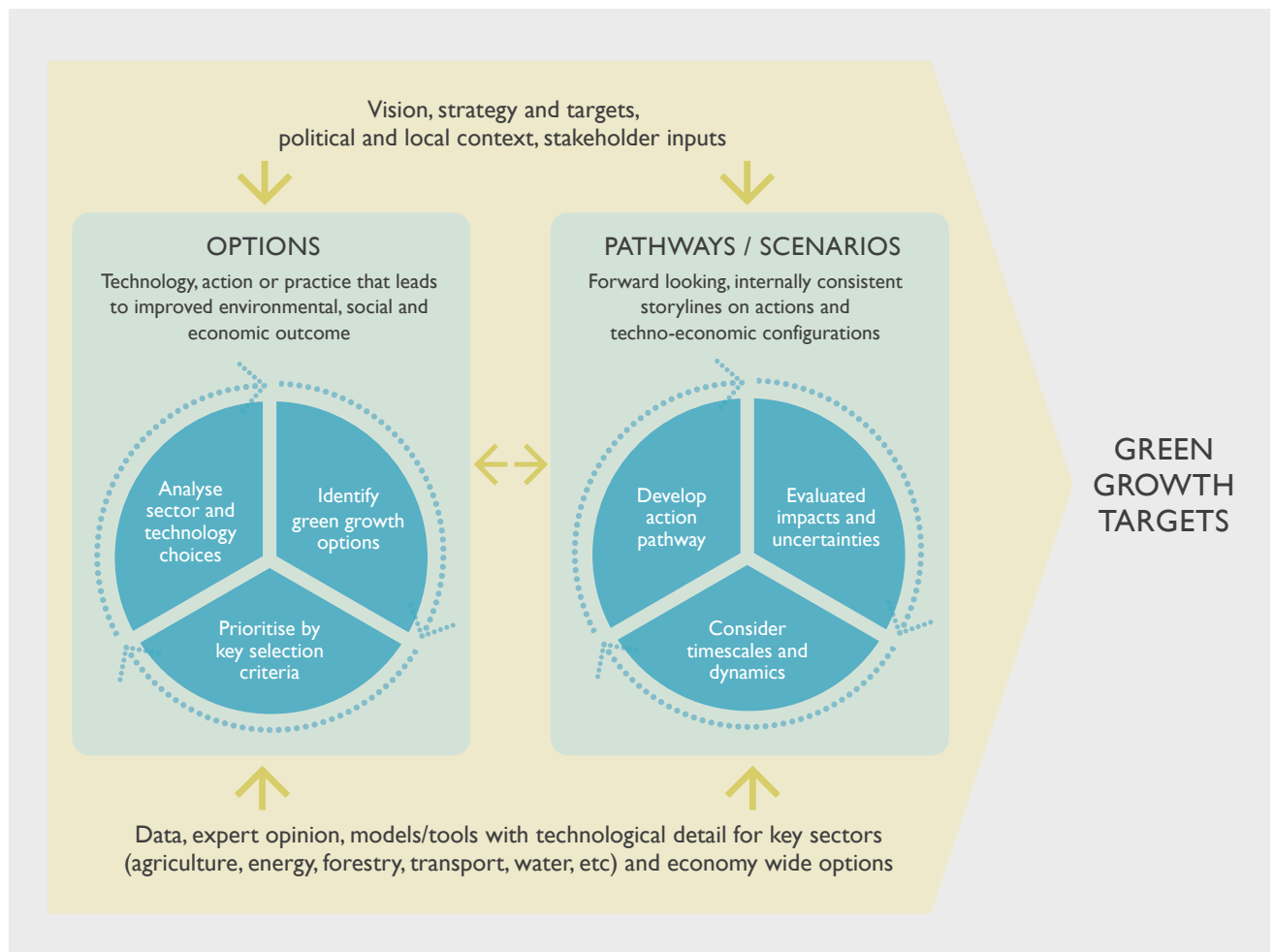
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Policy makers developing green growth plans have to take decisions on many levels: the degree of ambition, the choice of different options for achieving those ambitions, and the pathways to be taken for implementing and combining these options towards desired outcomes. This chapter reviews good practices in various countries to describe how analytical and consultative tools and approaches have been used to aid decision makers in their assessment and communication of these options and pathways.

Figure 1:

Options, pathways and scenarios as part of green growth planning



Key lessons from effective approaches are:

The choice of tools and approaches should be deliberate and cover economic, environmental, and social aspects. The tools should follow, not drive the questions to be asked by the analysis.

- The policy questions should drive the analytical approach. In practice, however, factors such as funding availability, donor and political priorities, and political timeframes can lead to a limited selection of analytical tools and approaches being considered.

- The scope of the tool should not restrict the scope of the green growth plan. The choice of analytical tools should be driven by the strategic priorities, not vice versa. For example, analytical tools that focus on narrowly defined metrics (such as cost-effectiveness of GHG abatement) may not be appropriate as they do not assess options in relation to other important development goals.
- The choice of analytical approach will depend on the complexity of the issue being assessed. More complex tools may be required when assessing an action with multiple impacts, or a package of actions where there are likely to be trade-offs and interactions.
- The analytical approach is often driven by pragmatic considerations such as the availability of data, resources, and capacity. Tools and methods that can be replicated and used by local experts will have more chance of being maintained. For example, spreadsheet analysis of key economic and social impacts offer a simple approach to prioritization, which can be a good place to start especially in least developed countries where data and resources may be scarce.

Combine top-down approaches driven by the vision and strategy, with bottom-up analysis of concrete actions and options. Combining tools and approaches can improve the consistency and robustness of results and address limitations of individual tools.

- Bottom-up models capturing technological detail can be combined with top-down models to address macro-economic impacts and feedbacks. In subsequent iterations of the analytical cycle, or in countries where data and resources are more advanced, more complex approaches are appropriate. For example, specialized sector-specific models might be used that relate to complex and interrelated systems such as management of water catchment areas (see Waal River case, Case 1), electricity systems, and macro-economic impacts of infrastructure development, such as in the case of the UK (Case 7).
- A relatively easy approach to prioritizing options is to rank them based on their cost-effectiveness (preferably not limited to financial costs and benefits, but viewed in a broader development context). However, a narrow analysis of short-term cost-effectiveness does not take into account longer-term trends and public preferences. In such instances additional tools may be required to strengthen the analysis.
- The choice of analytical approach should allow for a reasonable representation of social economic realities and observed behavior. Whilst many country governments may lack the expertise or data, it is essential that they

do not resort to off-the-shelf models without critically scrutinizing and questioning the assumptions and theoretical underpinnings. For instance, a comparative static Computable General Equilibrium (CGE) model will be of limited value when applied to an economy that is far away from equilibrium, facing major institutional barriers and structural problems.

Choosing priorities and pathways requires clear assumptions, reasonable data, and active stakeholder engagement.

- Options for action should be assessed against key selection criteria related to green growth dynamics. These criteria should be linked to the government's vision and strategy; and in developing countries are often strongly influenced by national development plans.
- Workshops involving a variety of relevant ministries, agencies, and experts are useful to identify options. These help to gain detailed sectoral input, and a wide stakeholder input at an early stage of the process.
- Analysis will gain traction if it is robust in the eyes of stakeholders. Where technical expertise and capacity are available, multiple complex models or integrated tools can bring together economic, social, and environmental impacts that are more likely to explore some of the dynamic effects of policy choices that can help inform long-run strategic choices. This will help if it provides tangible outputs such as identifying costs and wider benefits, growth, and jobs security that are clearly presented to stakeholders.

Apply an iterative process to analyze options, identify priorities and combine them into pathways for near and long-term green growth transformation.

- The initial stages may be based on quite simple analysis, but complexity often increases over subsequent iterations as more options and types of impact are incorporated into the analysis. There should be an ongoing plan for development of the approach.

Use pathways (or scenarios) to identify the scale and pace of change required in different sectors and highlight the choices and actions that need to be made over time, along with uncertainties.

- Scenarios can act as a bridge between a government's overarching vision and the more detailed implementation plan. They can be a powerful way to communicate the feasibility of green growth goals and can help show the

impact of different technology options. Scenarios can help decision-makers by showing the effects of factors that can be influenced (such as technology support) and factors that are outside the scope of influence (such as world oil prices). Scenarios are also used for sensitivity analysis of model results.

- Scenarios are more effective when they are aligned with the decision variables and political context in question. Greening growth often requires behavioral change and structural economic adjustment, which is typically a slow process. Pathways can provide a way of exploring realistic timescales to allow for these transformations.
- Clear assumptions and broad and meaningful involvement of relevant stakeholders are crucial to developing credible

green growth pathways. The cases show how important it is in any analysis that the interest of the stakeholder be put in place as well as ensuring that the approaches used are inclusive and legitimate. The choice will depend on available resources, both in terms of data, time and expertise. Across all the case studies, there were good examples of scenarios being used to encourage consideration of appropriate ambition levels in order to increase impact.

- Uncertainties in the approach should be acknowledged even if they cannot be formally assessed. Robust accounting for uncertainty is difficult, so the best option is to seek agreement among stakeholders on the nature and extent of uncertainty in the scenarios.

1. Introduction

This chapter aims to answer the question:

What tools, methods and approaches have been used to effectively identify, analyze, and prioritize options, and articulate alternative pathways to inform green growth plans?

What do we mean by options, tools, methods, and scenarios?

The term **option** here describes a technology, behavior, technique, action or practice that leads to an improved environmental, social, and economic outcome compared to the status quo. An option is not to be confused with the policy instruments used to achieve this (covered in [Chapter 5 on Policy design and implementation](#)). So for example, wind energy and Bus Rapid Transit systems are options, but feed-in tariffs or fuel standards are policy instruments.

Tools and methods are analytical devices ranging from formal proprietary models to less formal spread sheet analysis for evaluating the costs and impacts of particular options. *Approaches* refer to broader frameworks that bring together all the estimated impacts and offer a way of prioritizing amongst the different options. This includes the use of scenarios to explore possible future pathways. **Scenarios** are one particular approach – they are coherent, internally consistent and plausible descriptions of a possible future state of development, and the **pathway** to reach it. They are not forecasts; rather, each scenario is one alternative image of how the future can unfold.

The chapter first outlines means for identifying, prioritizing and analyzing options. It then shows how scenarios can be used as a bridge between high-level vision and detailed analysis of options, and also to aid decision-making under uncertainty by illustrating alternative future pathways. The target audience for this chapter includes policy analysts, strategic decision-makers, and planning officials engaged in commissioning and interpreting the analysis, and the development partners.

A number of myths regarding the analysis of options and pathways exist, and this chapter shows that they deserve reconsideration because reality is often more subtle than 'common wisdom' suggests, see Table 1.

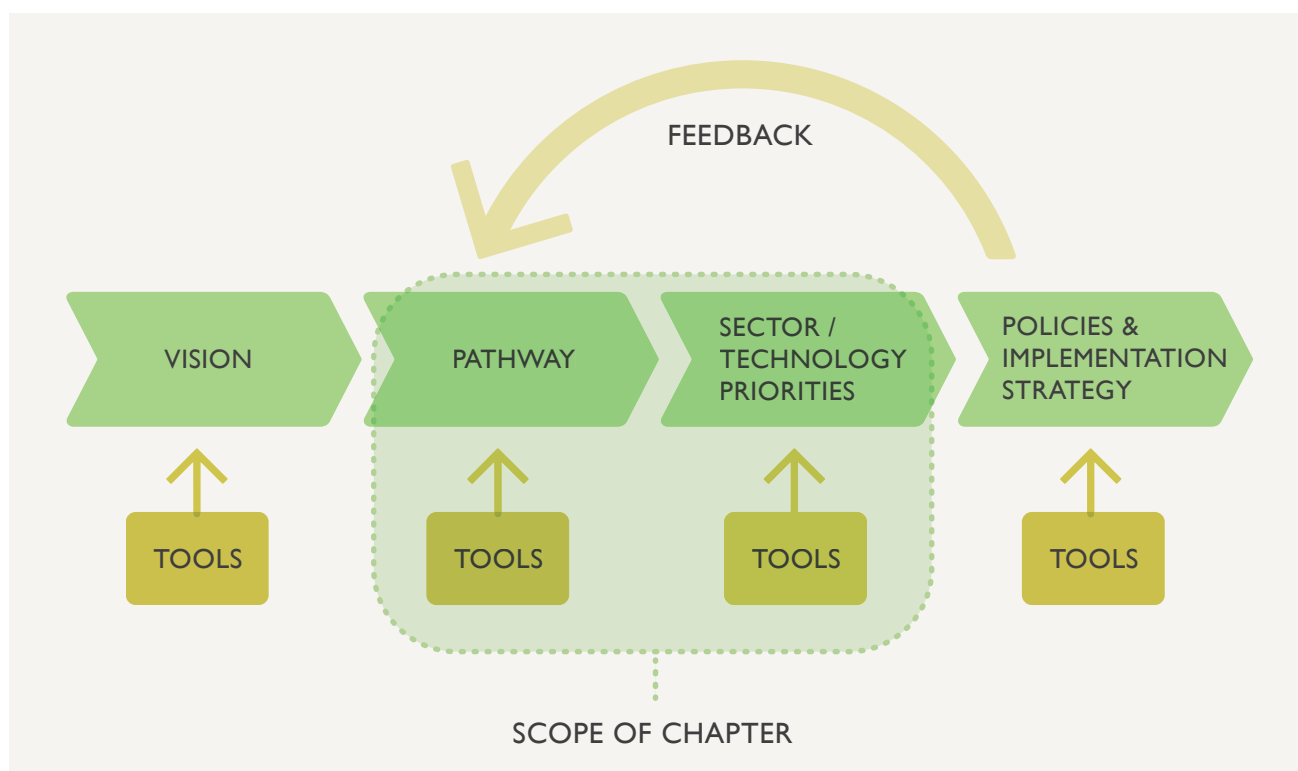
There are important linkages between this chapter and the questions covered elsewhere in the report. The discussion here does not assess the overall process for formulating and deciding on a green growth plan, but rather aims to illustrate how tools and approaches have been selected and used as inputs to these processes. It provides a bridge between the technical discussion of tools in [Chapter 3 on Assessing and communicating benefits of green growth](#) and the discussion of [Planning and co-ordination processes discussed in Chapter 1](#).

Whilst the planning cycle might be envisaged as a top-down progression from vision through to implementation, the experiences reviewed here show that bottom-up approaches are also often used. These provide feedback from sectoral plans into strategy in an iterative way (Figure 2). Various types of analytical tools and approaches are used to support planning by facilitating the transfer of data and assumptions between different levels and stages of decision-making.

Table 1:
Myths and realities

Myth	Reality
The more complex the analysis the better.	<ul style="list-style-type: none"> Starting simple is okay. The 80:20 rule (80 per cent of the result can be obtained with 20 per cent of the effort) is a useful guide. Analysis is a guide to decision-making, not an end in itself.
All good analysis starts with a MAC curve.	<ul style="list-style-type: none"> Tools need to match the issue and country context, drawing on available information and expertise. It is possible to address multiple dimensions green growth even in a simple framework.
We know what the future holds, let's 'just do it'.	<p>Uncertainty is not a reason for inaction, but:</p> <ul style="list-style-type: none"> Identify unknowns and explore a range of scenarios. Revisit and adapt tools as new information emerges and government circumstances change. Think about flexible and adaptable approaches.
The donor knows best.	<p>The selection of green growth tools and approaches:</p> <ul style="list-style-type: none"> Should be based on local issues and needs, and suitable to the local context. Can face challenges, including funding limitations, donor and political priorities, and political timeframes.
Public involvement is burdensome, expensive and unnecessary.	<p>If public engagement is implemented well,</p> <ul style="list-style-type: none"> The public can be a resource that can be tapped for information, brain power and creativity. The time investment will earn itself back in lower resistance and better plans.

Figure 2:
Scope of chapter



This review combined a broad-based literature review with a more detailed analysis of good practices in a number of more specific cases.

Summary of case studies reviewed in this chapter:

Ref	Country	Case study	Brief description
a	British Columbia	Encouraging green growth through provincial and local government planning action	Since 2007, the Canadian province of British Columbia has introduced a variety of legislation to encourage GHG emission reductions that includes a carbon tax and requires that all local governments set a GHG reduction targets at the municipal level. Emphasis was placed on providing local governments with the tools and resources they need to set priorities and develop green growth plans. 180 of 189 local governments have signed on to the Climate Action Charter.
b	India	National Energy Map for India: Technology Vision 2030	The National Energy Map for India: Technology Vision 2030 demonstrates the use of optimization tools to analyze energy security and green growth. An integrated modeling framework was used to develop and analyze various scenarios of energy demand and supply for each category of resources as well as sectoral end-use demand.
c	Kenya	Low Carbon Climate Resilience Plan	The 2010 National Climate Change Response Strategy, 2013 National Climate Action Plan, and a 2012 green economy scoping study have been funded through various bilateral and multilateral organizations. This has impacted the choice of tools, processes, and methods used to define, analyze, and compare green growth pathways, scenarios and options.
d	Mexico	Special Climate Change Program	In 2009, Mexico published the country's long-term climate change agenda together with the medium-term goals for adaptation and mitigation. It is a broad program to address the impacts of climate change in Mexico and reduce greenhouse gas emissions across all sectors. In evaluating options for the country's low carbon development, government estimates and inventories were supported by various studies and provided analyses on the economy-wide impacts of moving to a low carbon pathway.
e	South Africa	Long-Term Term Mitigation Strategies (LTMS)	The focus of the LTMS was on mitigation that also embarked on green growth path and opportunities. It serves a turning point in South Africa's climate policy, showing the vision, policy framework and strategic directions towards a low carbon pathway. It developed scenarios that create top and bottom emission levels up to 2050. These scenarios define the space within which the mitigation action occurs.
f	Netherlands	The Waal River Area	Waal river, part of the Rhine delta in the Netherlands, started a program called WaalWeelde, a new governance model that was adopted by the provincial government. The model organizes a process to bring bottom-up ideas about redesigning floodplains and management measures into the decision-making institutions. It reviews how a variety of analysis tools was applied and what the decision-making processes entailed in the context of the green planning of a 80 km Rhine-Waal river section downstream from the Dutch-German border.
g	United Kingdom	Carbon Reduction Plans	Electricity sector de-carbonization is a central feature of the UK green growth plan which is based on the deployment of three technology pathways (renewable resources, nuclear power and carbon capture and storage), and the implementation of new support mechanisms. This case reviews the wide range of analytical approaches used, and then focuses on the role of the Committee on Climate Change.

2. Prioritizing and analyzing green growth options

The choice of tools and approaches should be deliberate, and cover economic, environmental, and social aspects. The choice of tools should follow, not drive the questions to be asked by the analysis.

For green growth strategies driven either by top-down or bottom-up process, the analysis stage involves an iterative cycle of identifying, prioritizing, and analyzing the available green growth options, see Figure 3.

The initial stages may be based on quite simple analysis, but complexity often increases over subsequent iterations, requiring more sophisticated sector-specific tools.

Many tools and approaches are based on long-established techniques, but a wide range of specific interfaces have been developed over recent years, often by international organizations aiming to increase accessibility to policy makers. Tool selection is important, as it frames the scope of issues that can be addressed. Pragmatic issues such as requirements for data, technical expertise and other resources are key constraints. However, choice of analytical tools should be driven by the strategic priorities, not vice versa. Models or approaches used in one country may not work best in another country.

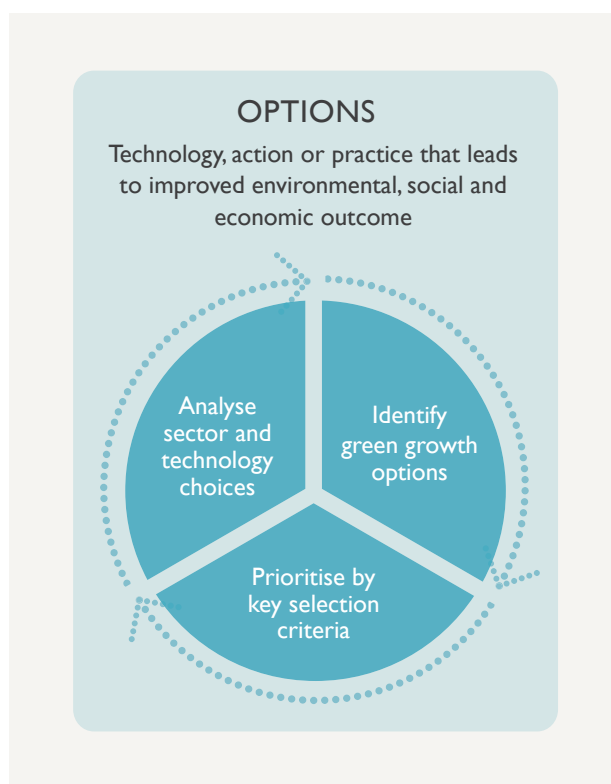
The choice of approach depends on the scope of issues to be addressed (see Table 2). Analysis will often start simply, by assessing the costs and benefits of individual options (top-left quadrant). As the analysis progresses, more comprehensive approaches can be developed to address multiple dimensions of green growth (moving to the right of the table) and system-wide impacts (moving to the bottom of the table). This broadening-out of the analysis, for example using multi-criteria analysis is important since a narrow cost-effectiveness comparison misses many relevant aspects of green growth such as jobs, resource savings, health issues, and security. Choosing the most appropriate approach also needs to take account of available resources (human, financial, and data) as discussed above. The list of models in the table is illustrative, not complete. References in the table relate to where particular tools have been used in the case studies reviewed.

Models are incomplete representations of reality. They do not give a final answer on prioritization, since this needs interpretation and political consideration. Therefore, close attention needs to be paid to appropriate interpretation of inputs, assumptions, and outputs of any tools used. This requires good communication of the approach from analysts to decision-makers and other users. Whichever tools and approaches are used, it is important to address their limitations through other elements of the decision-making process. This might be through broader but less formalized analytical approaches, or by combining outputs from different types of tool in a more holistic analysis.

It is common to use a variety of tools to prioritize green growth options. Combining top-down approaches driven by

Figure 3:

Identify, prioritize, and analyze green growth options



the vision and strategy, with bottom-up analysis of concrete actions and options, can improve the consistency and robustness of results, and address limitations of individual tools.

2.1

Identifying options

The first step for any analysis is to identify the range of options available, to gather basic information about their social, technical, and economic characteristics. Identification and prioritization of options and actions is iterative, not a one-off event. In most cases, the analytical approach evolves to become more complex during successive rounds. In many countries, initial assessments of options will have already been carried out at a sectoral level, or ideas and data can be drawn from other countries that have undertaken such reviews. Building on this, expert elicitation can be used to collate a 'long list' of initial ideas and available data on economic, social, and environmental impacts and benefits.

Subsequent rounds of analysis can strengthen this by using more detailed and localized data and considering the potential for dynamic effects and interactions between options and how costs and benefits may change over time.

Table 2:

Different analytical approaches used depending on complexity of issues addressed

	Individual Green Growth Issue (e.g. low carbon energy, sustainable agriculture)	Multiple Green Growth Issues (e.g. Sustainable growth / natural resource protection)
Bottom-up or option-level impact analysis	<ul style="list-style-type: none"> • Cost-effectiveness analysis^{a,c} • Marginal abatement cost curves^{d,g} • Cost-benefit analysis^{d,g} • Accounting models (e.g. EFFECT, LEAP^d, MEDEE, 2050 Pathways^g) • Sector-based and geographical-based agri-environmental frameworks 	<ul style="list-style-type: none"> • Cost-effectiveness analysis^f • Multi-attribute analysis • Multi-criteria analysis • Multi-purpose spatial planning^f (GIS-based) models • Land-use models (e.g. CLUE) • Urban energy systems
Top-down or system-level impact analysis	<p>Optimization approaches</p> <ul style="list-style-type: none"> • Energy system models (e.g. Markal^{b,e}, MESSAGE, EFOM WASP) • Computable general equilibrium models^c • Dynamic stochastic general equilibrium models • Integrated Assessment Models <p>Simulation approaches</p> <ul style="list-style-type: none"> • Energy system models^g (Energy 20/20, POLES) • Macro-econometric models (e.g. E3MG) • Ecological macroeconomic models • Agent-based models • System dynamics models 	

Notes: 1) Letters in subscript reference country cases. 2) See Abbreviations for full name of each modeling tool.

Data gathering will often rely on expert opinion, but should also involve a range of institutions and stakeholders: a greater level of engagement at the option identification stage is likely to lead to a greater level of buy-in to the outcome of the prioritization process (see for example Waal River case, Case 1). It is important to make sure all stakeholders have familiarized themselves with sufficient information to form opinions (See also [Chapter 1 on Planning and co-ordination](#), for further detail on stakeholder engagement).

There is some tension between efficiency (provided through simple, streamlined analysis with limited space for interaction, iteration and creativity) and robustness (supported through complex analysis or a more elaborate consultative process). At the start of a new process of green growth strategy development, the 80:20 rule (80 percent of the result can be obtained with 20 percent of the effort) is a useful guide. Good practice would be to start with a 'back-of-the-envelope' approach, sufficient to rapidly assess potential, and support initial political engagement, then progress to more detailed analysis, see for example the Mexico low carbon plan, (Case 2).

2.2

Prioritizing options

Prioritization usually proceeds with an assessment of the characteristics of each option according to common criteria. These criteria will depend on the overall scope of the green growth vision and strategy. They will typically include assessment of the costs of the option compared to a business-as-usual alternative, as well as evaluating social, development, and environmental impacts. It is important that the analysis of costs takes account of how these are expected to change over time, as focusing on cost-effectiveness in the short-term means that longer-term strategic trends may be missed.

If the scope of assessment is narrow, the benefits of different options may be directly comparable. For example, in some low-carbon development plans, a single metric (tCO₂ equivalent saved) will often be part of the assessment. Each potential option can then in principle be compared simply on the basis of cost (i.e. using a cost-effectiveness analysis). Cost-effectiveness analysis can be combined with estimates of the scope of each option to generate a supply curve. In the case of low-carbon plans for example, simple tools can be used to

Case 1:**Waal River Area, Netherlands**

Rivers are core to many economies. Economic, social, and ecological functions of rivers include transport, provision of drinking water, agriculture, energy, nature, recreation, and housing. In a densely populated area like the Netherlands, preserving these functions, in the face of many environmental pressures, requires a strategy that resembles a green growth plan. A major concern of the Netherlands, situated in the Rhine delta, is the expected increased river runoff in the coming years due to changing rain patterns. In one area of the Waal river, part of the Rhine delta, the planning for accommodating the additional runoff is done in a structured way in a program called “WaalWeelde” – loosely translated as “Wealthy Waal”. The WaalWeelde program started with a research project focused on the introduction of a new governance model that was later adopted by the provincial government. Flood risks are reduced while balancing conservation, agriculture, and recreation. In the future, renewable energy provision may also be part of the program.

Here, the water security argument could have been implemented in a top-down manner through the Province or the Ministry for Infrastructure and Environment identifying the most suitable overflow. However, this would have probably led to a strategy that would only be optimized on flood prevention, not on the other functions of the river area. Instead, the more local-led “WaalWeelde” program allows for bottom-up ideas about redevelopment of the river area



to be brought into the process. On the municipality level, groups were formed that included local people, business representatives, policymakers, and politicians. These groups were supported by experts who used spatial analysis tools to identify ideas that met the flood safety requirements (while balancing other services provided by the river).

Case 2:**Mexico's Low Carbon Plan**

In 2009, the Government of Mexico published a national long-term climate change agenda, together with medium-term goals for adaptation and mitigation – Mexico's Special Climate Change Program (PECC), which sets out a broad program to address the impacts of climate change in Mexico and reduce greenhouse gas emissions across all sectors.

Good base data on emissions and economic activity by sector were available. This enabled rapid analysis to be carried out to estimate sectoral carbon abatement potential in response to political timeframes driven by the UNFCCC process. With more time available, the long-range energy alternatives planning (LEAP) system was then used to help

develop their low carbon plan. This choice was pragmatic because it is an established tool, and allowed Mexico to get started quickly with their analysis. The tool requires a moderate amount of local capacity to enable it to be adapted to local conditions. In subsequent analysis, Mexico then developed other more bespoke tools, which required more analytical capacity and expertise. These included CGE, MACC, I-O models and cost-benefit analysis of options. Using a range of tools allowed different aspects of the low carbon plan to be addressed. This helped to improve robustness of the analysis by drawing on the particular strengths and covering for the limitations of each type of tool.

construct marginal abatement cost curves (MAC). Similarly, generation technologies in the power sector are often compared on the basis of their levelized cost of electricity (LCOE).

For a review of applications of MAC curve analysis in recent low-carbon development plans, see for example Pye et al. (2010), who conclude that such cost-effectiveness approaches are often an appropriate starting point for prioritization in cases where data availability is limited. However, MACC analyses have limitations because they are only based on measurement of cost against a single benefit. If all benefits can be expressed in financial terms, an alternative is to carry out formal cost-benefit analysis (CBA) to rank the options. However, the monetization of different types of benefit for such analyses is at best contentious, and at worst impossible (Jacoby, 2003).

In some circumstances, cost-effectiveness assessments may not be the most appropriate metric for prioritization, and multiple tools may be required to cover different objectives, as was the case in British Columbia. It is important that the scope of a country's green growth plans do not become limited by the analytical tools used. In least-developed countries (LDCs) for example, a focus on cost-effective GHG abatement potential may be an inappropriate distraction from core development priorities in a context where GHG emissions are already very low. Whilst MAC curves have been used in LDC contexts (for example in Ethiopia's Climate-Resilient Green Economy strategy (FDR Ethiopia, 2011)), the scope of development priorities should often be significantly wider.

Multi-criteria analysis (MCA) can help prioritize options when comparing different types of benefit or trade-offs that cannot be expressed in simple financial terms. MCA has been used in a number of low-carbon economic development plans (MAPS). Several different techniques for MCA are available (Hobbs and Meier, 2000). They usually involve scoring different attributes for each of the different options, and then weighting between attributes so that an overall score can be derived, allowing a comparison between options. The scoring and weighting used in an MCA is relatively subjective (although because these weightings are explicit, this can be considered as strength of MCA compared to other analytical approaches). MCAs usually incorporate expert review or wider stakeholder engagement to elicit these scores. The outcome of an MCA is affected by the procedures used, so ideally use of multiple different methods is recommended (Bell et al., 2001).

With respect to handling uncertainty in decision-making, MCA can incorporate uncertainty as a criterion in itself, which could be considered when evaluating options (in addition to dealing with uncertainty via scenario analysis discussed in the next section).

A less formal approach is multi-attribute analysis, where options are not scored or ranked, but assessed according

Case 3:

British Columbia: Provincial and local government planning and action

The Canadian province of British Columbia released a Climate Action Plan in 2008, and has taken action on many fronts to achieve its climate change goals, including an interim target of a six per cent reduction of GHG emissions below 2007 levels by 2012.

British Columbia provided a range of planning and prioritization tools for municipal governments. This encouraged 'getting it right, now' while undertaking on-going research and analysis of actual outcomes of the implementation of policies and programmes identified by the tools to 'get it right' over the long term. Tools and approaches for prioritization of green growth options and pathways can and should be improved on an on-going basis. The identification of green growth priorities and options is not static, but a continual process.

However, achieving an integrated overview of multiple outputs is not easy, and model limitations need to be recognized. The British Columbia Climate Action Team (2008) noted that the results of the modeling are important to set goals and to enable measurement of progress toward these goals, but the team cautioned "*against focusing too intensely on economic models that, at best, can provide only plausible estimates. The goal of reducing emissions – as much as possible wherever possible – must not be eclipsed by concerns about differing assumptions based on uncertain variables.*"

UNEP and UNDP have produced useful step-by-step guidance to multi-criteria analysis for pro-development climate policy. See:

UNDP. (2010). *Handbook for Conducting Technology Needs Assessment for Climate Change*. New York: United Nations Development Programme. Available at: http://unfccc.int/ttclear/sunsetcms/storage/contents/stored-file-20130321154847356/TNA_Handbook_Nov2010.pdf

UNEP. (2011). *MCA4climate policy evaluation framework, in A Practical Framework for Planning Pro-development Climate Policy*. United Nations Environmental Programme. Available at: http://www.mca4climate.info/assets/files/FINAL_MCA4report_online.pdf.

to their impacts on different development criteria. This was carried out for Rwanda's National Strategy for Climate Change and Low Carbon Development (Republic of Rwanda, 2011). Even without formal scoring, this can help to structure expert workshops to identify areas of priority. Dividing options into simple categories can also help prioritization. In *Inclusive Green Growth* (World Bank, 2012), choices are split according to their local and immediate benefits on one axis, and on the other axis their risk of creating lock-in or irreversibility (see Case 3). Initial prioritization would then be followed by more detailed analysis of each option.

Running multiple models and approaches helps address their individual limitations, giving a richer and more nuanced analysis. However, attention is needed to ensure coordination between different sets of analysts. Ultimately, prioritization is a political decision, requiring interpretation of available evidence, and therefore it is essential that there is good communication between analysts and decision-makers regarding interpretation of model inputs, assumptions and outputs.

2.3

Choosing tools

Analytical tools are widely used in green growth planning, allowing transparent linkages between assumptions and consequences. Tools need to be carefully selected because the choice will determine the framing of the problem and the kind of policy questions that can be answered.

The choice of tool will often evolve through successive iterations of analysis. The choice may be pragmatic; in situations where there is little data or resources for modeling, simple approaches such as spread sheet-based cost-effectiveness analysis of individual options can be an appropriate starting point. Ideally, a plan should be developed that allows progression towards analysis that includes multiple impacts, and feedbacks at the system level.

The case studies show the importance of choosing tools which have an appropriate scope that reflects the scale, definition and ambition of the green growth actions being considered. Across the cases reviewed, there is wide variation in the level of complexity of analysis. The choice is to a large extent driven by the availability of data and to also to some extent the availability of analytical expertise (see Kenya Case 4). As a minimum, good analysis requires sound data on key environmental and social indicators (including estimates on future trends), together with data on the potential actions that can be taken to improve these. All the cases reviewed used multiple analytical approaches, often combining bottom-up models capturing technological detail with top-down models to assess macro-economic impacts and feedbacks. Analyzing green growth through these multiple perspectives helped to improve robustness by addressing individual model limitations.

When data and resources permit a more detailed analysis, it is important to include the effect of interactions between these options. Examples of interactions include reductions in benefits when multiple options are implemented in the same

Table 3:

Example of simple matrix used to help prioritize green growth options

		Local and immediate benefits	
		LOWER (Trade-offs exist between short-and long-term or local and global benefits)	HIGHER (Policies provide local and immediate benefits)
Inertia and/or risk of lock-in and irreversibility	LOWER (Action is less urgent)	<ul style="list-style-type: none"> Lower-carbon, higher-cost energy supply Carbon pricing Stricter wastewater regulation 	<ul style="list-style-type: none"> Drinking water and sanitation, solid waste management Lower-carbon, lower-cost energy supply Loss reduction in electricity supply Energy demand management Small-scale multipurpose water reservoirs
	HIGHER (Action is urgent)	<ul style="list-style-type: none"> Reduced deforestation Coastal zone and natural area protection Fisheries catch management 	<ul style="list-style-type: none"> Land-use planning Public urban transport Family planning Sustainable intensification in agriculture Large-scale multipurpose water reservoirs

Case 4:**Kenya's National Climate Change Action Plan**

In a developing country context, the selection of analytical approach is often determined in consultation with donors, or comes with the associated consultants. In Kenya's case, an efficient approach was to develop simple spreadsheet tools to record and assess the key characteristics and potentials of different low-carbon options. The advantage in this context of spreadsheet tools was to increase transparency and replicability, and allow updating of the analysis on a regular basis. Spreadsheet tools are widely used by government officials, increasing accessibility and communication of the analysis between different stakeholders.

Use of common spreadsheet software (Microsoft Excel) allowed the team to have a workable tool, which used data and assumptions that often started from educated guesswork that was then validated by stakeholders. All data and spreadsheets were provided to the government. This transfer of tools and data is important to build in-country expertise and to ensure updating of the analysis. The spreadsheet bottom-up analysis was complemented with an economy-wide CGE model that considered energy, economic, and emissions information to compute the macroeconomic effects of low-carbon development out to 2030. Using two analyses, where bottom-up analysis was complemented with top-down national modeling, allowed for comparison and calibration, and resulted in more robust and comprehensive information for decision-makers.

sector, feedback into wider economic variables such as prices and demand for goods, rebound effects, and competition for resources including land, water and capital. In order to analyze such interactions, green growth options usually need to be incorporated into more formalized models.

These broader tools and models tend to be sector specific. For example, in the energy sector ESMAP (2012) reviewed models used for developing low-carbon development plans in seven countries. They note that energy sector models usually fall into the following categories:

- **Optimization models** such as **MARKAL**, used for example in India, **EFOM** and **WASP**. Advantages include a powerful ability to identify the (theoretically) least-cost solution for meeting a particular goal or target from a wide range of potential technical options available, taking into account constraints such as technology availability, demand requirements and emissions limits. Weaknesses include an assumption that real-world decisions are driven

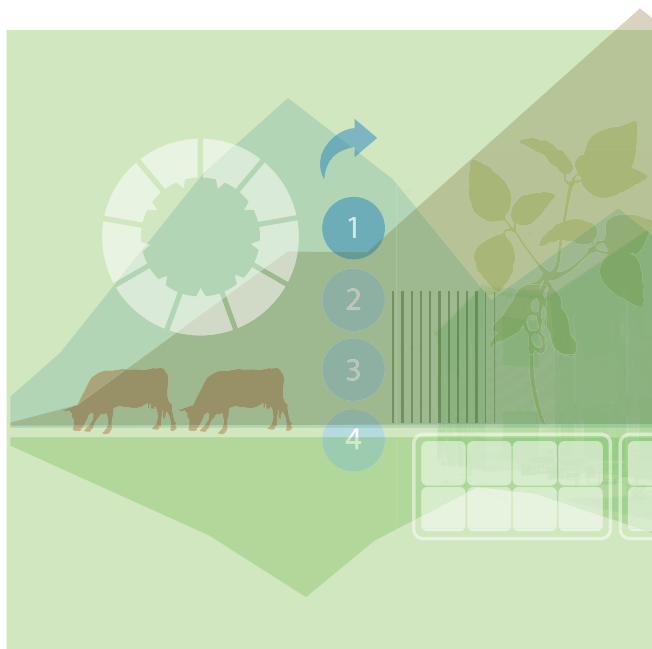
by least-cost, and that markets are complete and operate perfectly. They can also be relatively data intensive and complex, reducing transparency.

- **Simulation models** such as **ENPEP-Balance**, **Energy 20/20**, **POLES**. These models simulate the behavior of energy producers and consumers in response to prices, income, and other signals. They can simulate uptake of technologies in a more realistic way than optimization models, although the assumptions about future uptake depend on subjective inputs from the analysts. This could be viewed as a weakness. Require detailed assumptions about behavioral factors can make the models complex and sometimes opaque.
- **Accounting Models** such as **EFFECT**, **LEAP**, **MEDEE**, **MESAP**, and **2050 Pathways**. These include descriptions of key performance characteristics of the energy system allowing users to explore the resource, environment and social cost implications of alternative future 'what if' energy scenarios. These usually have a simple, transparent and flexible structure suited to evaluating the outcome of scenario-based policy decisions that are defined outside of the model. They do not include any prior assumptions about optimal choices or market behavior.

Energy systems models which take a probabilistic approach are increasingly used to address issues of uncertainty and risk. Examples include a stochastic version of **MARKAL** (UCL Energy Institute, 2013) and **ESME**, an energy system design tool developed by the Energy Technologies Institute (Energy Technology Institute, 2013).

Economy-wide models on the other hand have less technical detail, but allow analyses to assess interactions between policy choices and macro-economic variables such as growth and employment effects. For example, in the ESMAP low-carbon study for Poland (World Bank, 2011), a top-down dynamic stochastic general equilibrium (DSGE) model of Polish economy was used to assess the potential macroeconomic impact of GHG abatement measures. It was based on 2000 variables covering 11 economic sectors as well as general production factors and public expenditure. A regional computable general equilibrium (CGE) model was also used to analyze the macroeconomic impact of implementing the European Union's climate mitigation package.

The literature on top-down energy-economy analysis differentiates between optimization and simulation models. The former draws on neo-classical economic theory that assumes that economies are fairly close to equilibrium conditions. Models include CGE, DSGE and optimal growth models. Most integrated assessment models take this approach. Simulation approaches on the other hand allow for greater deviations from equilibrium conditions.

**Case 5:****India's use of optimization tools for green growth technological options and policies**

Given the emphasis on rapid economic growth as expressed in the Five-Year-Plans in India, it is evident that the country's requirements for energy and supporting infrastructure would increase rapidly as well. The relationship between energy access and growth has been well established and increasing access is a key priority in the government's development policy. Energy security thus becomes an important driver of green growth, and plans have been supported by modeling, particularly the use of MARKAL. The model enabled policy makers to assess alternate technological options and supported discussions around both energy security and climate policy (TERI, 2006; MoEF, 2009).

Approaches include macro-econometric models, ecological macroeconomic models, agent-based macro-models, and system-dynamic models. Scriciu et al. (2013) provide a review and useful categorization of these models, arguing that non-optimizing models can better capture socioeconomic system dynamics and the role of macroeconomic policies for sustainability governance, particularly in developing country contexts where economies are far from the 'idealized' equilibrium position assumed by CGE models.

Governments need to carefully scrutinize the assumptions and theoretical underpinnings of the models they choose to represent their economies, and ideally use more than one type of model to compensate for model limitations. Some studies incorporate both top-down and bottom-up approaches. For example, in the low-carbon analysis undertaken for Kenya, a dynamic, recursive computable general equilibrium model, **GEEM-Kenya**, was developed to inform climate investment choices and long-term development impacts in Kenya. This 'top-down' CGE model incorporated a 'bottom-up' analysis of emission forecasts and abatement opportunities that were validated locally as part of the National Climate Change Action Plan process (Sawyer and Peters, 2012).

Hybrid models such as **TIMES-MACRO** can embed simple CGE models into a more detailed techno-economic model or modeling framework that mix optimization and simulation approaches for different sectors (For example **PRIMES** model (E3Lab, 2013) and IEA Energy Technology Perspectives).

Integrated tools can bring together economic, social and environmental impacts into a single framework. An example is the **Threshold 21** (T21) model (Millennium Institute, 2013)

that has been used to carry out scenario analysis of adaptation options in Kenya and applied in other countries (Africa Adaptation Programme, 2012).

Urban systems models are also increasingly used to analyze urban development in light of green growth, particularly in relation to rapidly growing cities (Keirstead and Shah, 2013).

Options available for sustainable agriculture need quite different analytical approaches from those in the energy sector. Analytical frameworks for agri-environmental policy analysis assess issues at sector and geographical levels. Sector disaggregation breaks the agriculture sector down into different crop and livestock activities and enterprises types. Geographic disaggregation looks at issues as they relate to areas which share common soils, climate, and types of agricultural production, ultimately even undertaking analysis at the farm, field, and sub-field level (For example the **SAPIM** model (OECD 2010)). The same goes for integrated information and scenario tools such as those used for multiple-purpose spatial planning: they are predominantly GIS-based although they sometimes combine 3D functions. Land-use models include the 'Conversion of Land Use and its Effects' **CLUE** model (Veldkamp and Fresco, 1996) which simulates land-use conversion and change in space and time as a result of interacting biophysical and human drivers. For a more recent example of the application of this model to the case of land-use simulation modeling in the farming-pastoral zone of Northern China, see Chen et al. (2008).

Bringing together analysis of options across multiple sectors with different types of environmental impact is possible within integrated assessment models. These can incorporate analysis of climate change, land-use change and

Case 6:**British Columbia Climate Action Toolkit**

The British Columbia Climate Action Toolkit includes a green by-laws tool, water balance models, and guidance how to develop community energy and emissions plan. Provision of such tools allows expertise to be transferred effectively across different levels of government, helping to efficiently focus efforts on key decision points. A lesson is that best practices can be made available to local governments, but work and support is needed to build capacity to use the tools and customize them to specific situations. Having a plethora of tools and approaches to choose from can be confusing, and expertise is needed to identify the best tools for specific situations. Tools provided by the provincial government were designed to be flexible enough to allow local government users to expand the scope of the analysis to reflect local priorities. The City of Vancouver's planning and target-setting process went beyond GHG emissions, and included an Ecological Footprint goal and target. This analysis accounted for local energy and material consumption – including food, transportation, buildings, economy, and waste – and related this data to global ecological carrying capacity. Many of these actions have led to emission reductions; and reporting and assessment are continually undertaken to assess movement toward goals and the need to improve tools as learning takes place.

Case 7:**UK Carbon Reduction Plan**

Since the Kyoto Protocol in 1997, the UK has brought the management of carbon emissions ever closer to the center of energy policy-making in successive rounds of policy-making. The tools required to analyze and prioritize actions have developed in complexity as each new round throws up new issues to be resolved.

Detailed technical issues are addressed using different models from those used to set long-term strategic targets. For example, the degree of back-up generation required to ensure security of supply under large penetration of renewable energy requires detailed statistical analysis of wind availability and transmission system requirements. Long-run strategic policy decisions, on the other hand, require models that deal with wider macro-economic variables, technological learning, and supply-chain constraints.

The limitations of each individual approach are addressed through assessment of the collective outputs. However, in practice the different institutions involved in running these different models each have their own particular expertise, outlook and agenda, and integrating analytical outputs into a defined set of key messages has been difficult. Maintaining a clear path forward in the face of divergent evidence therefore requires a greater degree of clarity of political vision in order to overcome the ambiguities that can be thrown up by different analytical approaches.

agriculture into a single platform, for example **IMAGE**, **AIM**, and **MiniCAM** (US Department of Energy, 2009). These tend to be sophisticated and complex models, usually with either a global or large-scale regional coverage. Given the broad coverage, detailed assessment of individual technologies and options tends to be limited, so they are more useful for assessing large-scale strategic decisions.

Where technical expertise and capacity are available, a range of institutions running multiple complex models can lead to a richer data-set, and is more likely to expose some of the dynamic effects of policy choices that can help inform long-run strategic choices (see UK Case 7). This complexity does, however, lead to its own challenges of communicating with policy-makers, since drawing clear conclusions from potentially conflicting studies becomes more difficult.

2.4**Communication of results**

Aiding communication between different levels of government and different stakeholders in the decision-making

helps to improve the efficiency of consultation, and tools can facilitate this. A particular example is the Waal river case, where a dashboard was developed so that practitioners and policymakers could experiment themselves with the different options in the area. For similar reasons, an open-access multi-user tool (DECC 2050 calculator, <http://2050-calculator-tool.decc.gov.uk>) was developed in the UK which allows users to select different energy options. The department encourages use of the tool by the public to increase awareness of different energy technology choices, and potential trade-offs that might be needed, and their cost implications. This is significant since one of the political barriers to ambitious action is the difficulty of securing support from the public, which may be broadly supportive of climate action but wary of price rises.

The case examples suggest that there is rarely a direct correspondence between model output and policy decisions; the two are usually separated by layers of interpretation and political debate. Across the cases, it was found that analysts and modelers need to devote more attention to better communication, both with decision-makers and with the public.

In the British Columbia (BC) case, (see Case 6), the green growth plan required increased levels of co-ordination between provincial and local government, and communication and buy-in from local populations. Vancouver's Greenest City Action Plan for example involved consultation with over 35,000 people. More broadly, the BC case shows the need to ensure that such consultations have sufficient representation of multiple community groups appropriate to the scope of the green growth plan. The BC plan includes land-use issues, therefore the planning process needed to gather input from wide consultations with industry, academia, non-governmental organizations, faith-based groups, youth, First Nations (aboriginal peoples in Canada), communities, provincial ministries, and local governments.

In the case of the Government of India's Low Carbon Strategy, (Case 5), engagement was needed across multiple government departments in order to maximize the possibility

for integrating low carbon development into India's wider 12th five-year economic plan. An expert group appointed by the Planning Commission was tasked with identifying key focus areas for the plan, and then ensuring the necessary communication and co-ordination of these tasks within the overall planning process.

In the Kenya case, stakeholders were engaged at multiple points in the analysis. All assumptions and findings of the analysis were validated through a comprehensive stakeholder process that included local experts from government, business, research organizations and NGOs. Input from sector expert groups that ensured the low-carbon assessment was informed by technical sector-specific expertise and information. Adaptation priorities were identified through a qualitative assessment that focused heavily on stakeholder consultation.

3. Developing pathways and scenarios to inform decision-making

Use scenario analysis to identify the scale and pace of change required in different sectors and highlight the choices and actions that need to be made over time, along with uncertainties.

Scenarios are coherent, internally consistent and plausible descriptions of a possible future state of development, and the pathway to reach it. They are not forecasts; rather, each scenario is one alternative image of how the future can unfold. A set of scenarios is often adopted to reflect the range of uncertainty in projections. This can help improve the robustness of a decision in dealing with uncertain future conditions.

Scenarios act as a bridge between a national ambition, and the more detailed analysis of options and implementation plans to achieve it. This provides a framework for decision-makers to consider the implications of different ambition levels and choices.

Scenarios can be developed for different contexts. Some are storylines to illustrate the 'big picture' consequences of key economic variables for example the Shell Scenarios (Shell, 2014). They can also be used to communicate the feasibility of green growth goals, helping stakeholders to understand the actions that are implied, over different timescales of a goal such as going carbon neutral (Lazarus et al. 2011). In other cases, scenarios are tailored to particular decision choices, allowing policy-makers to explore several 'what-if' alternative futures. They can also be used as a sensitivity analysis tool to

Figure 4:

Pathways and scenarios for green growth planning



assess the extent to which policy actions or instruments need to be adjusted to deal with uncertainties.

While scenarios draw on the same data and analytical tools as options analysis previously discussed, there is wider discretion in the way they are set up. This can often reflect the pre-dispositions of the organization involved, and can therefore be quite political.

In order to be credible, scenario development needs based on clear assumptions, and to be designed appropriately to answer the policy questions being addressed. Experience has shown that to be effective, *“scenario-modeling tools need to be open access so that the assumptions can be scrutinized and to enable a degree of customization”* (ESMAP, 2012). Some scenario tools such as the UK 2050 Pathways calculator (DECC, 2013) are explicitly designed to encourage users to develop and test their own scenario assumptions. The Mexico case (Case 8) illustrates how stakeholder input can help to achieve robust and credible scenarios.

Choosing priorities and pathways requires clear assumptions, reasonable data, and active stakeholder engagement. The choice of tools and approaches should follow from the questions that need to be answered, not drive the analytic direction. Scenario analysis can be used to identify the scale and pace of change required in different sectors and highlight the choices and actions that need to be made over time, along with uncertainties. Experience has found that iterative processes to analyze options, identify priorities, and combine them into pathways can increase realism and acceptability to stakeholders.

Scenarios help to support discussion and decision-making about ambition levels. What defines ‘appropriate ambition’ is clearly very context specific. But it should be defined as an outcome of the green growth planning and consultation process, not predetermined by the analytical framework used. However, the way scenarios are set up often reflect the pre-dispositions of the organization involved, and can therefore be quite political.

Scenario development is typically a dialogue between analysts and decision makers. Based on an agreed set of assumptions, the analysts will produce a number of scenarios for discussion and assessment by policy makers. Often, there are two or more rounds of refinement where the analysts revise the scenarios as requested by policy makers – either to have more detail, explore variations on a certain pathway, or to test sensitivity or robustness to various assumptions.

In order to be credible, scenarios need to be based on clear assumptions, and be designed appropriately to answer the policy questions being addressed. Experience in seven countries as analyzed by ESMP (2012) has shown that *“data sourcing and scenario modeling were central [...], and have been cited by those who worked on the studies as key components in the consensus building that took place. To be effective in this context, scenario-modeling tools need to be open access so that the assumptions can be scrutinized and to*

Case 8:

Mexico Low Carbon Plan

In Mexico, the government-led initiative mandated all branches of the government to prepare development and sectoral plans. Development of initial scenarios for carbon emission was driven by the need to meet rapid timeframes of the UNFCCC, and used relatively simple calculations of potential, based on extrapolation from data on current emissions. Subsequent rounds of analysis could build on this, adding more detail and complexity, which in turn depended on using more sophisticated modeling approaches.

Broad engagement across government was achieved through establishing an Inter-Ministerial Climate Change Commission. The Commission engaged key ministries and some research institutes to facilitate continued dialogue throughout the process and maintain the high level of interaction among the different stakeholders.

The scenario analysis exercise followed on from political commitments which set targets for reducing GHG emissions. The analysis helped establish a body of evidence suggesting that Mexico can move to a low carbon pathway while generating certain economic opportunities. The analysis was premised on an early action, i.e. starting investing in low carbon technologies now, in a phased manner, reflecting their cost, technological maturity, and ease of implementation. This helped align the strategy with wider economic goals for the country.

enable a degree of customization.” One way of engaging with expert opinion for generating scenarios is through Delphi processes (Bailey et al., 2011). Some scenario tools such as the UK 2050 Pathways calculator (DECC 2013) are explicitly designed to encourage users to develop and test their own scenario assumptions.

Other examples include:

UK

Successive rounds of policy-making on climate change mitigation since 1997 have involved engagement of more ministries (including Treasury), and more agencies such as the electricity system operator. Because the climate change mitigation plans involve interventions in complex systems like electricity markets, they require a greater degree of expertise available across multiple institutions. This has been important to increase the credibility of analysis with investors and other stakeholders as it demonstrates that the detailed technical issues are being incorporated. This requires frequent and effective dialogue between institutions and analysts to encourage effective co-ordination between different tools and methods.

Case 9:**South Africa's Long-term Mitigation Strategy (LTMS)**

LTMS shows how scenarios can be used to help flesh out a vision and strategic direction, providing a framework for a more detailed policy-design process to emerge. It enabled strategic thinkers from key sectors across government, business and civil society to engage with scenario building. It used a blend of workshop and rigorous research, using peer reviewed processes able to address multiple benefits (particularly key energy security concerns).

A focus in the scenarios on wider economic impacts enabled South Africa to turn climate change mitigation into a pro-growth, pro-job and pro-development strategy in a carbon-constrained future. The high-level leadership and commitment of the government in the process enabled involvement of other government actors and sectors. It raised awareness and started conversations that are critical in the policy development process – the most important factor of success of LTMS.

The scenario analysis allowed attention to be focused efficiently on the strategies available to address the large gap between the 'Growth Without Constraints' and the 'Required By Science' scenarios (Winkler, 2009). The first three options

(start now, scale up, use the market) are composed of mitigation actions which are modeled for costs, emission reductions and economy-wide impacts using modeling tools like MARKAL (Market Allocation), an efficient choice given its wide use in energy planning. The fourth option (reach for the goal) suggests a suite of parallel options, emphasizing future technologies and behavioral change. The process also helped to efficiently focus on areas for future research, in particular the need for more detailed sectoral analysis of potential for emerging technologies and behavioral change.

Incorporating a science-based scenario helped to ensure that ambition levels were matched to the policy task. Top-down steering of scenario development also helps build in ambition, and in South Africa this was achieved through setting up the Scenario Building Team to oversee the techno-economic assessment of options. However, top-down steering has to be balanced against wider stakeholder engagement. This first phase of scenario building therefore fed into a second phase high level group process which involved a dialogue of the Inter-Ministerial Committee on Climate Change and leaders from business, labor and civil society.

Kenya

Scenario assessment provided the evidence base for prioritizing low-carbon actions. Bottom-up analysis of mitigation opportunities in six sectors were combined to demonstrate a feasible low-carbon pathway and compare it to a baseline and reference case. The options and pathways identified through the tools and processes were presented to the Kenyan government and stakeholders. After discussing the trade-offs and the differences in priorities across the scenarios, they ultimately made decisions on priority green growth options and pathways. These stakeholder processes were an essential and critical component of the process to ensure that decisions were ground-truthed, accounted for local realities, and that priority actions were doable in the Kenyan environment. The results of Kenya's climate change analysis were used as inputs to the process to develop the government's Second Medium Term Plan (2013-2017).

British Columbia

The BC case shows the importance of timing, where many of the policies and actions were designed with a phase-in period. The intent was to give people time to change their habits and equipment and avoid high transition costs. Evidence is emerging that the government's programs and policies, especially the carbon tax, are having a positive effect on

meeting its GHG emissions reduction goals. Although there was an initial backlash against the carbon tax, it is helping to reduce GHG emissions while keeping income and corporate taxes low. Per capita consumption of all petroleum fuels in 2012 had dropped 16 percent since 2008 when the tax was introduced (Reivers and Schaufele, 2012)

The development of Vancouver's Greenest City Action Plan included consultation with over 35,000 people. Multi-stakeholder groups made the final decisions on green growth priorities and pathways at the provincial and local levels. Continued assessment of tools and their results can improve decision-making. BC encouraged the use of a range of tools at the community level, and assessed the progress toward targets every two years. This helps to maintain an efficient process that is oriented toward results, by assessing outcomes against projections, and adjusting the tools, policies, and programs based on progress.

3.1**Incorporating uncertainty**

Most illustrative pathway and scenario analyses do not try to investigate all variables. They will usually focus on a few key elements such as macro-economic variables, key policy design

choices, technology choices, or behavioral or technological change scenarios. Sometimes multiple variables are changed simultaneously, and grouped to develop 'storylines' around self-consistent visions of potential futures.

Scenarios based on projections may tend to assume continuation of current trends, which can be a weakness when assessing how these may change in more radical visions. One technique for overcoming this is back-casting which presents a normative vision of potential futures, and then aims to address the question of how do we get there from here (Go et al, 2008; Gomi et al., 2010; and Robinson et al., 2011). A strength of back-casting is the ability to think beyond the limitations of current technologies and practices. A weakness of the approach is the potential lack of bounds, or rationale for the choice of future 'vision'.

Normative approaches to scenario development are common, particularly in a policy-making context where targets are set through the political process, and scenarios are developed to show how they can be achieved. One way of ensuring that normative approaches are technologically feasible is to link them to technology pathway studies such as IEA (2012) or GEA (2012), which aim to map out in detail the potential for future technological developments and supply-chain in relation to particular technologies over the longer-term.

Another use of scenario analysis is to assess sensitivity of green growth strategies to external variables over which decision-makers do not have control. These might include:

- National economic variables such as population, GDP growth or sectoral output;
- International variables such as demand for exports, energy prices, or major political changes affecting development pathways;
- Technology variables including availability and cost, possibility of breakthrough developments or barriers;
- Physical impacts such as climate change or natural disasters.

The diverse political interests of different institutions leads to significant variations in the scenario approach, with some taking a more normative approach taking environmental performance as a given, whilst others explore a wider range of outcomes that may not necessarily meet policy targets (see the UK example, in Case 10).

Scenario analysis helps to improve robustness of decisions to uncertain future conditions, and uncertainty analysis can be included as part of scenario development. But in general, accounting for uncertainty remains difficult as it may require passing over optimal solutions to avoid exposure to risks which ultimately do not materialize (Hallegatte et al., 2012). However, in the context of large uncertainties, minimizing potential losses may be more important than finding optimal solutions (Lempert and Collins, 2007 and Lempert, 2013).

Case 10:

UK Carbon Reduction Plan Scenarios

The diverse political interests of different institutions leads to significant variations in the scenario approach, with some taking a more normative approach accepting environmental performance as a given, whilst others explore a wider range of outcomes that may not necessarily meet policy targets.

- The National Grid 'Future Energy Scenarios' range from a renewable-dominated electricity system to a gas-dominated system. The scenarios are not constrained to meet current UK targets. The purpose of this analysis is to understand the impact on transmission system requirements of a wide range of different potential outcomes.
- Department for Energy and Climate Change projections assume that existing renewable policies will deliver the targets. The purpose of the scenarios is to explore sensitivities, such as to fuel prices, growth rates etc., and to assess the extent to which government policy may need to be adjusted to deal with uncertain outcomes for these variables.

The large number of models together with scenario analysis has allowed for interesting comparative analyses, helping to pull out key differences and similarities. Much work for example is being undertaken under the Transition Pathways to a Low Carbon Economy project (University of Bath, 2013) to compare different low carbon electricity sector scenarios. Broader comparative analyses have been done by the Energy Research Partnership (2013) in *Energy innovation milestones to 2050* and the UKERC (2013) in *Comparing Low-Carbon, Resilient Scenarios*. Other bodies such as the Department of Energy and Climate Change and the Climate Change Committee have commissioned work that has allowed for comparison, for specific sectors, and for systems analysis.

An example from the literature is a 'real options' approach for planning investments in large new multipurpose dam alternatives along the Blue Nile in Ethiopia in a world of climate change uncertainty (Jeuland and Whittington, 2013). The approach incorporates flexibility in design and operating decisions over the location, size and sequencing of new dams, and reservoir operating rules. The analysis uses a simulation model that includes linkages between climate change and system hydrology, and tests the sensitivity of the economic outcomes of new dams to climate change and other uncertainties. The real options framework enables the identification of dam investment configurations which offer the 'best bets' in an uncertain climate.

3.2**Engaging and communicating with stakeholders**

Though scenarios and pathways are popular tools for policy analysis, their subjective nature can foster a skeptical attitude amongst decision makers and stakeholders, unless they are engaged in the process. It is important to remember that the aim of scenarios and pathways is to bring consideration of future impacts into current decisions, but in a flexible way that permits learning and adjustment as the future unfolds. The examples of good practice reviewed here show that scenario analysis can support policy makers to make informed policy decisions under conditions of high uncertainty and complexity.

These experiences also demonstrate the political nature of green growth planning, which often pervades the analysis. Some actions can be taken to try to de-politicize the process. In the UK, the Climate Change Committee was established as an independent body to advise the UK Government on emissions targets and report to Parliament on progress made in reducing GHG emissions and preparing for climate change. In British Columbia, experience also shows that an approach of repeated, iterative assessment of progress towards targets and goals improves the results orientation and efficiency of policies, and enables models to be updated with learning. Nevertheless, even with such institutional arrangements, the process of aggregating diverse messages from multiple models, approaches and stakeholders, and using these to drive policy action, requires strong political leadership. This is covered in greater detail in [Chapter 1: Planning and co-ordination](#), but examples of good practice emerging from the case studies in this chapter include:

Kenya

In Kenya, high-level chairing of the task force to oversee the development of the National Climate Change Action Plan helped generate interest and engage powerful ministries

such as treasury and planning. The principal secretaries of the energy and planning ministries became personally interested in climate change, which was instrumental in taking decisions to develop a geothermal NAMA in the energy sector, and mainstream the action plan in Kenya's Second Medium Term Plan (2013-2017).

British Columbia

Using a range of different planning and analysis tools can help with engagement of stakeholders. In British Columbia, a variety of tools developed by NGOs, private sector and government encouraged wider participation and buy-in of different communities to the process of developing green growth plans. This led to green growth planning becoming institutionalized in many municipal governments, helping the issue survive political transitions. Taking planning and action to the community level ensures the engagement of a wide range of stakeholders, which helps to raise awareness and buy-in for action. Although in some cases, this process of localization is not complete.

Waal River, Netherlands

In the Waal river case, exploring green growth options at a localized level rather than based on a top-down centralized approach from Ministry for Infrastructure and Environment helped develop a more holistic analysis that incorporated multiple aspects of river management. This was an important element in defining what green growth means in this context, ensuring that the analysis of future pathways would address the concerns of those most affected by them. The local scale of the actions included in the analysis is likely to have resulted in a greater level of buy-in from local participants. This allowed multi-stakeholder groups to make the final decisions on green growth priorities and pathways at the provincial and local levels, and ensured the tools resulted in the best possible information.

Next steps

There are several outstanding questions that remain to be resolved. These divide into two categories, analytical issues relating to approaches and tools used, and process issues relating to how the analysis is managed.

Analytical issues

How to analyze and compare different kinds of impact?

When there are multiple impacts, assessing interactions and trade-offs ideally requires a common 'scale', but this cannot always be achieved. Formal use of multi-criteria analysis seemed relatively uncommon in this review. Further work is required to assess whether this is a 'missing' element of analysis, or whether other approaches provide reasonable substitute.

How to choose between simple tools and more complex, academically rigorous models? Simple models require less resources, are easier to communicate, and allow outsiders to challenge assumptions. On the other hand, complex economic models provide important insights into interactions and feedbacks. Using multiple tools and models is one solution, but raises further questions about how to integrate disparate results into a coherent inputs to policy decision-making.

How can uncertainty be better handled in the analysis?

Uncertainties are large and important, but incorporating them tends to make analysis more complex. The impact of uncertainty is difficult to analyze in a rigorous way and more work is required to draw lessons for green growth policy analysis.

Process issues

What characteristics make the translation of analysis into policy-making more or less successful?

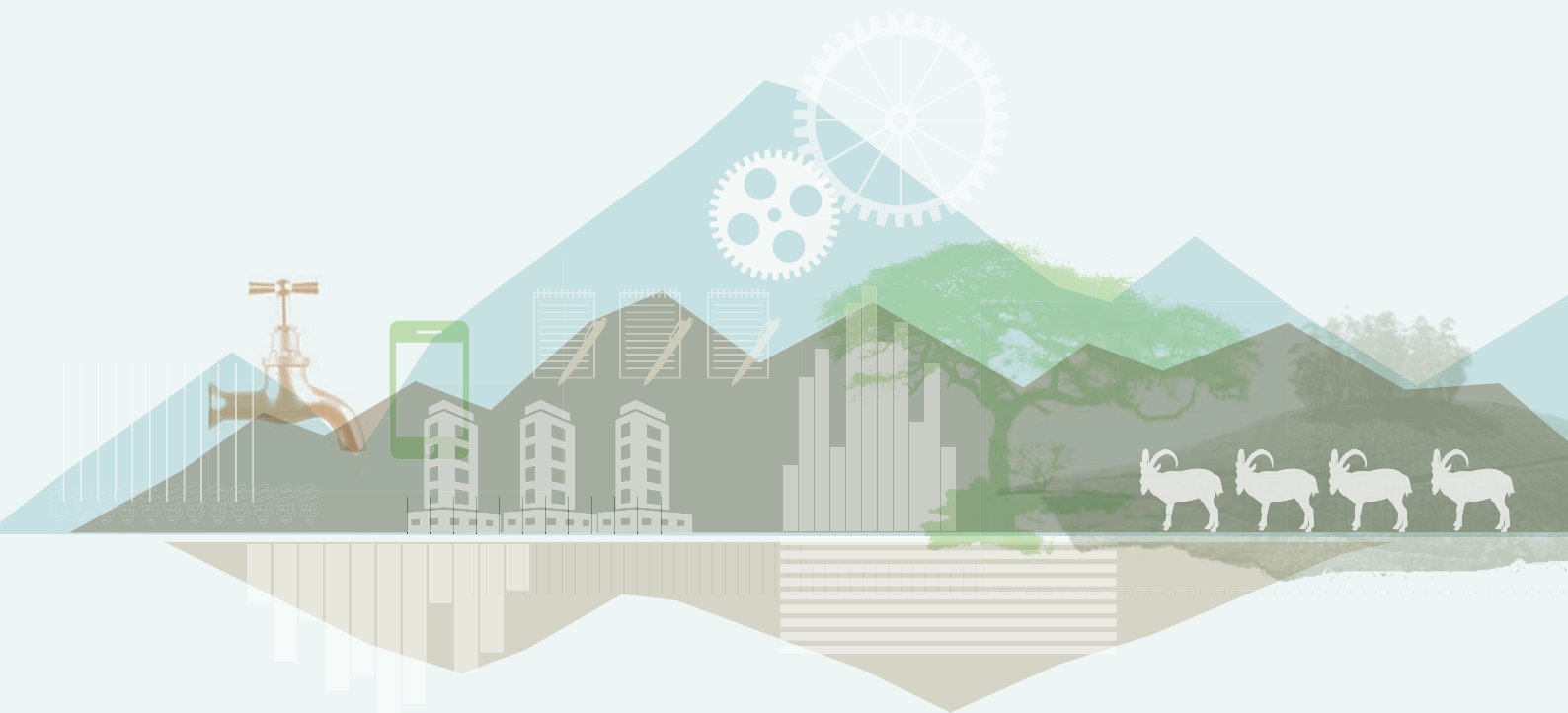
Further work is required on how analysis specifically feeds into policy decision-making, and which types of analysis were most successful or appropriate for helping to inform these decisions. Negative examples might also be useful to assess, i.e. what happens when analysis provides evidence against a particular course of action that already has political buy-in and momentum.

How can uncertainty be better communicated? In addition to the technical difficulties of analyzing uncertainty, more work is needed in how communication about uncertainty can be improved in the dialogue between analysts, politicians, and the public.

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Chapter 5

Policy design and implementation

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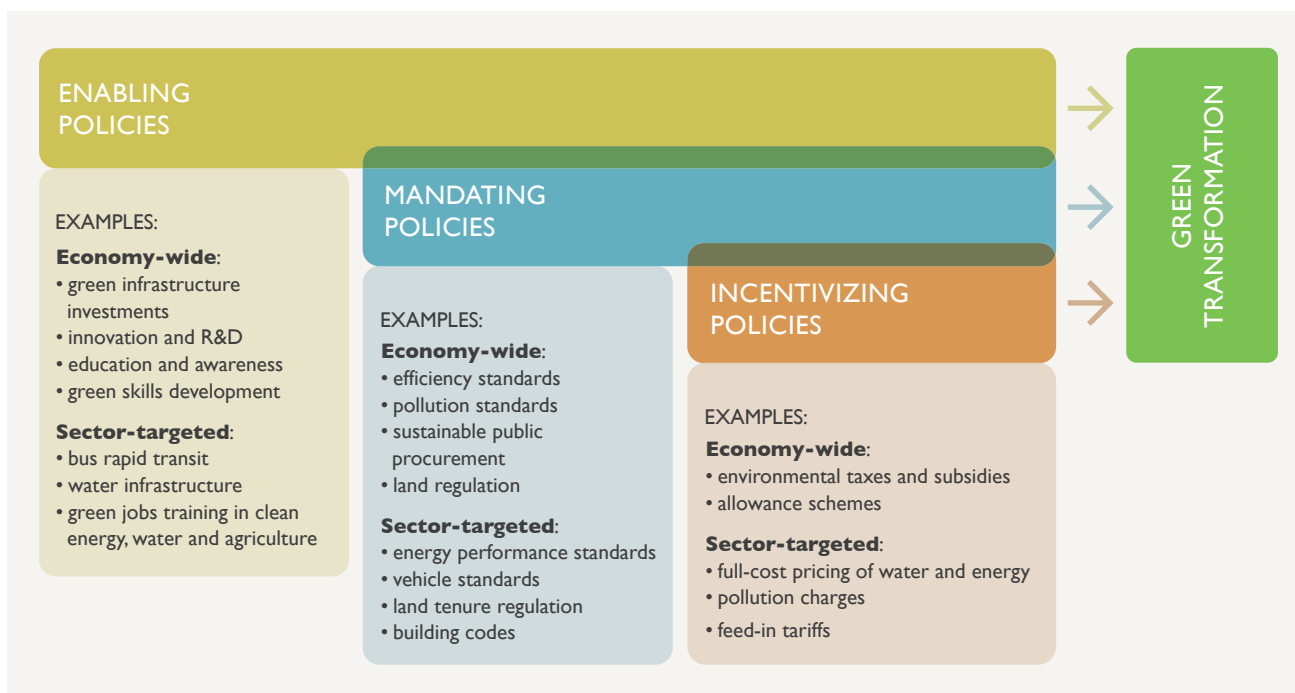
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Ambitious green growth strategies require comprehensive and coherent policy portfolios that can enable transformational change across the economy to achieve ambitious green growth objectives. In practice, however, in many countries the first steps in green growth policy making have been more limited projects and programs, particularly focused on energy efficiency, and renewable energy (OECD, 2013a). Green growth policies include both economy-wide polices, for example on innovation and natural resource pricing, and policy measures in key sectors, such as cities, transport, and agriculture.

Effective policy portfolios apply a mix of policy instruments to achieve short term goals and support long-term green transformation. This includes policies that (i) incentivize green transformation through pricing and fiscal policies; (ii) mandate the transformation through regulations, standards or codes; and (iii) enable the transformation through government investment, including in information and education.

Green growth policies are often designed and implemented as combinations of multiple policies and instruments to address multiple green growth goals and respond to market failures and political economy challenges. When designing policy portfolios governments need to take into account potential trade-offs and prevailing political economy challenges that may limit the effectiveness of policy implementation. For example, while fiscal and pricing policies, including realignment of perverse subsidies, are generally thought to be most efficient to incentivize a transition to green growth, prevailing market failures, vested interests and other institutional and governance constraints in many countries often limit the effectiveness of these instruments in practice.

Figure 1:
Policies for green transformation



There are a number of important economy-wide policy areas that cut across sectors and are foundations for green growth. Two policy areas stand out as prerequisites for a transition to green growth in many countries: green innovation policy; and labor market and skills development policies. Due to limitations in scope of this analysis other critical economy-wide policy instruments such as pricing of environmental services and infrastructure policy are not discussed.

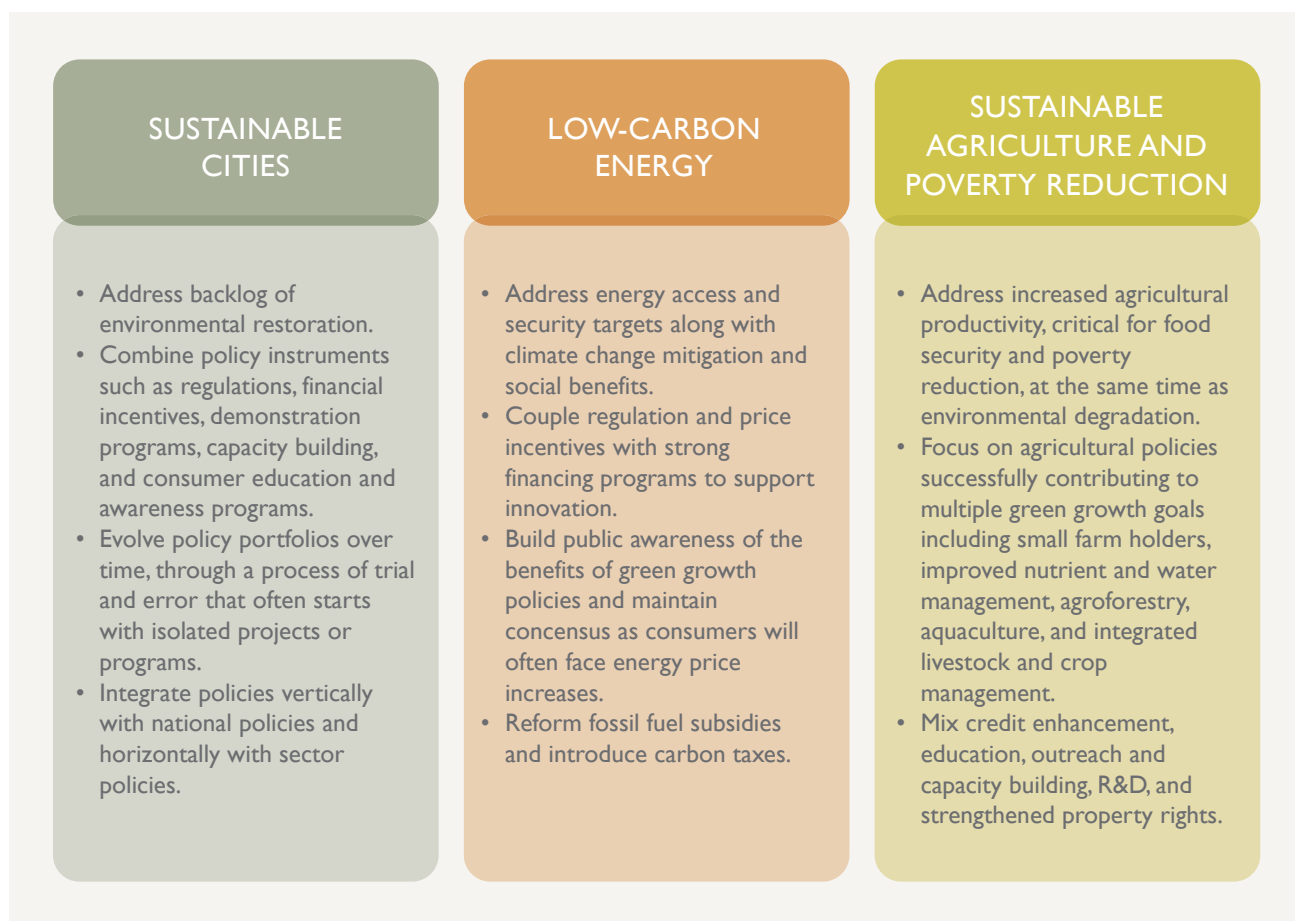
Green innovation policy plays a key role in decoupling economic growth from environmental and natural resource depletion. Fiscal and pricing policies, and environmental regulations, standards and codes are key drivers of markets for green products and services. However, to generate results in the longer term, for example in the form of development of new, 'breakthrough' technologies and business models, these policies generally need to be complemented with significant investments in green innovation. Governments can support innovation through procurement and demonstration

programs, as well as direct R&D support and incentives. Innovation that targets local needs through micro-enterprises and SMEs, and investments to strengthen the absorptive capacity is particularly relevant in low income countries, where often the capacity to adapt, diffuse and deploy imported technologies and to foster local innovation is limited.

In order for green growth policies to be effective, labor market and skills development policies are key. **Successful labor market and skills development policies avoid bottlenecks to investment, increase employment opportunities, smooth the transition of workers from declining sectors, and reduce social inequality especially for marginalized and lower skill workers.** The chapter provides illustrative case examples of the wide range of labor market and skills development policies and programs that countries are implementing in three key areas; (i) general education, (ii) vocational training; and (ii) re-skilling or up-skilling of

Figure 2:

Lessons from sectoral and thematic policy portfolios



workers. The analysis shows that effective green labor market and skill policies actively engage partners from the private sector, from organized labor and from local constituencies. The case examples illustrate that well-targeted skills development policies can reduce social inequalities including support for marginalized or lower skilled workers and that they are actively used for this purpose in many countries.

The last section of the chapter considers lessons from the design and implementation of sectoral and thematic policy portfolios for cities, energy and agriculture – three areas that are of key importance for green growth transformation

both in industrialized and developing countries. The analyses indicate that **effective portfolios couple consistent and coherent policy instruments across green growth sectors and at national and sub-national levels with strong governance and enforcement**. Additionally the assessment found that it is necessary to design policies based on an understanding of resource limits and environmental threats and to achieve development paths that protect and apply natural capital to accelerate and not retard economic and social development. Figure 2 gives an overview of the key messages coming out of the topical portfolio analyses.

1. Introduction

The aim of this chapter is to:

identify and assess promising as well as proven green growth policy design and implementation practices.

What do we mean by green growth policies?

Green growth policies include both economy-wide policies, for example on innovation and natural resource pricing, and policy measures in key sectors, such as cities, transport and agriculture.

Ambitious green growth strategies require *comprehensive and coherent* policy portfolios that can enable transformational change across the economy to achieve ambitious green growth objectives.

In practice, however, in many countries the first steps in green growth policy making have been more *limited, projects and programs*, particularly focused on energy efficiency, and renewable energy (OECD, 2013a).

There are a number of important economy-wide policy areas that cut across sectors and are foundations for green growth. The chapter discusses two key economy wide policy areas: **innovation policy** and **labor market and skill development policy**, which were identified through the GGBP process as deserving special attention. Other economy-wide policy instruments not discussed here, but of no less importance, include pricing of environmental services and infrastructure policy.

In relation to sector specific policies, the chapter looks at three areas: cities, energy, and agriculture. The sectors have been chosen to reflect policies in low-, middle-, and high-income countries with challenges and opportunities across different sectors.

The chapter draws on existing frameworks developed to analyze policies for green growth, including for example from the OECD and the Partnership for Environment and Poverty (OECD, 2013b; PEP, 2012). The analysis is supported by illustrative case examples:

Location	Cases
Brazil	Sustainable agriculture and poverty reduction Rio de Janeiro Low Carbon City Development Program Rio de Janeiro 2016 Strategic Plan Agriculture Policy
Medellin, Colombia	Green City Policies
Germany	Renewable energy policy framework
Korea	Labor and skills development policy
Mexico	Mexico City's Green Plan (Plan Verde)
Norway	Green innovation policy
Singapore	The Singapore Green Plan 2012
South Africa	Green innovation policy in Gauteng, South Africa Green Economy Accord
Thailand	Energy policy

It is important to note however, that many of the policies analyzed are relatively new and it is not yet possible to evaluate their full impact.

2. Incentivizing, mandating and enabling policies

Implement a portfolio of policies to achieve short term benefits and support long-term transformation. This includes fiscal and pricing signals, standards and regulations, public investment, and provision of information and education.

Large-scale green transformation requires a combination of economy-wide and sector-targeted green growth policies that induce structural and behavioral change among consumers, producers and investors. To be effective, policies must address market failures, recognize the political economy context and consider dynamic interactions with other policies. The basic policy toolkit for doing so is neither new nor exclusive to green growth (see Table 1).

Policy makers have three main levers to foster a transition to green growth. They can (i) **incentivize** the transition through pricing and fiscal policies; (ii) **mandate** the transition through regulations, standards or codes; and (iii) **enable** the transition, through government investment, including in information and education. Table 1 shows that these types of policy instruments can be applied to stimulate broad action across the whole economy and in specific sectors.

Table 1:

Overview of green growth policies by type and application

Types of policy	Economy-wide policy	Sector-targeted policy
Fiscal and pricing policies	<ul style="list-style-type: none"> • Environmental (e.g. carbon and pollution) taxes and subsidies • Allowance schemes • Payment for environmental services 	<ul style="list-style-type: none"> • Full-cost pricing of energy, water, or fuels • Taxes and charges e.g. taxing waste disposal or congestion charges • Feed-in tariffs • Targeted subsidies • Tax credits by sector e.g. for clean energy and other green technologies & products • Fossil fuel subsidy reform
Regulations, standards, and codes	<ul style="list-style-type: none"> • Air quality or water pollution standards • Green public procurement 	<ul style="list-style-type: none"> • Efficiency standards • Energy performance/efficiency standards • Green public procurement • Vehicle standards • Building codes • Regulation of utilities, public transport • Renewable portfolio standards
Enabling policies, including information and education.	<ul style="list-style-type: none"> • Redirection of environmental tax revenue • Earmarked budget allocation for green infrastructure investments or green innovation and R&D. • Education, green skills and training programmes • General green economy awareness programmes 	<ul style="list-style-type: none"> • Green jobs training programmes by sector • Sector specific product labelling and consumer awareness initiative • Soft loans • Land tenure regulation

2.1

Addressing market and political failures

It is well understood that the core market failure which prevents efficient resource use and adequate investment in green opportunities and innovation, is that prices do not reflect the full costs of environmental resources such as energy, water, forests, land, and clean air. The economically-efficient approach to aligning economies towards environmental sustainability is 'getting the prices right'; internalizing environmental externalities, for example through taxing pollution or pricing water.

However, where other market failures prevail, the efficiency of pricing instruments may be hampered. Other prominent and often interlocking market failures facing green growth arise from public goods characteristics, non-competitive and missing markets, and information asymmetries.

As a result, governments often cannot focus on fiscal and pricing policies alone, but need to consider a wider range of policies, such as regulations, performance standards, or education programs (Hallegatte, Fay, and Vogt-Schilb, 2013).

Table 2:

Examples of policy mixes in response to market failures and political economy challenges

Market failures		
	Single: Environmental externality	Multiple: Environmental externality, economies of scale, knowledge externality, co-ordination failure, missing markets (e.g. capital markets), or lack of long term credibility of pricing signals
Prevalence of political economy challenges	<p>Low political economy barriers</p> <p>Example: Coal-based power generation where competitive alternatives are available</p> <p>Objective/challenge: Internalize environmental externality</p> <p>Policy instruments: Price-based instruments, i.e. environmental tax or allowance market (emissions trading scheme)</p>	<p>Examples: (i) Supporting technically viable green technologies (e.g. off-shore wind power) in becoming commercially viable, and (ii) Strengthening absorptive capacity for green technologies especially in developing countries.</p> <p>Objective/challenge: accelerate technology development, adoption, and diffusion</p> <p>Policy instruments: temporary support to increase absorptive capacity and develop new green sectors and technologies</p> <ul style="list-style-type: none"> • R&D subsidies • Capacity building and training • Feed-in tariffs, forward contracts and demonstration projects.
Prevalence of political economy challenges	<p>High political economy barriers</p> <ul style="list-style-type: none"> • Limited social acceptability • Competitiveness concerns • Lobbying power of vested interests (industries, workers, consumers, etc.) 	<p>Example: Low environmental resource price (e.g. water or energy) leads to high consumption and environmental costs.</p> <p>Objective: Reform subsidies, introduce tax, or increase tariffs/charges.</p> <p>Challenge: Improve social and political acceptability of higher resource prices.</p> <p>Policy instruments: Complement price increases with:</p> <ul style="list-style-type: none"> • Targeted cash transfers/subsidies to the poor • Improved social safety nets • Support to affected firms and/or service providers (e.g. subsidized loans, re-circulation of tax revenues) • Labour and skills development
		<p>Example: private consumption dependent on inefficient and environmentally-costly technologies and production practices (e.g. vehicles, energy, agriculture)</p> <p>Objective: Increase environmental resource prices and introduce new technologies and production practices</p> <p>Challenge: improve social/political acceptability of higher prices, handle competitiveness issues, trigger R&D into new technologies</p> <p>Policy instruments: Complement price increases with:</p> <ul style="list-style-type: none"> • Standards • Subsidize learning-by-doing • Education and awareness programmes • Redirection of environmental tax revenue

Source: Adapted from Hallegatte, Fay, and Vogt-Schilb (2013)

In addition, the design of effective green growth policies and policy portfolios must address political economy barriers. Policies that promote green growth can be associated with short-term net costs. Benefits and costs are rarely evenly distributed across different stakeholders. This can lead to opposition, often from powerful vested interests (OECD, 2013a).

Table 2 illustrates the impact that market failures and political economy challenges have on the effectiveness of policy instruments. Pricing and fiscal policy instruments are most feasible and effective as stand-alone instruments where there is a single market failure and where political economy challenges are low. Where there are multiple market failures, and greater barriers in terms of social acceptability, competitiveness issues and vested interests, a portfolio of policies including mandatory and enabling approaches may be needed.

2.2

Developing effective policy portfolios

Successful green growth policy portfolios recognize winners and losers of a transition to green growth and apply measures that ensure robustness, social acceptability and address competitiveness issues. The analysis shows that accompanying measures that address industrial competitiveness and employment loss impacts are particularly important.

It is important to design policies based on an understanding of resource limits and environmental threats and to achieve development paths that protect and apply natural capital to accelerate and not retard economic and

social development. This is explored in the sections on sustainable cities, low-carbon energy, and agriculture and poverty reduction.

Balancing trade-offs between policy objectives such as equity and efficiency is not straightforward. Furthermore, policies in one sector may have unintended consequences on resource use and effectiveness of policy tools in another sector. In Mexico, for example it was found that one of the best ways to address overuse of water was to reduce the subsidy on electricity subsidy for irrigation (OECD, 2013d). This example points to the significance of ensuring consistency and coherence of instruments within and across priority green growth sectors, and with existing policies at national and sub-national levels.

Experience also shows that it is critical to couple consistent and coherent policy instruments across green growth sectors and at national and sub-national levels with strong government and enforcement. Policy portfolios that effectively integrate short and long-term policy objectives across different sectors and governance levels are not created as a one-off design but develop over decades. Green growth policies, therefore, require strong institutions and systems to ensure accountability, including participatory and iterative planning and monitoring processes. Successful policy portfolios are designed in accordance with institutional and governance contexts and particularly in developing countries may include elements that strengthen institutional and governance capacities to manage, enforce, and monitor and evaluate policies. More detail on the effective design of iterative planning processes can be found in [Chapter 1: Planning and co-ordination](#).

3. Innovation policy

Government investment in green research and development (R&D) and demonstration projects, and support for scale up through procurement can enable development and commercialization of breakthrough green technologies, as well as distributed and localized innovation on green technologies to reflect local conditions and needs.

Technological innovation is crucial for decoupling economic growth from environmental and natural resource depletion (UNEP, 2011). Development of more resource efficient production practices and technologies, new business and financial models, and new institutional arrangements contribute to the establishment of new markets, and support the creation of new green jobs and growth (OECD, 2011).

Green innovation policies are therefore a critical area of green growth policy making. This is also discussed in [Chapter 7: Public-private collaboration](#).

Green innovation policies face many of the same challenges and opportunities as traditional innovation policies. However, two special features of green innovation are highlighted in the literature: the positive externalities and social gains of green innovation are higher, strengthening the case for government intervention to achieve socially desirable levels of investment in green innovation; and the need to adapt the innovations to local environmental and social conditions is often greater (Dutz and Sharma, 2012).

In response to the challenges of green innovation an increased focus on open, social and financial innovation is emerging to complement the focus on technological



Case I:

Green innovation policy in Norway

The Norwegian government frames its innovation policy as a process of building a creative society which puts human wellbeing and sustainability at the center (Norway Ministry of Trade and Industry, 2012). Support for innovation is focused on six sectors: energy and environment, oil and gas, healthcare, agriculture, marine, maritime, and tourism. This includes a USD 80 million program supporting enterprises to initiate green research, a strategy council for environmental technology, and a national strategy for environmental technology. The innovation approach builds on engaging users in the innovation process; has a focus on public sector led innovation; and public procurement is designed to actively reward innovation (Nordic Innovation, 2012).

innovation. This places a more explicit emphasis on the role of changes in institutional structures and systems for green transformation (Weber and Rohrer, 2012).

Green innovation policy generally targets the following goals (Dutz and Sharma, 2012):

- The development and commercialization of new 'breakthrough' technologies.
- Promoting 'catch-up' innovation by facilitating access to new-to-the-firm knowledge and to stimulate technology absorption and adaptation.
- Enhancing the absorptive capacity of entrepreneurs, firms and workers through additional measures such as promotion of knowledge accumulation and skill development.

As highlighted in the previous section, clear and stable green fiscal and pricing-based policies are key to establish market signals that reflect the real value of environmental and natural resource use. Together with regulatory policies they are powerful drivers of innovation, but are generally not sufficient to bring about the level of investments required for longer-term innovation resulting in for example 'breakthrough' green technologies. Government investment is needed and experience indicates that it pays off.

Government investment in green research and development (R&D) successfully translates into development and commercialization of break-through green technologies that put social and human well-being goals at the center of R&D. To illustrate, between 2000 and 2005, 60% of all green patents registered worldwide

originated in just three countries: Japan, USA and Germany. All three countries are characterized by high levels of government spending on innovation, including R&D (Dutz and Sharma, 2012).

Norway's green innovation policy is an illustrative example of an approach that emphasizes goals of social and human well-being (Case I). Norway promotes open innovation, stimulated by an engaged public sector, and with participation of actors at multiple levels with goal of establishing a creative society.

Public leadership via procurement and government demonstration of emerging green technologies and practices is critical. A recent comparative analysis of the green innovation approaches taken in Scandinavia (Nordic Innovation, 2012) finds that compared to Norway, Sweden has a more traditional research-driven approach to innovation, emphasizing public research carried out through universities and colleges to support in particular break-through innovation. In contrast, Danish innovation policies, while prioritizing public R&D in technology and science, also embraced elements of open innovation and focus on incentivizing the private sector through price signals. User involvement, public-private partnership and support through public procurement are key parts of the approach (Nordic Innovation, 2012). Green procurement by the public sector is becoming a driving force for innovation not only in Norway and Denmark but also in Iceland, where ecological procurement plays a central role in public sector engagement in innovation. These Nordic examples highlight the importance of public leadership via procurement and government demonstration of emerging green technologies and practices.

It is too early to evaluate the results and efficiency of these particular policies. However, the governments of the Nordic countries, like other countries with high government spending on innovation, have the ability to understand and use innovative technologies and practices and adapt these to the specificities of their national contexts. Empirically, the correlation between high government spending on R&D and development of breakthrough innovation technologies and business models is confirmed (Dutz and Sharma, 2012).

In low-income countries it is critical to support distributed and localized innovation on green technologies and practices by SMEs and community groups that reflect local resource conditions and development needs and are integrated into current cultural practices. In low-income countries, the formal private sector often has limited ability to meet local innovation and technology needs, so the engagement of local players, sometimes from the informal economy, can make a real difference. Fostering entrepreneurship and facilitating community-level innovation is equally important, particularly for cost-effective management of natural resources and small-scale technology deployment (Dutz and Sharma, 2012; OECD, 2013b; OECD, 2011; and OECD, 2010).

To date, 'base-of-pyramid' green innovation to meet the needs of low-income households in developing countries has been relatively limited (Dutz and Sharma, 2012). However, there are successful examples. The Manila Water Company created an innovative business model that brings affordable water to the urban poor using a combination of physical pipeline and sewage infrastructure, natural resources conservation, and community programs; in India, Jain Irrigation provides drip irrigation systems designed for smallholder farmers; and the Brazilian cosmetics company Natura works in co-operation with local communities to use their knowledge

on how to extract natural resources sustainably (WEF, 2011).

The provincial government of Gauteng in South Africa has developed a comprehensive innovation strategy which aims to stimulate SME involvement and local community engagement. The strategy targets innovation to advance social inclusion, including by young people and women, (see Case 2).

Case 2:

Green innovation policy in Gauteng, South Africa

Gauteng has a dual position as the innovation hub of South Africa, accounting for 52.2% of the total national R&D expenditure in 2008-09, and as the host of the largest concentration of informal settlement in South Africa. The government's innovation policy therefore targets employment creation, and sustainable social and economic development (Department of Economic Development, 2010). The strategy has a number of interesting open innovation features. It focuses on community-led innovation to identify alternative economic value chains and community developed innovation solutions and fosters those solutions through replication and incubation particularly in the townships. Proposed strategic interventions include the development of networks to exchange information and knowledge, based on open innovation systems; and promotion of high speed Information and Communication Technology (ICT) access at a household level as a means of fast-tracking innovation (Department of Economic Development, 2010).

4. Labor and skills development policy

Work with the private sector to anticipate, and address the effects of green growth policies on employment, using labor market and skills development policies to enable the reallocation of workers from declining to growing sectors and help prevent bottlenecks to green growth.

Well-targeted skill development policies, such as support for marginalized or lower skilled workers, can reduce social inequalities. A transition to green growth brings significant potential for creating new green jobs. In Korea, the development of green technologies is expected to result in one million additional jobs by 2020 (ILO, 2011). At the global level, the International Labor Organization (ILO) has estimated that green jobs have the potential to employ 100

million people worldwide over the coming decade in sectors ranging from agriculture to construction and renewable energy to sustainable tourism (ILO, 2013).

The largest structural changes accompanying green transformation are likely to take place in fossil fuel based and renewable energy industries, with the former experiencing the steepest decline in employment and the latter the sharpest increases (OECD 2012a; and 2013a).

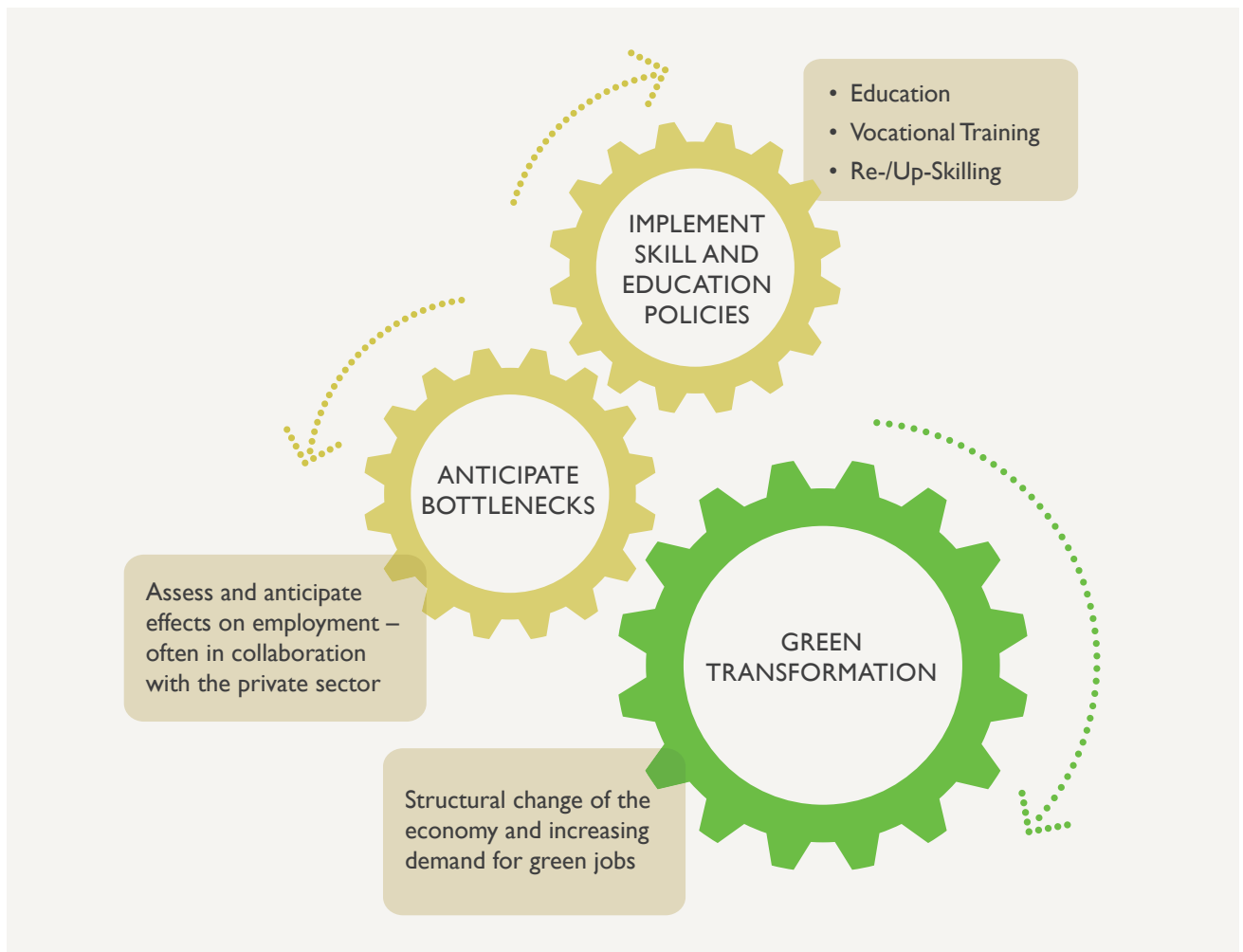
Labor market and skills development policies can play an important role in supporting the reallocation of workers from declining to growing sectors and help prevent bottlenecks to green growth. A goal of labor market and skill development policy is to smooth the green transition in particular for workers in sectors that will lose out as a result

of green growth, such as the fossil fuel industries. At the same time, without well-designed policies to ensure that workers and firms have adequate green skills, skill bottlenecks can arise in expanding green sectors and industries and be a serious impediment for growth and investments (OECD, 2013a). Modeling results indicate that the restructuring of the energy system to low carbon intensity can be accomplished with only

minor effects on economic growth (GDP), if labor markets adjust smoothly to structural employment changes (OECD, 2012a). Forward-looking policy interventions that anticipate structural change are, therefore, crucial to accompany the transformation. Figure 3 shows the role of labor market and skill policy for green growth.

Figure 3:

Labor market and skills development to support green transformation



Governments should seek to assess, anticipate, and address the effects of green growth policies on employment. This can often best be done through joint initiatives with the private sector. Anticipating structural changes and providing the support needed to shift workers to new occupations is central to inclusive green job creation and to avoid bottlenecks (ILO, 2011). In the Brussels region, for example the construction sector, trade unions and public

authorities established the Professional Reference Centre for Construction (PRCC) to address skills shortages in eco-construction, renovation and retrofitting by bringing together employment and training services, educational institutions and the construction sector. It offered employers a cost-free training opportunity and targeted marginalized and low skilled workers for integration in the labor market (Bruxelles Environment, 2010).

However, such active labor market policies are a particular challenge in many developing countries, where the information gathering capacity is low, where training opportunities are limited, and trainers are almost non-existent in the emerging green sectors (such as wind turbine installation and efficient building construction). Capacity building among government staff is therefore crucial (OECD, 2013b). To anticipate changes and needs effectively and to enhance co-ordination and coherence, green labor market and skill policies should therefore actively engage partners from the private sector, from organized labor and from local constituencies. The cases included in this chapter provide examples of joint efforts. Table 3 summarizes a number of other programs and initiatives that involve skills development and are implemented jointly by government, private sector and other stakeholders to create green jobs.

Countries are implementing labor market and skill development policies across three main categories: (i) general education, (ii) vocational training, and (iii) re-skilling and up-skilling policies. The measures target worker groups in either new occupations, such as solar technicians, or existing occupations, which need to adapt to changing requirements, such as within the automotive industry and agricultural sector. The re-skilling and up-skilling policies are aimed primarily at mid-career workers in this latter grouping. Case 3 illustrates how a combination of such policy measures is implemented in the Republic of Korea.

Close collaboration between government and private sector – at the enterprise, industry and sector level – is central for effective and efficient labor market and skills development policies. A recent ILO study (ILO, 2011) highlights that it may be appropriate to start at enterprise level. These are the fastest and most effective means of meeting company-specific needs related to changes in production methods, technological requirements or consumption patterns in greening growth. However, these small-scale responses, though cost-effective in the short-term, are rarely coordinated and have rather limited influence on the overall greening of the economy and on the regular skills supply.

At an industry level, considerable progress has been made in improving training programs and certification schemes together with industry skills councils or Chambers of Commerce. The QualiCert standard for a 'common approach for certification or equivalent qualification of installers of small-scale renewable energy systems in buildings' is one of these examples (EREC, 2011).

The Government of India has adopted a thematic, sectoral approach to addressing green skill shortages. To promote energy efficiency in buildings, the Indian Green Building Council and the Bureau of Energy Efficiency are conducting training programs and a national certification examination for energy managers and energy auditors respectively. Agricultural training institutes provide skill development courses on plant protection, pest management

Case 3:

Labor market policies in the Republic of Korea

In the Republic of Korea, promoting green growth is very much a government driven agenda leading to ambitious centrally coordinated efforts. To realize the green job potential, the government has invested in greening education policies for university students as they have been identified as primary target group for skill development and education policy in the green economy transition. The government also provides support for vocational training with industry and youth education and public awareness raising initiatives. Korea faces several challenges, including the lack of a national information infrastructure for anticipating and coordinating green jobs and skills requirements. With many green technologies and innovations scaling up from early stages, the country faces shortages of experts and vocational training teachers for the field. The ILO (2011) recommends that Korea strengthen co-ordination between educational institutions and training facilities and with industry.

Case 4:

The Green Economy accord in South Africa

The Green Economy Accord aims to create at least 300,000 green jobs by 2020 with a target of 80 percent of new jobs to go to young workers, who face high levels of unemployment. The Accord agreed between business representatives, labor unions, and government involves 12 commitments, including support for biofuels through regulatory measures and assistance to small farmers; waste recycling; retrofitting buildings; increased use of renewable energy; investment in mass transit; and various green finance facilities (ILO, 2013; and South Africa Government, 2012).

and locust control. The Indian Council of Agricultural Research has developed training programs in new and emerging areas such as organic farming, which have boosted farm productivity and enabled farmers to secure higher prices for agricultural products (Sanghi and Sharma, 2012). The Indian experience illustrates that **well-targeted skills development policies, such as support for marginalized or lower skilled workers, can reduce social inequalities.**

As illustrated in Case 4, in South Africa the government established an accord with business representatives, organized labor, and community groups to promote green jobs creation.

Table 3:

Examples of sector-based and provincial programs and initiatives that create green jobs and involve skills development

Country	Green job estimate	Actors	Name	Sector
Sector-based programs				
Australia	10,000	Government, Environment Groups, Youth Groups	National Green Jobs Corp	Education and training
Brazil	50,000	Government, Local Government, Private Sector	Green social housing	Green buildings
China	670,000	Government, Trade Unions	ACFTU Energy Efficiency Inspectors Training	Energy efficiency
Fiji	N/A	Government, Indigenous Groups, Private Sector	Fiji Ecotourism Association	Sustainable tourism
Germany	600,000	Trade Unions, Government, Civil Society, Employers Federation	The German Alliance for Work and the Environment	Energy efficiency
Korea, Republic of	6,400	Government, Local Government, Civil Society	Suncheon Wetland Restoration Program	Sustainable tourism
Malaysia	N/A	Government, Research Institutions	Green Townships	Low carbon cities
Provincial level initiatives				
Brazil	50,000	Local Government, Private Sector, Academia	Curitiba City	Sustainable cities
China	N/A	Government, Local Government, Private Sector	The national low carbon province and low carbon city experimental project	Low carbon cities
Hong Kong	120	Local Government, Private Sector	Tuen Mun eco-park project	Waste management
Japan	100,000	Local Government, Private Sector, Academia, Civil Society	Kitakyushu eco-town project	Low carbon cities
Korea, Republic of	1,000	Government, local government, private sector, academia	Ulsan eco-industrial park	Cleaner Production
Singapore	500-1,000	Government, private sector, NGOs	Skyrise greenery program	Urban landscape
United Arab Emirates	70,000	Government, academia, private sector	Masdar City zero-carbon, zero-waste, car-free and 100 per cent renewable-energy-powered city	Sustainable cities

Source: Data extracted from ILO (2013)

5. Sustainable cities

Pilot and scale-up regulations, financial incentives, demonstration programs, capacity building, and consumer education and awareness programs to improve the quality of life and environmental impacts of cities.

Urban policy will play a significant role in green growth. The world's population, economic activity, and resource consumption are concentrated in cities. While covering only about 2% of the global land area, cities are responsible for approximately 80% of global economic output and between 60-80% of global energy and material flows (UNEP, 2011). Between 2009 and 2030, cities are expected to accommodate an additional 3 billion people – approximately 90% of which will take place in Africa, Asia-Pacific, Latin America and the Caribbean, however already one third of the urban population of developing countries live in slums (UN Habitat, 2013).

Global statistics like those above mask the variety of challenges that different cities around the world are facing with some stabilizing or even decreasing in size while others are growing rapidly. Both situations present opportunities as well as challenges to green growth. However, considering the interconnectedness of sectors at the city-level, as well as the smaller scale of the implementation challenge, designing effective policies at this level can be more manageable than at a national level (OECD, 2013c).

Green growth policies in cities must address the backlog of environmental restoration. One of the central challenges for urban green growth policies is restoring environmental quality. Many cities, especially in developing countries, have experienced rapid economic and demographic growth and have built up problems of water and air pollution, noise, and land degradation. For example, between 33-50% of the solid waste generated by cities in low- and middle income countries is not collected and less than 35% of waste water is treated (UN Habitat, 2013). In China air and water pollution in 2003 is estimated to cost at least 2.5% of national GDP (World Bank, 2007). Additionally, social challenges in cities are increasing. In India, for example, it is estimated that by 2030, 38 million households will be unable to afford market-price rents (McKinsey Global Institute, 2010).

Many cities are developing green growth plans to both address these challenges and harness the economic growth opportunities. For example, the C40 Cities initiative brings together major cities addressing climate change, and gives an overview of their progress (C40 Cities, 2014). Case 5 illustrates the case of Mexico City.

Effective policy portfolios for sustainable cities often combine policy instruments such as regulations, financial incentives, demonstration programs, capacity building, and consumer education and awareness programs (OECD, 2013c). Singapore (Case 6), for example, has successfully implemented a broad mix of such policies across

Case 5:

Mexico City's Plan Verde

With 21 million people on 1,499 sq. km. and after decades of environmental degradation, Mexico City's Green Plan (Plan Verde) was launched in August 2007 to address the critical environmental issues (City Mayors Environment, 2010). It focuses on land conservation, housing and public spaces, water supply and sanitation, transportation and mobility, air pollution, waste management and recycling, and climate change. The city government established a plan with 76 goals and has spent more than \$1 billion per year on it, representing about 7% of its annual budget. One noteworthy hallmark of this plan is the *establishment of concrete implementation targets and effective systems to monitor progress*. A key lesson learned is that it is important to apply a rigorous approach to developing tailored solutions for each urban sector. (Mexico City's Green Plan, 2014)

Case 6:

The Singapore Green Plan 2012

Singapore first launched its Green Plan at the World Summit on Sustainable Development in Johannesburg in 2002, which has been reviewed and upgraded at 3 year intervals since then (MEWR, 2006). The plan is driven by concern for quality of life and resource security in the city state, as well as securing a clean and green image as a means to attract investment. The plan includes regulations and standards, pricing systems, demonstration programs, consumer behavior change campaigns, information management, and other policies, and addresses air quality, climate change, water, waste, nature conservation, and public health. Singapore's government has invested significant resources in achieving its environmental goals, and has met most of its 2012 goals. In 2009 the Inter-Ministerial Commission on Sustainable Development launched a longer term Sustainable Singapore Blueprint which sets out stringent sustainable development goals to 2030. These include ambitious targets for energy efficiency, water consumption, air quality, public transportation, water catchment areas, and green buildings. One feature that has enabled Singapore's success is the use of a *comprehensive mix of approaches tailored to each environmental goal*.

environmental issues in key sectors. Policy portfolios for green growth usually address the following sectors: land-use planning, transport, housing and public-spaces, energy, waste, and water.

Implementation of comprehensive policy portfolios often starts with isolated projects or programs. Cases evaluated confirm that important actions are taking place related to land conservation, housing and public spaces, water supply and sanitation, transportation and mobility, air pollution, waste management, and recycling. Policies in each area have often been implemented in different periods, for different purposes, and are managed by different institutions. In some cases, the municipal government has realized the co-benefits of some actions, such as reforestation projects which also avoid landslides and decided to integrate these in one program, normally under the umbrella of climate change. More recently, cities have begun to adopt broader concepts of sustainability and resilience, but usually with the primary objective of integrating existing initiatives into a consolidated policy framework, rather than designing a policy portfolio of new initiatives. Cities such as Mexico City, New Delhi, and Singapore have, for example, embarked on more comprehensive greening efforts following concerted efforts to improve air and water quality.

Long-standing experience in cities shows that effective policy portfolios at the city level tend to evolve over time, through a process of trial and error, especially as city administrations change. Singapore has been developing its policy portfolio since 2002, reviewing and upgrading it regularly (Case 6). Another strategy discussed in the literature involves layering policy instruments together to make the most of their complementarities, for example, starting with enabling instruments, such as education programs and technical assistance, before moving to regulatory strategies later (OECD, 2013c).

City policies must be integrated with national and sector policies. One of the key challenges for effective design and implementation of policy portfolios in urban areas is their integration across different governance levels, sectors, and actors, including the private sector, civil society, and the general public. The vertical linkages between national and local levels are discussed in more detail in [Chapter 8: Integrating subnational action](#).

The city of Medellín in Colombia (Case 7) illustrates, for example, the importance of integrating programs across different actors, coupling government policies with corporate environmental and social responsibility programs, and across sectors to address mobility, housing, public space, and environmental goals.

The case of Rio de Janeiro (Case 8) shows the importance of another dimension, that policy portfolios need to integrate effectively across time. In Rio the climate policy portfolio fully integrates medium and near-term climate change mitigation measures with the long-term city development plan.

Case 7:

The city of Medellín

The city has a goal of becoming an urban center that promotes alternative urban development, responding to the challenges that climate change impose. Water and transportation sectors are two case examples of policies that are being designed in the context of green growth. The public water services provider for Medellín and the Aburrá Valley in Colombia serves a population of 5.2 million people (UNECLAC and UNW-DPAC, 2012). It combines formal public policies at the local and national level with corporate social responsibility policies benefiting the weakest segment of the population. A portfolio of initiatives aims to guarantee universal access to public services and to prevent vulnerable populations from falling into a poverty trap that would impede their ability to connect to and consume these essential and vital services. A recent evaluation study found that the current provisions for vulnerable users are showing good results.

Case 8:

The Rio de Janeiro 2016 Strategic Plan

To ensure the good use of foreign investments coming to the city and to improve its governance, the Rio de Janeiro administration developed its 2016 Strategic Plan and a new management structure to support the implementation and tracking of its specific climate change targets and milestones. Aligned with Rio's Climate Change Mitigation Law of 2011, that is one of the policies that make up the Strategic Plan, the Rio Low Carbon City Development Program intends to provide a critical link between long-term strategic planning and medium- to short-term implementation of climate mitigation-related interventions (World Bank Institute, 2013).

6. Low-carbon energy

Develop policy portfolios that deliver on energy access and security along with climate change mitigation and social benefits. Regulation and price incentives are most effective when coupled with strong financing programs to support innovation.

Policy portfolios can achieve energy access and security targets along with climate change mitigation and social benefits. The energy system is the source of approximately 60 percent of total current greenhouse gas (GHG) emissions (IPCC, 2011); and hence a fundamental area for green growth policy. Moving from fossil-fuel based growth to green-energy based growth, while simultaneously providing energy security and access to clean and safe fuels for people currently lacking access to electricity is a tremendous challenge. However, lessons from existing approaches indicate that it is possible to design policy portfolios to achieve energy access and security targets along with climate change mitigation and other environmental and social goals.

Green growth and low-carbon energy policy portfolios generally aim at decreasing the share of fossil fuels, increasing the share of renewable energy sources, boosting energy efficiency in industry, buildings, and transport, and extending electrification in rural areas. Currently at least 138 countries have renewable energy targets and 127 have renewable energy support policies, with more than two-thirds of these targets and policies found in developing economies. Feed-in tariffs and renewable portfolio standards are the most commonly used approaches (REN21, 2013). However, especially in developing countries, these and other policy tools are often implemented in isolation, rather than as part of wider green growth policy portfolios.

Regulation and price incentives are most effective when coupled with strong programs to support innovation. Based on a review of existing policies mainly in G20 countries, ClimateWorks Foundation (Harvey and Segafredo, 2011) highlights a number of best practices for low-carbon energy policies. It illustrates how prices and incentives, performance standards and support for innovation, research and development can complement and reinforce each other, accelerating deployment of low-carbon energy technologies and lowering costs.

Two interesting examples of countries that have successfully implemented comprehensive energy policy portfolios are Germany and Thailand. The German case (Case 9) demonstrates the effectiveness of combining incentivizing, mandating and enabling policies in an ambitious and consistent national policy portfolio covering renewable energy and energy efficiency.

In order to ensure robustness, green energy policy portfolios must build public awareness of the benefits of those policies and maintain consensus on policy

implementation plans, particularly as consumers will often face energy price increases. The German experience also illustrates that, in order to secure support for such policies, which may raise consumer prices, it is important to build public awareness of the benefits of these policies. The gradual introduction of reforms and the role of stable institutions, have been important to ensure robustness of policies in Germany, helping to build and maintain public support and awareness of the policy benefits – a lesson that is echoed in, for example, the experience with energy policy portfolios introduced in the UK and Canada, as well as in the case of Thailand (see Case 10). However, such an ambitious policy generates significant costs for taxpayers and energy consumers. The combination of a strong financing institution and ambitious regulations are among the key success factors for the effectiveness and efficiency of the German energy policy. These aspects make it challenging to closely replicate the approach in other countries.

Overcoming political economy challenges, which prevent reform of fossil fuel subsidies and the introduction of carbon taxes, would greatly facilitate the move towards low-carbon green growth. As illustrated earlier in this section, subsidies for renewable or low-carbon energy generation, such as feed-in tariffs, are widely used as incentivizing policy tools to internalize the costs and benefits of externalities. The two other key policy tools for “getting prices right” – reform of fossil fuel subsidies and carbon taxes – despite their attractiveness in terms of economic efficiency gains and revenue raising potential, face substantial political economy challenges.

Case 9:

Germany's Renewable Energy Policy Framework

The Government of the Federal Republic of Germany has implemented policies to promote the development and uptake of renewable energy, since the beginning of the 1990s. The approach combines feed-in tariffs, for renewable electricity; investment subsidies and low interest loans targeting renewable heat; and quota obligations and tax exemptions targeting biofuels. The keys to its success are the combination of instruments and the design of the feed-in tariff that offer long-term and predictable revenues to renewable energy investors. It has been effective in stimulating a rapid and large deployment of renewable energies in Germany – the share of renewables in final electricity consumption increased from 4% in 1990 to about 25% in 2013. This has also supported the development of global supply chains for renewable technologies, bringing their costs down more broadly (OECD, 2012b).



Case 10:

Energy Policy in Thailand

The Government of Thailand has gradually implemented a policy portfolio of fiscal, regulatory, and enabling policies to support the uptake of energy efficiency and renewable energy. Policy measures include skills development programs, support to universities and research institutions for technology improvements, use of income tax breaks and import duties exemptions on equipment, and the establishment of a revolving fund for low-interest loans to renewable energy projects financed through a tax on petroleum products. Key factors enabling implementation include (i) alignment with priorities for energy security, inclusiveness and market development; (ii) gradual expansion of the programs to ensure robustness; and (iii) involvement of civil society and small private energy suppliers.

Despite attention to reforming fossil fuel subsidies, efforts to date show mixed results and fossil fuel subsidies continue to soar at USD 1.9 trillion per year, equivalent to 2.5% of global GDP, or 8% of total government revenues (IMF, 2013). As a recent IMF report finds, fossil fuel subsidies are particularly damaging in how they aggravate fiscal imbalances, and crowd out priority public spending and private investment. Fossil fuel subsidies also encourage excessive energy consumption, artificially promote capital-intensive industries, reduce incentives for investment in renewable energy, and accelerate the depletion of natural resources (IMF, 2013).

Several countries are pursuing policies to increase taxes on polluting activities and to use those tax revenues to

reduce other taxes, such as income taxes, that can distort labor supply and saving decisions (Pearce, 1991). To support transitions and overcome opposition to environmental taxes and subsidy reform, governments are using revenues to address social concerns and to reduce tax burdens in different ways. Indonesia, for instance, removed diesel subsidies for industries and used the budget savings for poverty alleviation programs. Thailand (Case 10) used a tax on petroleum products to provide low-interest loans for renewable energy. Germany introduced an eco-tax and at the same time restructured taxes to stimulate job creation and green investment by reducing labor costs and providing incentives for energy efficiency (UNEP, IMF, and GIZ, 2012).

7. Sustainable agriculture and poverty reduction

Agricultural policies that are proving successful in contributing to multiple green growth goals include credit enhancement, education, and outreach and capacity building, R&D, integration of poverty reduction and agricultural policies, and strengthened property rights, targeting improved nutrient and water management, agroforestry, aquaculture, and integrated livestock and crop management for both big and small farmers.

Increased agricultural productivity is critical for food security and poverty reduction, but policy portfolios for green growth in agriculture must simultaneously tackle environmental degradation, climate change resilience, adaptation, and mitigation. Realization of green growth objectives in agriculture – especially in developing countries – is intrinsically linked to boosting agricultural productivity, i.e. increasing agricultural yields by a factor larger than the associated increase in inputs, such as land, labor, fertilizers and water. With a projected global population of around

9.2 billion by 2050 and with 2.5 billion people currently depending on agriculture to sustain their livelihoods, the challenges for food security and poverty reduction are clear. The role of growth and increased productivity in agriculture for reducing poverty and ensuring food security is confirmed in the literature (Cervantes-Godoy and Dewbre, 2010; and Timmer, 2005). More specifically, growth originating in agriculture is estimated to be between 2.5 and 4 times as effective in reducing poverty in developing countries than growth in other sectors (Stevens, 2012; and UNEP, 2011).

Furthermore, green agricultural growth implies that resource efficiency and productivity gains go hand-in-hand with ensuring the long-term provisioning capacity, or sustainability, of agro-ecosystems (FAO, 2012; UNEP, 2013; and Negra, 2013). This implies addressing environmental externalities as well as climate change resilience and adaptation issues (Garrett et al., 2013; IPCC, 2007; and Neufeldt et al., 2013). Policies and practices in the agricultural sector will also have tremendous implications for global greenhouse gas emissions and their mitigation. Currently, agriculture contributes directly to 10-12% of global greenhouse gas emissions (Tubiello et al., 2013). If indirect emissions from agriculture-related deforestation and forest degradation and from agricultural pre- and post-production emissions are also taken into account, 19 to 29% of global greenhouse gas emissions are attributable to the global food system (UNEP, 2013). The good news is that in many cases there are synergies between policies and practices that contribute to increased productivity, poverty reduction, and

environmental and climate-related goals (FAO, 2011; UNEP, 2013).

This section draws on lessons from the design and implementation of a number of such promising agricultural practices and policy portfolios that can realize multiple green growth goals at different scales and in different country contexts. It focuses specifically on developing and emerging economies and acknowledges that findings are highly context- and location- specific.

Agricultural policies that are proving successful in contributing to multiple green growth goals include those targeting small farm holders, improved nutrient and water management, agroforestry, aquaculture, and integrated livestock and crop management. A number of green growth oriented agricultural policies and practices have been designed and implemented, prominently under the headings of sustainable land management and climate-smart agriculture. In many cases, they are proving effective in jointly addressing a suite of green growth goals including increased productivity; food security; poverty reduction; climate change resilience, adaptation and mitigation; and reduced environmental degradation. Focusing on smallholders, who manage more than 80% of the world's estimated 500 million farms and provide over 80% of the food consumed in large parts of the developing world (IFAD and UNEP, 2013), UNEP (2011) finds that adoption of greener farming practices by smallholders is associated with increased yields of between 54 and 179%. Pretty et al. (2006) estimated an average crop yield



Case 11:

Agriculture Policy in Brazil

Brazil has achieved a reduction in poverty rates, from 20% of the population in 2004 to 7% in 2010, supported by a set of complementary policies and programs to improve the productivity, and reduce the environmental impacts of agriculture (Beddington et al., 2012). Key policy elements include: (i) a focus on agricultural R&D and diffusion of knowledge at local levels with the pivotal role of the agricultural research agency, EMBRAPA, and the allocation of the necessary resources more than in any comparable country in the world, (ii) provision of complementary measures such as agricultural credit and the environment guidelines of the Brazilian Development Bank BNDES; (iii) dovetailing agricultural production patterns to the national program on Zero Hunger ensuring consistency of poverty and agricultural policies; (iv) farm-level capacity building policies and mechanisms ensuring stakeholder participation; and (v) supporting trade policies.

increase of 79% associated with the adoption of sustainable farming practices and technologies, based on an analysis of more than 286 agricultural projects in 57 developing countries.

Prominent practices and related policies include improved nutrient and water management in rice systems, agroforestry, aquaculture, water harvesting in dryland areas, and livestock integration into farming systems. In addition to increasing yields, profitability and income, these practices are often associated with environmental benefits such as reduced soil vulnerability decreased agricultural runoff, enhanced soil productivity, and climate change resilience and mitigation benefits (UNEP, 2013). No-till practices, where seeds are sowed directly under the mulch layer from the previous crop, have also shown effective in generating such multiple green growth benefits and have been an important element of agricultural improvements in Argentina, Brazil, Paraguay, Uruguay, Australia, and USA (see Case 11 on Brazil). It should be noted, however, that no-till cultivation is more appropriate for large than small farm sizes due to high investment costs for machinery, and that no-till has been associated with overuse of glyphosate herbicides and reliance on genetically modified crops to combat weeds.

Several governments are having success with portfolios of policies to achieve inclusive green growth in agriculture that mix credit enhancement, education and outreach and capacity building, R&D, integration of poverty reduction and agricultural policies, and strengthened property rights.

Establishment and enforcement of well-defined property rights may be the single most important precursor for adoption of sustainable agricultural management practices, and has often been found to be a necessary prerequisite for market-based incentive policies to be effective (UNEP, 2012). In addition to well-defined and enforced property rights, OECD (2011) highlights inclusion of the following types of policies in comprehensive and coherent policy portfolios for green growth in agriculture: pricing policies and subsidy reforms, land-use regulation; and R&D and skills development to increase resource use efficiency throughout supply chains (OECD, 2011; Negra, 2013; and Stevens, 2012).

To date, most experience with design and implementation of green growth policies in agriculture is limited to initiatives to promote specific sustainable practices and policy goals, as opposed to policy portfolios designed and implemented in response to comprehensive national green growth strategies for agriculture. Nonetheless, the recommendations on policy portfolio elements outlined above are supported by lessons

Case 12:

Agriculture Policy in Thailand

In Thailand, government intervention including agricultural credit and extension services seek to expand land under cultivation, promote sustainable practices, and upgrade agro-processing and exports (OECD, 2012c). The sector has developed through mechanization and technology adoption, raising farm productivity and size. Key lessons from Thailand's experience include the value of integrated area development approaches that recognized rural-urban dependencies and enabled moving labor to move from the agriculture sector to agro-processing and industrial sectors. This resulted in greater wages in the farm sector and greater mechanization and technical innovations for raising farm productivity and emergence of commercially viable farms.

from actual implementation of policy portfolios, including the experiences from Brazil and Thailand (see Case 11 and 12). The role of government in providing access to credit and creating financial incentives for farmers, for example through direct subsidies and tax offsets, seems particularly critical not least to tackle up-front investment costs and time-lags between private investments and pay-offs that pose significant challenges to adoption of sustainable agricultural management practices. In Kenya, for example, tax incentives for growing trees have been introduced alongside reforms to restrictions on harvesting and marketing of tree products, the creation of contract farming schemes to enhance trading of tree products between landholders and companies, training of extension service staff, establishing tree nurseries countrywide, prohibition of harvesting of trees from public forests, and awareness raising (UNEP, 2013). UNEP highlights that this mix of policies has resulted in a 215,000 hectare expansion of agroforestry over the last 30 years in western and central Kenya.

Evidence also points to the pivotal role of skills and innovation and R&D policies for sustainable agriculture and poverty reduction, as illustrated in the Thailand case and notably the Brazil case. Capacity building and R&D has played a central role in improving nutrient and water management in rice systems in a wide range of countries including Bangladesh, China, Vietnam, the Philippines, Nigeria, Rwanda, and Senegal (UNEP, 2013).

Next steps

While this chapter has examined a wide range of promising green growth policies, it would be premature to claim that a comprehensive list of best practices has been identified.

The available evidence suggests that there has been significant policy experimentation in both developing and developed countries, which highlights potential growth policy options. There has, however, been relatively little comprehensive analysis of the effectiveness, efficiency, and robustness of these policy options, under a range of political, economic, and social conditions. A major conclusion of this chapter, therefore, is that governments and their policy analysts need to address this significant gap in information.

This is especially true for analysis of policy portfolios. One of the difficulties in analyzing policy portfolios stems from the issue of attribution—which of the policy portfolio parts is responsible for the greatest change. Accordingly, increased research is needed on natural policy experiments, where

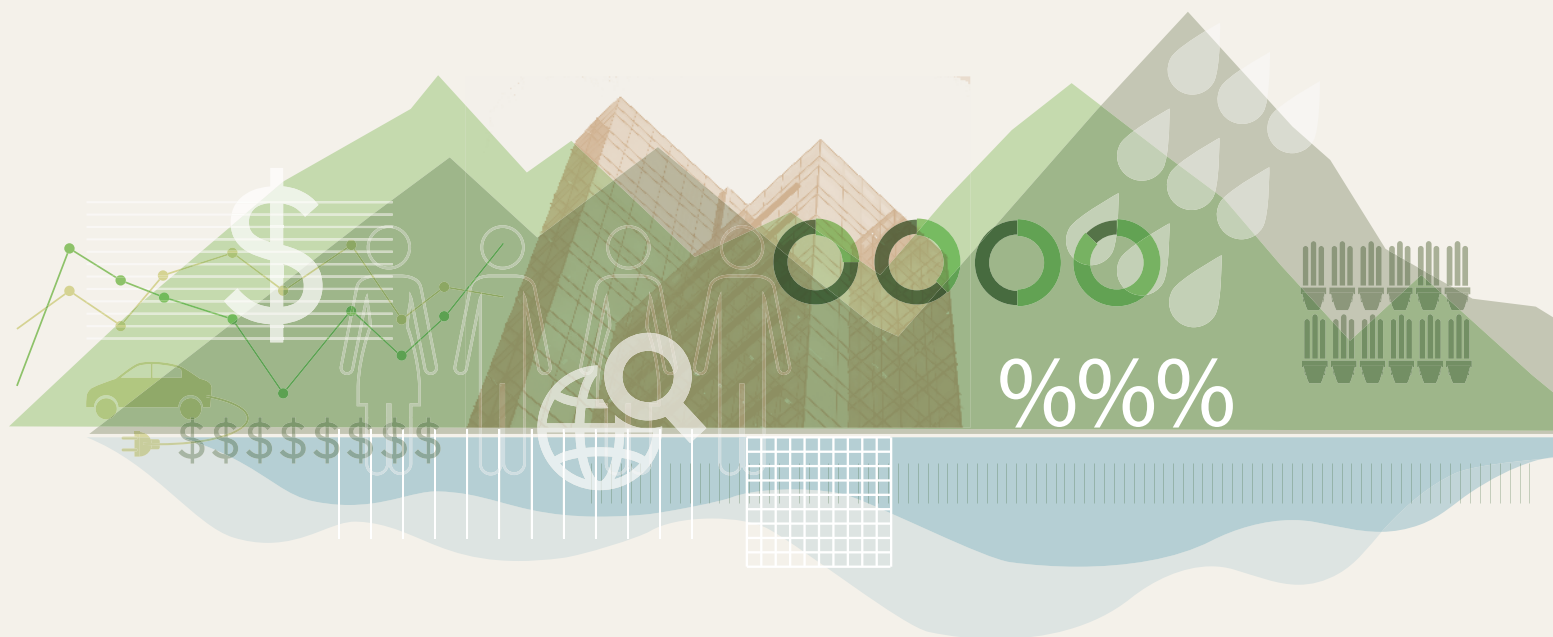
differing combinations of similar policies have been applied under varying enabling conditions.

It is also important to conduct deeper research on specific types of policies that can drive green growth transformation. This includes further assessment of the conditions under which countries should pursue policies designed to support breakthrough innovations in technologies and business models versus supporting more incremental innovations and adaptations of existing technologies. In addition, a more extensive understanding is required for the policies and measures that improve skills of new and existing workers and ease the transition to new green industries for displaced employees. Governments and other practitioners would also benefit from more detailed analysis of sector level green growth policies that will achieve the greatest impacts in reducing poverty and achieving social inclusion, while advancing green development objectives.

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Chapter 6

Mobilizing investment

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A fundamental objective of all green growth programs is to unlock the investment needed to achieve a transition to a green development pathway. However, governments face significant challenges in securing the level of investment needed due to real and perceived investment risks, insufficient returns on investment for some green technologies and practices, competing subsidies and policies, insufficient capacity, information gaps, competing development priorities and other adoption, and regulatory and institutional barriers.

Government financing strategies for green growth should seek to encourage green investment opportunities by combining effective use of government policy and funding arrangements with financial risk mitigation instruments. They should address investment needs for transformation of the whole economy and in specific priority sectors at both national and sub-national levels. This analysis of public finance has identified several specific lessons that can inform on-going and future government green growth financing initiatives.

Governments can play three primary roles in mobilizing green growth investment: i) Creation of an enabling environment for long term green investment; ii) Effective use of public budgets and investments, including through dedicated funds and/or financial intermediaries to encourage green growth; and iii) Tailored application of financial risk-mitigation instruments to mobilize private green investment. Governments will have the greatest success with public finance measures where they are integrated with national development programs, developed in consultation with the business and finance communities, and tailored to address local investment risks and market constraints. The role of government should be more prominent in the early stages of green market development, setting the foundation to unlock substantial pools of private capital and defining from the outset a clear exit or diminished role over time (Figure 1).¹

Green growth financing strategies will be most effective when they are supported by an enabling framework that provides green price signals, investment grade policies, removes market barriers, aligns economic drivers, and supports early market projects. Governments can establish strong investment signals through clear, long-term, and binding, policies and regulations. Governments also need to align price signals to green growth goals, which may require redirecting existing incentives and subsidies, for example for fossil fuels, towards green policy objectives. The alignment process and shifting of investment decisions will take time due to the challenges of clean technology adoption. For this reason, governments can support early market development by deploying resources for innovation and commercialization

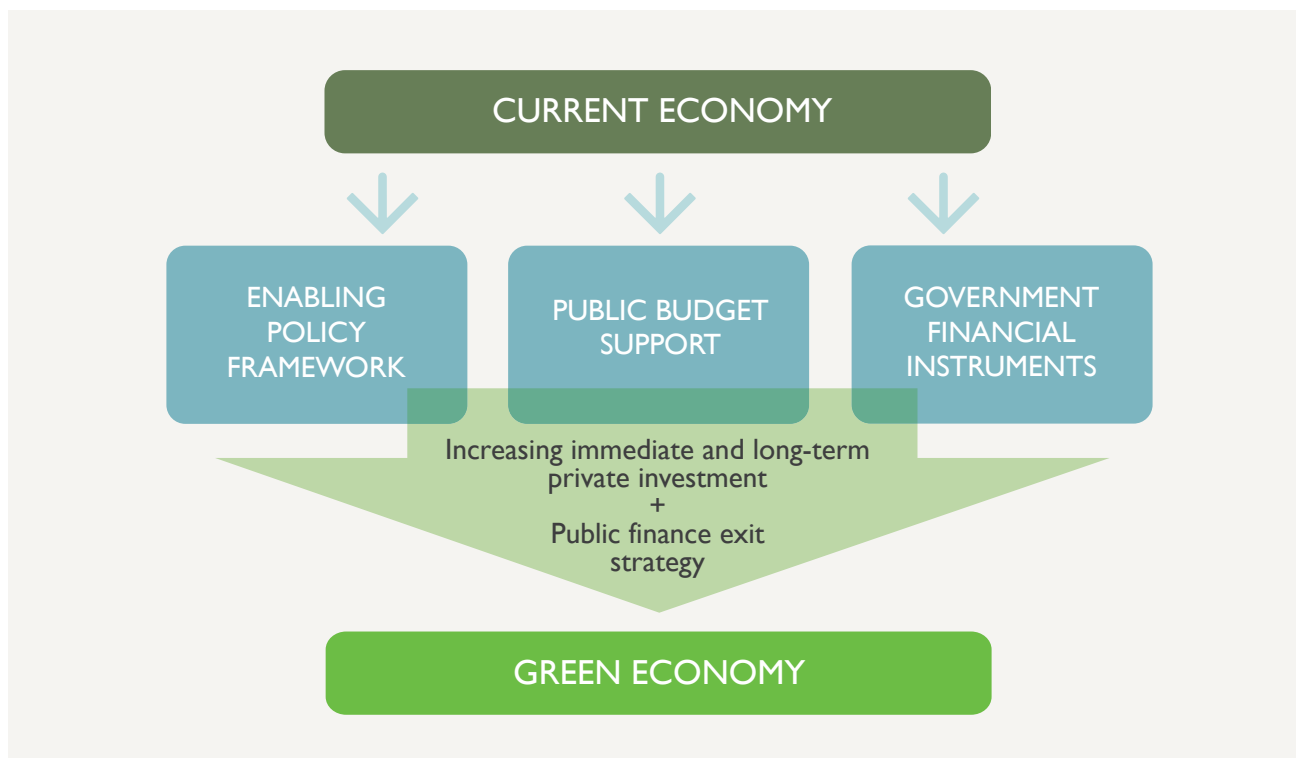
of emerging technologies and systems, demonstration projects, public procurement, green project development, and other mechanisms to attract private capital. Governments should set a long-term green growth vision with the necessary policy framework and develop a credible strategy for financing its implementation with appropriate involvement of relevant public and private financial actors.

Effective allocation and management of public budgets and public investment, including the use of dedicated funds and other intermediaries for green growth, can greatly increase green investment flows when they are integrated with fiscal frameworks and strategic plans, and have strong governance systems. Governments can make public budget allocations directly to priority green growth initiatives and to national and sub-national agencies, such as the case of funding dedicated to the Moroccan Agency for Solar Energy to develop a pipeline of solar projects in Morocco. Other governments, such as South Africa, Brazil, and Costa Rica have established funds to support priority green development projects. Developing countries can also tap into international sources of public finance from international financial institutions, while increasingly national development banks are also playing a role in funding green investments in developed and developing countries alike. National institutional arrangements should ensure coherency amongst funding from multiple national and international partners for priority green growth programs. Public funding arrangements should have effective governance and review systems in place, be integrated with existing fiscal frameworks, and consider innovative revenue sources. In selecting among public funding mechanisms, governments can consider their relative stability, sustainability, administrative simplicity, and ability to leverage private funds.

Governments can employ a variety of financial instruments to mitigate the financial risk and increase the returns for private investment, which will be most effective when they are aligned with policy measures, provide an appropriate level of concessional support, and are transparent. Financial de-risking instruments can include loss concessional loans or equity, grants for investment and for technical assistance,

1. Interestingly, none of the case studies examined have an exit strategy (even the long running programmes). This raises questions about the viability of green growth as a market based stand-alone strategy and show that new approaches will need to be found.

Figure 1:

Role of public policy and finance in unlocking private investment in green growth

guarantees and insurance mechanisms. In order to create effective demand and price signals to entice new investors into green sectors, such instruments must be deployed in tandem with complementary policies and regulations and other market-enabling measures, for example to increase transparency of market information and data. Concessional loans and grant resources must be designed carefully to sufficiently adjust the risk profile to attract appropriate investors without crowding out private capital or creating an unsustainable market that will depend on long-term government support. Risk guarantees or even credit lines from public budgets may be needed initially to mitigate the perception of risk associated with green projects in order to encourage financial institutions to offer concessional loans to investors in green projects. The establishment of monitoring and evaluation systems and processes will enable continuous refinements in the use of public resources to improve effectiveness whilst ensuring transparency and clarity of these changes.

Governments can team up with central banks, development finance institutions, institutional investors, and others to accelerate participation of long-term finance by developing innovative financial approaches and implementing regulatory

and other measures to increase capital flow for green growth and engender sustainable investment practices.

Governments need to pay careful attention to how current and planned financial regulations may impact credit supply and investment flows into green development priorities. In addition, governments can encourage investors, including commercial banks and institutional investors, to invest in green infrastructure and to adopt investment decision-making and risk management that expands beyond short-term calculations of financial risk and return and considers the long-term environmental dynamics impacting on project profitability. Currently, the majority of institutional investment is in fixed income and asset investments and some of these funds should be diverted to green investment, and in some cases to tap into resources available through sovereign wealth funds. Ongoing public financial management reform plans can support green growth financing and coordinate with climate change related reforms by ensuring that low emission and climate resilience options are prioritized in infrastructure procurement programs. Furthermore, green growth programs can advance efforts to promote socially sound sustainable banking and investment practices.

1. Introduction

This chapter explores the experience of governments in using public finance and policies to mobilize investment in green growth. Ideally, policy incentives would deliver green markets but more often than not additional financial incentives are required. Public finance is an important part of government green growth strategies. With the right enabling investment environment, even small amounts of well-designed and targeted public investment in green projects can shift the direction of much larger flows of both private investment and international capital spending (Polycarp et al., 2013). Limited public finance needs to be used efficiently to overcome barriers and to catalyze a major shift of private capital investment (OECD, 2013a).

Public financial intervention for green growth can take several forms and be sourced and managed institutionally in a range of ways. A recent OECD report also points out that factors and options for governments to consider include the design of efficient and prudent policy frameworks and regulations, the creation of effective pooled investment vehicles, and interventions by green investment banks or other public financing institutions (Kaminker et al., 2013). This chapter is structured in four sections to present emerging lessons on how public finance can assist in creating the investment conditions for green growth identified by the OECD:

- i) *Creating an enabling environment for green investments (Section 3)* through use of economic and non-economic instruments for public and private finance mobilization
- ii) *Programmatic and capital support from public budgets (Section 4)* through direct government budget allocation, use of dedicated funds, and other public institutional funding arrangements to support green growth.
- iii) *Use of financial instruments to de-risk projects and increase return on investment (Section 5)*
- iv) *Innovative long-term approaches to green growth finance (Section 6).*

The national context in which green growth is being considered is exceptionally diverse and for this reason, seven cases were selected that explore approaches across a wide range of national, regional and developmental contexts. Specific factors for case study selection included: demonstration of leadership in financing for green growth, regional distribution, country economic status/income, time-frame of implementation, type of activity and sector, and diversity in national, sub-national and regional approaches.

It would be premature at this early stage to extract homogenous best practices from these case studies that can be broadly applied. The intent is to demonstrate to readers that although integrating green growth into national development paths may be a complex process, several creative options are possible. A further objective is to encourage countries to evaluate their own contexts and determine an appropriate entry point and financing approach to green growth. The case studies highlight the diverse nature of national contexts and show that what is most relevant and effective for one country may not be for another.

Country / State	Case study	Region / Income ²	History	Sector(s)
California	Portfolio of Green Growth Measures	North America (HIC)	10 yrs	Energy
Germany	Household Energy Efficiency (EE)	Europe (HIC)	20 yrs	Energy, Buildings
South Africa	National Green Fund	Africa (UMIC)	2 yrs	Energy, Forests/Agriculture, Water, Infrastructure, Waste
Costa Rica	Payment for Ecosystem Services (PES)	Latin America (UMIC)	20 yrs	Forestry, Natural Resource Management
Vietnam	Development Policy Loans	Asia (LMIC)	5 yrs	Infrastructure, Energy, Transport, Waste, Forests / Agriculture
Morocco	Moroccan Agency for Solar Energy (MASEN)	MENA (LMIC)	5 yrs	Energy
Bangladesh	Microfinance for Solar Home Systems (Infrastructure Development Company – IDCOL and Grameen Shakti)	Asia (LIC)	20 yrs	Energy & Services

2. HIC: high income countries; UMIC: upper middle income countries; LMIC: lower middle income countries; LIC: low income countries.

2. The financing gap

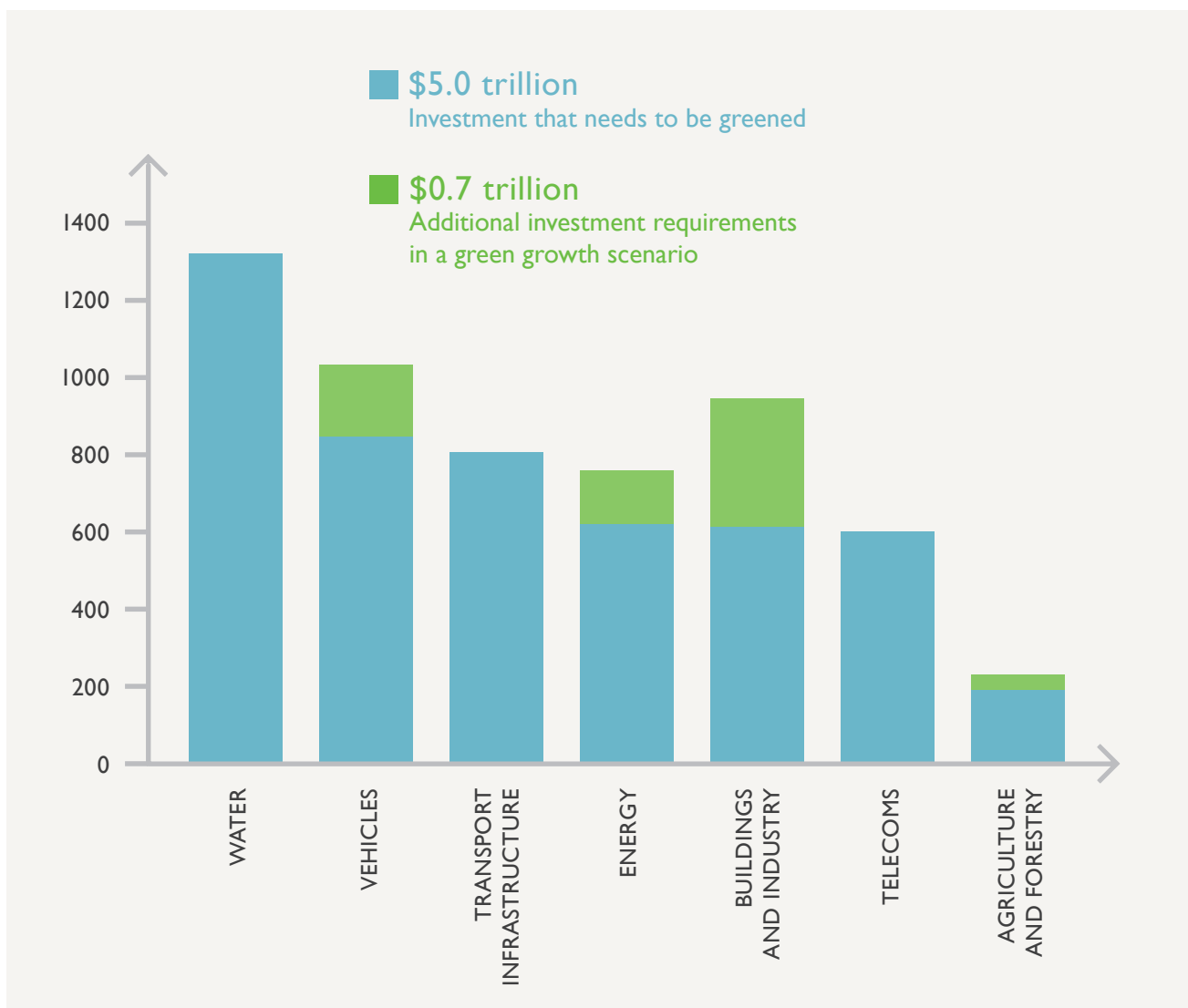
The goal of public policy and finance for green growth is to support the development of sustainable commercial financial markets which continue to finance green projects after public financial support has finished. Many green options in energy, transport, agriculture, buildings, and natural resource management involve higher up-front expenditure compared with 'business-as-usual' options, and many do not yet present commercially viable risk/return prospects even though the full life-cycle costs may be lower for green projects compared with brown alternatives (Ryan et al., 2012).

Large-scale investments across key sectors (e.g., agriculture and forestry, energy, water, transport, etc.) are

needed, which will entail both greening existing infrastructure spending as well as mobilizing additional investment. The additional investment requirements in a green growth scenario (estimated at USD 0.7 trillion per year in Figure 2) could be offset through the creation of virtuous cycles. This arises when although the initial investment in green growth is higher than BAU, it can reduce the future need for investment in non-green areas such as roads, airports, and infrastructure for production and distribution of fossil fuels because the demand is less than it would have been without green growth (Kennedy et al., 2012).

Figure 2:

Additional and total investment requirements in a green growth scenario



2.1**Overcoming barriers to investment**

Significant financial and non-financial barriers facing private sector investors in green growth projects that have been well documented (Polycarp et al., 2013; IEA, 2011; OECD, 2011a; CDKN, 2013; Liebreich and McCrone, 2013; Sierra, 2011; WEF, 2013; and Stadelmann et al., 2011), include:

- Higher costs of green technologies
- Technology development risks
- Distortionary subsidies
- Lack of liquid debt and equity markets
- Lack of consumer finance
- Information gaps and asymmetries
- Skills gaps/limited technical expertise.

The OECD (2012a) identifies three key investment conditions for green growth that would mitigate these barriers, which can be facilitated by public interventions, notably:

- i) Generating investment opportunities;
- ii) Improving return on investment, including boosting returns and limiting costs; and
- iii) Mitigating risks faced over the lifetime of the project.

The case studies examined in the following sections demonstrate the range of options available to governments in both the governance, form of public funding, and financial instruments used for green growth. They illustrate the clear link between stage of market development and policy instrument. Early market development tends to be supported by grants and direct investment. As the market matures public financial support shifts to risk mitigating financial measures and then on to structural supports such as technical and contractual assistance, until finally the commercial financial sector is sufficiently engaged for public finance to be phased-out. The stage of market development can refer to the specific technology and/or the financial market maturity. In some countries, the financial markets may be relatively immature for lending to all green sectors. In others, this may be true only for relatively unproven technologies.

3. Creating an enabling environment for green investments

Create a stable policy framework and price signals to provide enabling environment for private investors.

A critical factor in encouraging and enabling green investment is creating 'long, loud and legal' signals through a stable regulatory environment and policy framework (Hamilton, 2009; OECD, 2012b; and WEF, 2013).

Public finance is a key policy instrument to both incentivize and enable the transition to green growth. Some estimates consider public finance has the potential to mobilize five or more times its contribution from the private sector (WEF, 2013 and IDFC, 2012). However, for all country and sector contexts, this mobilization is thought only likely to occur when targeted public finance is combined with other aligned policy and regulatory measures.

Hamilton (2009) introduces the concept of 'investment grade policy' for policies that create *"the general environment which attracts private sector capital into a number of different solutions and if designed well will achieve the scale of investment required."* Four key principles to achieve investment grade policy are proposed by the Capital Markets Climate Initiative (CMCI, 2012):

1. Clear, long term and coherent policy and regulatory framework;
2. Realigning economic drivers (including price signals) to support green growth;
3. Active programs to develop investable projects; and
4. Early and on-going managed dialogue with stakeholders, including investors.

This section on enabling environments for public and private finance draws on the findings from the case studies and identifies how governments have created green investment signals in the context of each of the principles.

- A strong and binding policy and regulatory framework creates demand in the market for investment in green products and services. New standards should be given sufficient lead-time to alert and encourage investors in green growth.
- Price signals create incentives (or disincentives) to investors in green projects. Green taxes and prices should be made progressive to promote equality among income

groups and if necessary provide grants to low income groups in the case of the removal of other subsidies.

- In the early stages of green market development, governments should have active financial programs to develop investable projects. Public finance can be used to lay the foundations of a green market through demonstration projects, public procurement, and support for project preparation.
- Stakeholders should be engaged at all phases of developing a finance strategy for green growth to provide insight into the barriers facing private investors that need to be addressed and to help ensure public acceptance once the strategy is introduced.

3.1

Clear, long-term, and binding policy and regulatory framework

Investors in new and mostly capital-intensive technologies require confidence that governments are committed to policies and regulations that make them viable. Strong, coherent, and long-term frameworks, including binding legislation, are important to increase the certainty of return on investment and credibly help to mitigate risks faced over the lifetime of the projects, offering comfort to investors (see section 5 for risk mitigation measures). Also, giving sufficient lead-time before implementation of regulatory frameworks enables investors to look ahead and invest accordingly.

Overall, as described in greater detail in [Chapter 5: Policy design and implementation](#), there needs to be better coherence between policies delivering green growth across all sectors. Governments should also integrate green growth objectives into broader economic policy-making and development planning (OECD, 2013b). For example, the Korean government proclaimed 'Low Carbon, Green Growth' as the new national vision in 2008 and set about establishing a legal framework, policy initiatives, and budget resources to support them.

Germany's energy efficiency in housing program was implemented through a combination of regulatory and financial interventions. Regulatory measures setting energy performance standards for new and existing buildings were enacted through the Conservation Act (EnEV-Energy Conservation Ordinance), and the national public bank, KfW, provided concessional lines of credit to financial intermediaries that were available for loans to implement energy efficiency measures. A key factor in its success has been the creation of the KfW Efficiency House (KfW-EH), based on the energy performance standards, which is used as a benchmark for financial incentives and the promotion of the brand.

In **California**, a portfolio of green growth-related regulatory and policy instruments has successfully been

complemented by the use of financing measures, an active role of state budget authorities and private initiatives in support of green growth. For example, the California Global Warming Solutions Act of 2006, which forms the basis of California's cap-and-trade emissions trading scheme, has been complemented by the State's provision of concessional loans and tax-related financial support measures to implement environmental standards and regulatory measures for air pollution control, energy efficiency for buildings, and appliances (Perry et al., 2013). Private investment is mandated since 1996 by requiring California's three major investor-owned utilities (Southern California Edison, Pacific Gas and Electric Company, and San Diego Gas & Electric) to collect a 'public goods charge' on ratepayer electricity use to create public benefits funds for renewable energy, energy efficiency, and research, development and demonstration (RD&D). This, in addition to ambitious regulations and financial incentives, has driven private investment in clean energy and transport in California.

3.2

Aligning price signals

Aligning price signals with green growth is essential to mobilize investment for green growth. Prices that clearly reinforce green growth policy provide incentives and direction to the market and investors. Many governments still provide significant support to activities that work against green growth such as incentives for deforestation, subsidies for fossil fuels and construction of infrastructure on flood plains. Incentivizing green investment is made harder and more costly if these pricing signals remain. At individual- and firm-levels, the introduction of a price signal through a product tax can change consumer behavior significantly (Convery et al., 2007).

The importance of removing investment signals that are inconsistent with green growth is well-demonstrated in **Costa Rica**. Reforms to agriculture and land-tenure policy which had been driving deforestation, was crucial to the success of the country's forest conservation programs (Rodricks, 2013). In addition, the government created a Payment for Ecosystem Services (PES) system which links user tariffs for key environmental resources to a system of payments to farmers for forest conservation.

South Africa has also used a number of taxes and charges to align price signals to support green growth. The national budget collects approximately R45 billion (USD 4.4 billion) in revenue from: an emissions tax on new passenger motor vehicles, fuel levy, international air passenger departure tax, electricity levy, tax on incandescent light bulbs, plastic bag levy, water charges, and emission reduction credits from CDM projects. In addition, South Africa is one of the first countries in the world to announce the implementation of a carbon tax to be launched by 2015. California offers a sales tax exemption for clean technology manufacturing equipment

and tax credits for the purchase of hybrid cars (Perry et al., 2013). These incentives for investment in clean technology development have helped establish California as a leading region for green energy research and investment (Iwulski, 2012).

Other experiences also present evidence of schemes to align price signals with green growth. For example, the **Indonesian** subsidy reform that was introduced to gradually increase fuel prices reduced the state budget deficit by USD 4.5 billion in 2005 and USD 10 billion in 2006. To reduce the potential negative impact of the policy on the poor, the Government provided support through a direct cash transfer program (IISD, 2012). In **Singapore**, water pricing policy has been used since 1997 to integrate the ecological costs of water and streamline the rate based on the amount of water used (UNESCAP, 2012).

3.3

Active government programs to develop investable projects

Governments should have active programs of public finance to support, underpin and develop investment grade projects that mobilize private capital for green growth. In the early stages of market development, this is likely to involve direct investment by government and subsidies in the form of grants, concessional loans, and tax relief in order to encourage and incentivize investment. More developed markets require less direct finance and more support from government.

Direct investment to support pilot programs and projects can provide a demonstration function and build a track record of the likely risk-return profile involved. In addition to various policies and public procurement measures to support project development, governments can provide direct grant, debt, or equity investment to demonstration projects, establish project pipeline facilities, and provide financial support for feasibility studies and project preparation (Jones, 2012).

As markets mature for green products and services, and private investment grows, public-private partnerships can become more important. Public funds can provide seed capital or concessional finance for large investment structures such as public-private partnership funds. The initial stages of the project cycle are often where commercial banks and other financiers would find it difficult to invest. A specific example of this is **South Africa's** Green Fund, which has been designed to provide support to projects at the initial stages through project development grants/loans, with the aim of enabling them to develop into sustainable ventures.

Dedicated government agencies can also have a key role in building project development expertise as well as generating a stream of investable projects. Dedicated agencies can be useful as a single focal point to coordinate policy analysis, project management, marketing, and program evaluation and to carry out other functions (IEA, 2010). The

Moroccan Agency for Solar Energy (MASEN) was established by the **Moroccan** government in 2010 using an innovative approach so that all concentrated solar power (CSP) projects could be developed as Public-Private Partnerships (PPPs) sitting off the balance sheet of the systems operator. This extra-budgetary approach avoids putting additional financial burden on the existing energy and fiscal system (Buchner et al., 2012; Falconer et al., 2012).

Once markets have sufficiently matured, government intervention can then take the form of risk guarantees, technical assistance, and changes to contractual arrangements where less public funds and more institutional support are required.

3.4

Managed dialogue with stakeholders including private sector investors

Ensuring buy-in for long, loud, and legal policy and price signals requires strong collaboration with a wide range of stakeholders. Such dialogue can inform the design of government interventions and secure ongoing commitment by both public and private actors in the transition to a greener economy (Jones, 2012).

Dialogue with the financial sector throughout the process of green policy, regulation and financial planning processes can significantly reduce the cost of transitions, by allowing for mutual understanding of the respective risk profiles of public and private actors, uncovering opportunities to actively mitigate risks through complementary actions. In the case of the **California** Renewable Energy Program, a thorough upfront stakeholder consultation process which included representatives from industry and utilities enabled broad public commitment to the program and facilitated the development of the California Clean Energy Jobs Act.

In **South Africa**, there was extensive consultation with key stakeholders during the preparation of its National Climate Change Response Strategy. The consultation and research programs funded through international co-operation informed the design of the Green Fund so that it could target areas of greatest need. The initial call for proposals was 12-times oversubscribed which demonstrates that the fund was on target.

Close dialogue between countries and development partners can help to enhance the effectiveness of a financing program with green growth objectives. This was true in the case of a climate change policy loan for **Vietnam**, where the government and donors worked together to define policy actions through regular technical meetings. These meetings were also used to share information on progress and lessons learned during implementation of policy actions, and provided opportunities to identify challenges at early stage and introduce any required modification.

4. Effective use of public budget and frameworks

Public finance for green growth can be allocated directly from public budgets or through the establishment of national or sectoral fund structures or through financial intermediaries, including national development and commercial banks. This section describes in two parts the different approaches to sourcing and investing public funds in green growth:

- The direct use of public budgets to finance green growth (4.1)
- The use of dedicated funds and other public intermediaries to finance green growth (4.2).

Criteria suggested by Hilke and Ryan (2012) can be used in comparing different funding streams and selecting appropriate sources to finance energy efficiency policy for green growth. These include the level of stability and sustainability of funding, the administrative simplicity, the least cost of finance, and the ability to leverage private funds.

The case studies differ in their context and methods of funding; nonetheless several insights can be gleaned from the experiences with different kinds of public funds used in promoting green growth.

- Governments can choose from different public finance sources and management options to fund green growth priorities, including direct budget allocation, and/or a range of intermediaries such as dedicated funds, including government loan funds, public banks, and green bonds. These funding types differ in terms of their stability, sustainability, administrative simplicity, and ability to leverage private funds.
- Governments can also consider a range of revenue sources (budgets, taxes, user charges, international development assistance, etc.) to support green growth. Many countries have developed strategies for combining different revenue sources and public funding mechanisms and for achieving integration with current budget and planning processes (e.g. Climate Public Expenditure Investment Reviews (CPIERs) and other similar approaches).
- Market distortion needs to be avoided in using public finance for green growth projects and programs. This can be achieved by planning the leverage and eventual takeover of private capital in the green financial market and an exit strategy for public finance.
- Direct budget allocation can provide flexibility to governments to fund priority green projects and programs and facilitate mainstreaming of green growth with current development programs.
- The use of public dedicated funds enables governments to combine and leverage public and private finance (including support from financial institutions) and utilizes delivery channels that directly reach market actors. Such

financing intermediaries may be more sustainable, if additional private finance is raised over time and direct budget allocation is phased out or reduced.

- Administrative simplicity and education of investors are important to encourage high uptake of public finance for green projects. For example, green bonds benefits from using a well-known and proven mechanisms, but effort may be required to help investors understand the definition of green projects.

4.1

Direct use of public budget

Traditionally, promotional policies for green growth have been funded directly by the public budget. The public budget used to finance green growth projects can come from a number of sources and the main sources are listed in Table 1 with the advantages and disadvantages (pros and cons) associated with each.

Once the funds are raised or allocated to green activities, a range of options exists for governments as to how they are used. They may be used to support sector agency programs (which may include financial instruments) or to support government-wide programs managed by cross-cutting ministries, or to be allocated to support sub-national governments such as municipalities for green capital investment.

General budget allocation for green activities can be found in **Korea**. Korea's Low Carbon, Green Growth strategy includes a '2 percent rule' in which government spends approximately 2% of GDP on the implementation of green growth strategies (Min, 2013).

An example where a government has earmarked fuel taxes for green activities is Costa Rica where 60% of the total Payment for Ecosystem Services (PES) budget has come from fuel taxes. Costa Rica has contributed more than USD 170 million of the national budget to PES since its launch in 1993. Apart from fuel tax revenues, a range of public and private sources including the water companies and the tourist sector contribute to the PES fund (FONAFIFO, 2013). This program has been adjusted over the course of its long history to improve its performance. Its continued reliance on public funding highlights the difficulty in designing the exit of public funding from programs and the need to assess the impact of government interventions over the long term.

In the **United States**, 'public benefit charges' in the form of small fees (typically in the range of 0.001 – 0.01 cents/kWh) are levied on the electricity rates paid by customers. These are collected by energy providers and can either be used directly to fund activities related to obligations such as research, or to develop clean energy funds which provide grants, loans, subsidies, equity funds, loan guarantees, credit guarantees, and supplier credits (Heffner and Ryan, 2010).

Table 1:

Main sources of public budget to finance green growth

Funding source	Advantages	Disadvantages
General public budget allocations (at national or sub-national levels)	Provides flexibility and control for government allocation process; relatively simple to administer.	May not be stable source of funding; may be subject to political budget cycles; green strategy needs to compete with other priorities for funding.
Revenues from earmarked taxes	Can provide steady and reliable revenue stream.	Dependent on continued political support for green priorities; tax base may decrease.
Revenues from user charges ³	Not accounted for in public budget; less susceptible to erosion of tax base.	May be resisted by public and business; tax base may decrease.
Funding from international sources / development assistance funding	Finance may be available at low interest rates; other support, i.e. technical assistance, may be provided.	May be slow with complex administrative process; may have other conditions attached.
Revenues from resource trading (for example emissions) and auctioning; royalties such as sovereign wealth funds	May generate significant revenues; can provide transfer from polluting activities to green growth.	Dependent on market price of resource auctioned likely to be out of control of national government.

Source: Hilke and Ryan, 2012

3. A difference with taxes is that charges may not be accounted for in public budgets although collection is empowered by public policy. Also, the primary goal of these charges is to raise revenues for a particular purpose, i.e. green growth measures, while other environmental taxes are often designed to give an incentive to change polluting behavior and as a consequence erode the tax base over time (Hilke and Ryan, 2012).

The use depends on the legislation in force.

In **Vietnam**, funds from international development partners are aggregated with national public funds for implementing projects on climate change and the National Green Growth Strategy. The funds are distributed within the national budget with the goal of mainstreaming climate policy priorities into its socio-economic development plans. This has presented an opportunity for the Vietnamese government to complement international funds with its own public funds to support implementation (Le, 2013).

The Climate Public Expenditure and Institutional Reviews (CPEIRs) are an example of a review methodology used by ministries of finance to address climate change in budgets and expenditures (Aid Effectiveness, 2014). Several countries are undertaking CPEIRs including in Africa (Ethiopia, Tanzania and Uganda, and in Asia Pacific (Bangladesh, Cambodia, Indonesia, Nepal, Philippines, Samoa, Thailand and Vietnam). For some of these countries, this has resulted in the ongoing tracking of expenditure for green and climate-related initiatives through the budget as in the case of Indonesia and Nepal.

Early experiences from these examples underscore that, even in some low income countries, the majority of public finance for climate change is raised domestically, but that these expenditures are often not well coordinated and managed. Globally, Climate Policy Initiative (CPI) estimates that 51% of climate finance is invested in developing countries and that the majority of this is raised domestically (Buchner et al., 2013).

In most of the case studies, the public funds allocated to green growth are small relative to the total national budget, but appear to have played a role in leveraging finance for green activities. Regardless of scale, the duration and nature of support is critical for ensuring that desired impacts are sustainable and do not create unintended consequences such as market distortions (Polycarp et al., 2013). Generally governments need to consider strategies for exit from the outset and for reducing the use of public incentives in a way that maintains investor confidence within the sector whilst ensuring competitiveness of green markets.

4.2

Public intermediaries and use of dedicated green funds

Public finance for green growth projects may not always be managed primarily or exclusively through public budgets; governments often use intermediaries and funds for a variety of reasons. They can provide an institutional set-up to blend public and private funds from various sources and thus form a focal point for regrouping many smaller sources of funding to a single budget. Secondly, intermediaries can administer the distribution of the funds to the target group. Thirdly, separating green funds from the public budget allows the funds to be kept off the balance sheet of public expenditure. The main types of intermediaries and funding arrangements found for green growth projects are:

- Dedicated funds;
- Public banks and financial institutions;
- Sovereign wealth funds; and
- Green bonds.

Dedicated funds, such as government loan funds, and public banks may disburse funds directly to program applicants or cooperate with entities, such as local banks, that can serve as local contact points for program applicants. Combinations are also possible. For example, applicants have to first pass through a mandatory assessment procedure by a local partner before applying directly via a central application portal. Green bonds also have a role in providing a vehicle for funds to be collected and disbursed to green growth projects. They can aggregate projects and achieve sufficient scale to reach new groups of private investors (Hilke and Ryan, 2012). Bonds have been the dominant asset class favored by institutional investors in portfolio allocations of institutional investors across OECD countries. Consequently, much attention has been focused on the potential to develop the use of fixed-income vehicles to support greater institutional investor participation in green growth investments (Kaminker et al., 2013; Kaminker and Stewart, 2012).

UNDP outlines the advantages of 'national climate funds' in terms of:

- Collecting and distributing funds to activities that support national priorities;
- Facilitating the blending of public, private, multilateral and bilateral sources of funding⁴;
- Coordinating national climate change activities; and
- Enabling 'direct access' to international climate finance (Flynn, 2011).

Green funds have become a popular institutional innovation by countries seeking to create a domestic mechanism for blending funding from different sources and for allocating and reporting it against green growth priorities. However, there are also concerns that these funds are disconnected from formal budget processes and can result in a dilution of accountability and transparency. They can also be sidelined, and may not have much influence on the direction of the main budget process (Irawan et al., 2012). Funds have often been rapidly developed in order to create a signal of commitment and in some cases to attract international climate finance. But establishing the human and institutional resource capacity to manage a fund effectively takes significant time and may not be adapted to dealing with all types of recipients, in particular smaller investors and individuals (Flynn, 2011).

Of the cases explored here **South Africa's** climate change and green growth aspirations are directly supported by the Minister of Finance, who set aside R800 million (USD 80 million) within the 2011 national budget to catalyze investment in green economy initiatives via a new Green Fund (Gordhan, 2011). Following an initial tendering, additional funds have been allocated to meet the overwhelming demand for green project development.

In other cases, governments have introduced new functions within existing funds. For example, the National Forestry Financing Fund (FONAFIFO) in Costa Rica now operates a payment of renewables premiums and the Payment for Ecosystem services systems.

Another example of a more tightly focused and specific fund with financial mechanisms is the example of **Morocco**, whereby MASEN was established as an extra-budgetary entity through a range of domestic public finance sources, including investments from the national budget of the Government of Morocco, the national utility, and existing national investment funds (Moroccan Agency for Solar Energy, 2011).

Public banks or financial institutions are an important type of intermediary well-placed to collect and disburse public finance for green growth projects. CPI estimates that of the USD 359 of climate finance spent globally in 2013, USD 69 billion was contributed by National Development Banks (NDBs), USD 38 billion by multilateral development banks (MDBs), and USD 15 billion by bilateral finance institutions (BFIs), compared with USD 1.6 billion by climate funds and USD 12 billion by government budgets (Buchner et al., 2013). Public finance through development financial institutions (MDBs and NDBs) can have significant advantages over direct budget allocation because they can "raise funds on the capital markets, reinvest earnings, and mobilize additional funds through co-financing (either with commercial banks, financial institutions, development partners, or other international finance institutions)" (Buchner et al., 2013).

4. Public-private approaches are increasingly popular as a way of leveraging private sector funding in green growth projects. There are many advantages of this approach and these are discussed in further detail in Chapter 7: Public-private collaboration [link].

National development banks (NDBs) have an advantage over other forms of public finance as they usually have knowledge and long-standing relationships with the local private sector, which puts them in a better position to access local financial markets and understand local barriers to investment. As public institutions, NDBs are more likely to be able to take risks than the commercial financial institutions, and therefore can provide long-term financing in local currency in their local credit markets (Smallridge et al., 2013).

The **German** Government has harnessed the expertise of its national development bank, KfW, to support the country's energy efficiency investment programs, drawing on its capital base through EUR 4.65 billion as equity capital and EUR 3.25 billion as subordinated loans (OECD, 2012b). With a balance sheet total of more than EUR 450 billion, KfW is one of Germany's three largest banks (Hilke and Ryan, 2012). KfW refinances its lending business almost exclusively in the international capital markets and, since it is backed by the German Federal Republic, it can borrow at relatively low interest rates. As the bank has no branch network, funds are extended to customers by using the concept of 'on-lending' via commercial and savings banks.

The **UK** Government launched a new Green Investment Bank in November 2012, committed to delivering UK green objectives as set out within the Climate Change Act and related policy measures. In 2012/2013 a total of 25 projects were backed committing GBP 764 million which will mobilize GBP 3.2 billion when fully deployed. It is estimated that the bank so far has leveraged an additional GBP 3 of private capital for every GBP 1 invested by the Green Investment Bank (GIB, 2014).

Brazil's national development bank, Banco Nacional de Desenvolvimento Economico e Social (BNDES), offers an energy efficiency credit line Proesco, with annual rates of 14 percent. In 2011 about R\$ 30 million (USD 16.5 million) of financing was approved from the line (Bloomberg, 2012). BNDES also manages the Amazon Fund and has approved support in the amount of R\$ 16.4 million for environmental sustainability in the state of Amazonas to develop a management project on indigenous land, covering approximately 50% of the indigenous territories in the state.

Multilateral development banks or MDBs and bilateral financial institutions can also play a pivotal role particularly in the poorest countries to address market barriers (high perceived risk, high transaction costs, low liquidity, etc.) and to leverage investment in green growth. They can provide seed funding and lines of credit to NDBs or governments directly for green growth investment and also other forms of

support such as technical assistance when the market is less developed.

Public investment can also be deployed in green projects through sovereign wealth funds. A sovereign wealth fund (SWF) is a state-owned investment fund or entity (kept separate from the national budget) that is commonly established from balance of payments surpluses, official foreign currency operations, the proceeds of privatization, governmental transfer payments, fiscal surpluses, and/or receipts resulting from resources exports (World Economic Forum and IHS Cambridge Energy Research Associates, 2012).⁵ The long-term investment horizon of such funds makes them potentially compatible with green investments (Mao and Schmitz, 2012). Current examples include Norway's Government Pension Fund Global and Abu Dhabi's Mubadala who are each invested in renewable and sustainable energy.

Green bonds are broadly defined as fixed-income securities issued by governments, multi-national banks or corporations in order to raise the necessary capital for a project which contributes to a green economy (Della Croce et al., 2011). They differ from regular bonds, mainly in that the funds raised are exclusively used for specified environmental and sustainable development purposes which means that investors that are looking for socially responsible investments (SRI) may be targeted (Hilke and Ryan, 2012). Della Croce et al. (2011) estimated that green bond issuances in 2011 had amounted to USD 15.6 billion, representing only a fraction (0.017%) of the global bond market and Deutsche Bank (2014) estimates that this is continuing to increase. In 2014, a consortium of investment banks developed the Green Bond Principles which are "*voluntary process guidelines that recommend transparency and disclosure and promote integrity in the development of the Green Bond market by clarifying the approach for issuance of a Green Bond*" (CERES, 2014).⁶ This should help scale up the market by providing consistency and transparency across green bonds.

A new EU Project Bonds pilot (part of the European Commission's Connecting Europe Facility⁷) aims to stimulate investment in key strategic infrastructure sectors and to establish debt capital markets as an additional source of financing for infrastructure projects. Green infrastructure projects, packaged into bonds can therefore offer long, steady, and inflation-adjusted income streams for green investments as they mature. The Climate Bonds Standards Board of the Climate Bonds Initiative is developing standards for investments eligible to be called Climate Bonds, which is a subset of green bonds (CBI, 2014).

5. The definition of sovereign wealth fund exclude, among other things foreign currency reserves assets held by monetary authorities for the traditional balance of payments of monetary policy purposes, state-owned enterprises in the traditional sense, government-employee pension funds, or assets managed for the benefit of individuals' (SWF Institute, 2014).

6. Four banks drafted the principles: Bank of America Merrill Lynch, Citi, Crédit Agricole Corporate and Investment Banking and JPMorgan Chase; while the following banks announced their support of the Principles: BNP Paribas, Daiwa, Deutsche Bank, Goldman Sachs, HSBC, Mizuho Securities, Morgan Stanley, Rabobank and SEB.

7. A new facility proposed by the Commission in the 2014–2020 Multi-financial Framework that would use both grants and financial instruments such as project bonds to accelerate infrastructure investment.

5. Public financial instruments for risk mitigation and increasing return on investment

Green projects often appear to present higher risks to investors due to the higher capital costs often associated with green, and perhaps unproven and unfamiliar technologies, the financing risks from immature financial markets and institutions, the perceived risk associated with finance in a particular country and sector, and policy risks. These latter risks are not specific to green growth investments but where they apply they add to the already higher risk profile of green projects. The impact of these will vary depending on sector and country context. The real or perceived risks associated with green projects may lead to their rejection by private investors. Providing access to capital through public direct investment will not fix this problem on its own; targeted financial instruments are required to restructure risks in order to attract private capital. The key question to be addressed here is *what features characterize good practice in the use of public finance instruments for sharing risks and mobilization of private sector finance?*

Lessons learned on financial instruments to de-risk and increase return on investment of green projects are:

- Public finance instruments and support remain essential to raising finance for green investment through their role in mitigating risk and increasing the return on green investment for the private investors.
- Different financial instruments play a role at different stages of the market development for green growth. Higher shares of public finance are needed initially, which drop as the private financial sector takes over.
- The range of financial instruments currently being used for green growth is relatively limited, with most experience in the use of grants and concessional loans demonstrated. Moving towards scale of investment is likely to require a wider range of instruments tailored for use in differing country and sector contexts.
- Publicly-financed preferential rate loans can cut financing costs significantly for investors but may not be sufficient to encourage financial institutions to actively seek customers for green loans if there is still sufficient risk perceived on the capital.
- Risk guarantees or even credit lines from public budgets may be needed initially to mitigate the perception of risk associated with green projects in order to encourage financial institutions to offer concessional loans to investors in green projects.
- Transparency of green finance can be improved through project monitoring and reporting requirements and when independent financing vehicles with a greater level of transparency are used. The absence of detailed information on the terms of finance provided is often related to commercial confidentiality, which makes it very difficult to assess whether or how green finance is being used most effectively.

- Exit strategies for public finance of green growth remain relatively underdeveloped in the case studies examined. It is important that governments try to devise financing plans that transition to a green economy financed by the private sector.

5.1

Financial de-risking instruments

Public financial instruments are designed to reduce real or perceived risk and/or to increase returns on investment. UNDP (2013) and Micale et al. (2013) identify two main categories of de-risking instruments:

- **Policy de-risking instruments** or other interventions that address underlying barriers which cause risks. Policies can also be a source of risk in themselves if they change frequently and destabilize the investment environment. These are discussed in relation to issues of investment grade policy in Section 3 above.
- **Financial de-risking instruments** which may not directly address underlying barriers but rather strategically transfer risks that private investors face to public actors such as national governments or development banks. These instruments can include concessional loans, grants for risk-mitigation, guarantees, insurance, and public equity co-investment.

Another key barrier for green finance is the general lack of affordable long-term capital and so the inability for investors to refinance green assets. Without efforts to address this, the ability for delivering scaled up green investments over time will be reduced.

Financial de-risking instruments can help shift the risk-reward profile of green projects. Four basic types of financial instruments can be used by the public sector to mobilize green private sector investment, notably grants and other subsidies such as tax relief, concessional loans, guarantees, and equity investments. Table 2 summarizes the four main instruments, considers the key advantages and disadvantages (GCF, 2013), and examples from the case studies examined here. Of the seven case studies, only the South African Green Fund used guarantee or insurance mechanisms and only Morocco employed equity investment as one of the financial instruments for green growth.

These instruments may be used at different points in an investment program cycle to target different investors. In general, higher shares of public finance and subsidy in the form of grants or tax incentives are needed when the market for green projects is very new or under-developed. The use of non-reimbursable grants for technical assistance (TA)

Table 2:

Overview of characteristics of financial de-risking instruments

Instrument	Definition	Advantage / disadvantage	Examples
Grants and other subsidies / tax incentives	Resources aimed at funding investments without the expectation that the money be repaid.	<p>Advantage: Provides technical assistance and capacity building. Gives viability to a project. Covers full cost of adaptation, complement other instruments. Reduces administrative costs, as no payback required</p> <p>Disadvantage: There are no reflows and hence is expensive for public budgets.</p>	Germany – Energy Efficient Construction and Rehabilitation (EECR) program grants; California's Public Interest Research (PIER) program; South African Green Fund; Costa Rica – payments to landowners for forest conservation; Morocco – grants for solar energy;
Concessional loan	Loans provided on conditions more favorable than market terms by offering low or no interest rates, longer repayment and/or grace periods, or a combination of them.	<p>Advantage: Reduces the overall cost of capital and can improve the risk: return ratio to other investors and lenders, encouraging local banks to enter the lending market for energy efficiency and renewables.</p>	Energy Efficient Construction and Rehabilitation (EECR) program concessional loans; Bangladesh – Grameen Shakti loans with no collateral; California, USA – concessional loans for energy efficiency and renewable energy; South African Green Fund; Vietnam – loans for policy development; Morocco – loans for solar energy
Guarantees and risk-sharing	Commitments in which a guarantor undertakes to fulfill the obligations of a borrower to a lender in the event of non-performance or default by the borrower of its obligations, in exchange for a fee.	<p>Advantage: Attracts capital through debt on terms that could ensure the feasibility of a project. Mitigates or manages risks.</p> <p>Disadvantage: it is hard to quantify risks and in international financial institutions it accounts for the same amount of financing quota as a loan.</p>	South African Green Fund Central and Eastern European Fund (CEEF)
Equity	Injection of capital to grow operation of a project or a firm to leverage resources as it mitigates risk for other investors, used when the probability of failure is high, but still with positive probability of success, therefore, of return to the equity holder.	<p>Advantage: Support for innovation of start-ups. Leverages resources.</p> <p>Disadvantage: difficult to quantify risks and define with certainty the level of participation in the total equity.</p>	Morocco – MASEN equity

Source: adapted from GCF (2013)

and other advisory services may be particularly important in assisting countries with the development of policy and regulatory frameworks and institutional strengthening, and other market enabling activities. Tax incentives and relief may be attractive to governments since while grants require outlay of the public budget, tax incentives impact revenues.

Governments and development financial institutions can also support the market for green finance by mitigating risk through concessional loans. For example, green credit lines may be offered to financial institutions to help recipient banks develop their portfolio of green investments and mitigate credit risk, in turn promoting the financing of private green investments, or by providing concessional loans directly to investors. Governments can also support debt finance indirectly through policies that enable financing arrangements through third parties (such as on-bill finance) and introducing guarantees and risk-sharing facilities (Blyth and Savage, 2011; Hilke and Ryan, 2012). Rapidly developing countries may have less capital available to finance green infrastructure, leading to high costs of debt finance. CPI proposes two solutions for financing renewable energy in the developing world: First, index renewable energy tariffs to foreign currency so that currency hedging costs are eliminated; second, improve the cost-effectiveness of domestic renewable energy support programs by providing lower-cost debt through debt concession programs before implementing other support programs (Nelson and Shrimali, 2014).

Guarantees may also be used to cover both policy and financial risks associated with green investment. Policy risk insurance (PRI), which is now emerging as a new green finance product, can be provided by institutions such as the Multilateral Investment Guarantee Agency (MIGA) and the Overseas Private Investment Corporation (OPIC) and can indirectly address policy risk under their expropriation coverage but is limited. Partial Risk guarantees provide risk mitigation for specific government obligations, and can provide investor certainty against the impacts of specific retroactive regulation changes (Micale et al., 2013). First loss guarantees protect investors against a pre-defined amount of financial losses, thus enhancing credit-worthiness and improving the financial profile of the investment (Herve-Mignucci et al., 2013). Multi-lateral and national development banks have increasing experience of these instruments.

5.2

Identifying good practice in the use of public financial de-risking Instruments

A wealth of literature exists on the good design of public finance, particularly in the context of climate change (Buchner et al., 2013; Corfee-Morlot et al., 2012; Hohne et al., 2012; Jones, 2012; Kaminker et al., 2012; OECD, 2013b, 2013c; and Ryan et al., 2012). Most of the studies are aligned on several points, such as that small amounts of well-designed public

funding can unlock private investment if it targets individual barriers to green investment, and occurs over a relatively long period (over five years). Also technical assistance is often crucial to building capacity in local financial institutions and scaling up green finance.

It is important that governments take a long-term view and design financial instruments or measures with stable funding sources over a relatively long period to allow investors to plan stable revenue streams. Crowding out private investment is a concern when using public financial instruments, particularly those utilizing concessional finance and grants for investments. These are of particular concern when used in functioning commercial banking systems; however, when used in countries with weak financial markets, the potential for appropriately designed interest rate subsidies to distort the economy is fairly low. A further concern over measures to reduce technology or operational risks is that of moral hazard, whereby a party insulated from risk behaves less carefully from how it would if it were exposed fully to the risk (EC, 2011).

In principle, public finance should only be used where private investment is unavailable or for sharing risks to unlock private resources. However, this can be very challenging to assess. Here we identify four important yet challenging steps for avoiding market distortion when using public financial instruments to mobilize private investment around which we structure the remainder of this section:

- Understanding the policy context and barriers, costs, and risks to be overcome through the use of a public finance incentive;
- Tailoring concessionality carefully to provide just enough incentive for the investments to take place and not distort markets;
- Ensuring transparency in terms of who benefits and how, and long-term plans (Amin et al, 2014); and
- Planning an exit strategy

5.3

Integration with the policy context

Policy contexts are unique and must be clearly understood so that domestic or international public instruments are used to tackle specific barriers and risks and to avoid potentially market distorting subsidies. Similarly, targeting public resources to de-risking green growth requires a sufficient level of institutional capacity to understand how the policy and regulatory framework impacts on commercial decisions and vice versa (Amin et al. 2014).

Clearly, making the transition to green growth implies shifting from economies with green niche products to mainstreaming green choices across all sectors of the economy. This means that public financial instruments for

green projects should not be environmental side-lines but rather integrated into the existing policy context. In the transport sector, for example, this may mean differentiating existing vehicle taxes based on environmental characteristics of the vehicles and prioritizing public transport funding. For the buildings sector the existing building codes may need to be tightened for energy performance requirements and funds made available to implement the change.

In the case of CSP in **Morocco**, MASEN was established within the context of Morocco's 2010 Renewable Energy Law alongside various other measures designed to develop CSP as part of an industrial strategy. The high level of public resource was therefore justified on the basis of this wider government strategy.

In **Bangladesh**, the Grameen Shakti program uses no direct public subsidies and is exceptional⁹ in not requiring collateral. The program's success is largely attributed to the way it is integrated within the rural context of informal institutions and lack of end-user credit.

Coupling technical assistance for policy, regulatory and other institutional arrangements and capacity development with financial instruments, can help ensure better uptake and efficiency in implementation of public financial de-risking instruments (UNDP 2011).

Strengthening the capacity of financial institutions to support renewable energy and energy efficiency projects has been important in unlocking domestic sources of finance for low-carbon energy. In **Tunisia**, capacity building to strengthen the knowledge and expertise of domestic financial institutions in solar water heaters was an important component of the Government's Prosol program, which led to significant leveraging of private capital (Trabacchi et al., 2012).

Development finance institutions, whether national, bilateral, or multilateral development banks, can be key players in helping to bridge understanding and maximize synergies between Governments and relevant market actors (Ecofys-IDFC, 2012; Smallridge et al., 2013). In India, technical assistance from Asian Development Bank to strengthen the capacity of Industrial Development Bank of India to appraise energy efficiency projects, combined with a loan to enable lending to such projects, was effective catalyzing investment in energy efficiency (Polycarp et al., 2013; IEA, 2011).

5.4

Tailoring concessionality

Targeting concessional finance to ensure it does not crowd-out other finance providers, and does mobilize new sources of green finance is a key challenge (Jones, 2012; Amin et al., 2014). Public finance may be used to subsidize the interest rates and/or can provide partial debt relief for energy efficiency loans.

From the case studies, the role of existing institutions, such as KfW and World Bank, or new specially created structures, such as MASEN and IDCOL, have been important in helping align different sources of finance, domestic and international, including concessional resources, towards green investment goals. Here differing approaches towards tailoring of concessional finance are provided as illustrations of how this may be achieved in diverse policy contexts.

Germany's energy efficiency housing program links the amount of public subsidization and size of any low interest loan to the level of the improvement in energy performance due to the energy efficient retrofit. In this respect, concessional resources are 'targeted' to encourage home owners to undertake more comprehensive refurbishment.

In **Bangladesh**, the Infrastructure Development Company (IDCOL) financing entity has channeled international finance, including from the Global Environment Facility, to provide grants subsidizing the cost of Solar Home Systems (SHS), or small photovoltaic systems and soft loans to financial intermediaries. It also provides technical assistance and support for capacity development. Creation of this new, dedicated financial intermediary has been an important way of allowing international sources of finance to be combined and tailored to the local context (Islamic Development Bank, 2012).

In **South Africa**, the diverse range of financial instruments available through the Green Fund, can help tailor instruments to overcome specific barriers and identified risks.

5.5

Transparency of public financial incentives

Transparency in the deployment of public financial instruments is important to make all potential beneficiaries understand their likelihood of accessing these de-risking instruments, and to provide certainty for investors (as the risks and so costs of investment decline) in the planned phase-out of public support. Transparency also ensures lessons can be captured to strengthen relevant capacity of the public sector in how to best use public resources for building local green markets. Greater attention to balancing transparency and necessary confidentiality is critical for increased understanding of how risks are being priced and how public finance is currently used to mitigate these in different countries, markets, and sectors.

The low interest loans for energy efficiency in housing provided by KfW are distributed via German commercial banks through an 'on-lending-system' where KfW commits a refinancing loan to the commercial bank. To ensure that the commercial bank passes on the low interest rate to the investor, the KfW establishes and publishes a maximum

7. The vast majority of credit delivery financial systems require collateral no matter the size and category of loan.

interest rate, including the commercial bank's margin that can be applied. This level of transparency of the terms of public finance provided is considered as an innovative way of ensuring benefits passed on through financial intermediaries.

Transparency is important on several levels within the **Bangladesh** case: 1) IDCOL as a non-government financial entity provides a vehicle for transparently combining differing international sources of finance with domestic budget; 2) transparency at the micro-credit level as developed through the Grameen Shakti program has been essential to harness social pressure for repayment of loans, reducing the credit risks often associated with micro-finance; and 3) constant monitoring and evaluation of the program through after sales services has helped to foster continuous improvement of the program, and issues/problems are solved immediately which is sustaining the solar PV industry in Bangladesh.

MASEN, as a vehicle for blending international and domestic resources, including concessional finance from the Clean Technology Fund, can allow greater measure of transparency in how and to whom public financial support is channeled. In facilitating project origination and as equity holder in the solar power company (SPC), MASEN has helped balance risks and align interests across the public and private sector in a relatively transparent and streamlined way.

6. Mobilizing long-term investment for scaled-up green development

As outlined in section 2, too little capital is currently invested globally in the transition to a green economy of the future (Buchner et al., 2013). It is essential to shift the world's capital from fossil-fuel and resource-intensive economic activities to sustainable, low-emission activities. Large scale investment in green infrastructure needs to attract private investment at scale, particularly capital from institutional investors.

Public support examined in case studies remains focused on creating an enabling environment, enabling development, and scaling up of green technologies, without yet reaching the point where non-financial support alone such as technical assistance is sufficient for market take-off. The lack of exit strategy and the inadequate scale of current green investment point to the need for further transformation of prevailing market incentives and rules that conspire against capital shifting.

Changes are needed on several fronts to support capital flow to green investments. As an example, the IFC shows that 70-90% of institutional investor asset portfolios (worth approximately EUR 35 trillion) are invested in fixed income

5.6

Planning an exit strategy

Governments should develop from the start of any public finance program an exit strategy for public subsidies and public capital directed to encourage green growth investments. Such an exit strategy is necessary to free up resources for other public investment priorities as well as to facilitate a broader transformation of the economy to low emission and climate resilient development and economic growth. However, governments should also recognize that some of their roles in the market for green investments will likely to endure, such as enforcement, technical capacity building, and 'green' pricing signals.

In line with the principle of investment grade policy, governments should manage 'exit' in the provision of public financial support in a way that ensures long-term capital is attracted at scale into green investments. This will signal the maturity of the green finance sector and ability for financing the scale of investment required to transition to green economies. However, in the absence of investment grade policy, and where various barriers and risks for green investments remain, public finance decision-makers will need to accelerate participation of long-term providers of capital to meet the required scale of investment.

and equity investments (IFC, 2013). Capital for investment in green investments issued through green bonds comes from the remainder, meaning that green bonds are currently considered a niche product. In order to scale-up private and public green investment, it is crucial that capital is diverted from mainstream fixed income and equity investments to widen the scope of so-far niche green investment products.

In the wake of the economic and financial crisis, some of the traditional sources of green infrastructure finance and investment – available through governments, commercial banks and utilities – face significant constraints such as illiquidity and their ability to raise capital. New, mainstream financial sources will be needed not only to compensate for these constraints, but also to ramp up green infrastructure investment. One potential source for such long-term investments is **institutional investors**. In OECD countries, these investors held over USD 83 trillion in assets in 2012 (Kaminker et al., 2013). However, a recent OECD analysis shows that pension fund allocations to direct infrastructure investments in general continues to remain small at less

than 1% for OECD pension funds surveyed. The 'green' investment component of their asset allocations remains even more limited (Kaminker and Stewart, 2012).

The latest OECD working paper developed a set of case studies to help develop guidance to better design policy and structure deals to encourage investment from institutional investors into green infrastructure projects. The policy lessons for governments which may support investment in green infrastructure by institutional investors, drawn out in the paper include, inter alia, ensuring a stable and integrated policy environment, addressing market failures, providing an infrastructure road map, facilitating the development of appropriate green financing vehicles, and promoting market transparency and improved data collection (Kaminker et al., 2013).

Addressing financial innovation and encouraging investors, including commercial banks and institutional investors, to adopt investment decision making and risk management that extends beyond the short-term is only one element of scaled up finance for green investment. These investors are inherently operated and governed by the regulations and conditions of a national and international financial system that may restrict their ability to assign more capital to green investments. In addition, much work is required in the preparation and presentation of new green investment opportunities to the stakeholders within the financial system. For this reason, it is important to assess whether the financial system is aligned with low emission, climate resilience and environmental sustainability, beyond internal institutional adjustments. Initiatives are emerging in this area and these signal that the organic changes which may ultimately lead to better alignment.

The UNEP (2014) has launched an Inquiry into the Design of a Sustainable Financial System: Policy Innovations for a Green Economy. They will do this by "identifying best practice, and exploring financial market policy and regulatory innovations that would support the development of a green financial system", through collaboration with policy makers, investors, the broader business community and other concerned stakeholders.

The informal Sustainable Banking Network supported by the International Finance Corporation (IFC) launched in 2012 demonstrates the leadership role being taken by banking regulators and associations to promote environmentally and socially sustainable banking practices and green credit policies. A distinct feature of sustainable practices is the system of disclosure and auditing requirements. Countries participating in this network engage and exchange lessons in support of mainstreaming sustainable banking practices into their national finance system; Bangladesh, Brazil, China, Indonesia, Lao PDR, Mongolia, Nigeria, Peru, Vietnam and Thailand. The network is underpinned in the belief that environmentally and socially sound sustainable banking practices will in turn ensure capital preservation and creates new financial products and markets.

Financial regulations will need to be modified to increase access to capital and scale up of investment. An interesting example is how the China Banking Regulatory Commission and the Ministry of Environment and Pollution are implementing a Green Credit Policy and Guidelines to incentivize banks to provide finance for green-related projects, as well as creating disincentives for investment in environmentally polluting projects.

Another example of the type of modification needed to financial regulations is the US PACE (Property Assessed Clean Energy) mechanism, which has been used nationwide for decades in the US to access low-cost, long-term capital to finance improvements to private property that meet a public purpose for the purpose of green investment. As the mechanism began to be used to provide loans to property-owners for energy efficiency refurbishments, complications with existing regulations arose; the Federal Housing Finance Agency advised that PACE assessments are not valid and should be treated like "loans" that cannot be senior to mortgages. It therefore advised the Federal National Mortgage Association and the Federal Home Loan Mortgage Corporation to avoid purchasing any mortgages with PACE assessments. This has meant that there is a lack of clarity around the legal status of homes that have been PACE-assessed (PAGE, 2014). In addition, it was necessary for many federal states to enact legislation to enable PACE. For example, California enacted AB811 which authorized local municipalities to create special assessment districts necessary for PACE programs to exist.

A key barrier to scaled-up green finance is the lack of access to **affordable long-term capital** and this appears to be heightened in developing countries. Rapidly developing countries have many competing demands for capital, yet "immature financial markets, higher risks, inflation, and the lower saving rates of young populations limit the supply of capital available for long-term investment" (Nelson and Shrimali, 2013). According to this report, as a result of a higher cost of debt, renewable energy projects in developing countries cost on average 30% higher than if they were financed under the terms and interest rates available in developed countries. Special attention may be needed to ensure that capital is not restricted for green investment in new infrastructure in developing countries, where the bulk of green investment will be needed. For developed countries the refurbishment of existing infrastructure is more urgent for green investment and the challenge is to unlock capital for this purpose.

Another area to watch will be **protectionism**. Some sectors particularly associated with green growth, such as energy or agriculture for example, are often more restricted to foreign direct investment (FDI) than others because they are considered to be of national interest or have strong political lobby groups. Contract enforcement is critical in encouraging private investment and mitigating the risks

outlined in section 5.2 and may be an issue in financial markets that are less mature. The OECD Freedom of Investment Roundtable explored the role of international investment law in supporting government green growth strategies and warned against green protectionism and encouraged FDI in support of green growth (OECD, 2011b).

Ongoing **public financial management reform plans** should be implemented by governments to support green growth financing and to coordinate with climate change related reforms. One example where this may be possible is to ensure that low emission and climate resilience options are prioritized in infrastructure procurement programs, at the national and sub-national level, which would be critical to scale up demand for green investment by private sector investors. Additional measures may include the reassessment of public incentives and subsidies which may have the consequence of restricting investment in greener options and

the adoption of new greener incentives either at consumer- (e.g. carbon taxes) or sector levels (e.g. energy efficiency). Emerging work in several developing countries such as Peru, Chile, and Colombia argues that national financing pathways and strategies for finance would facilitate more effective use of international and national finance to implement low emission and climate resilient development plans (Naidoo et al., 2014). Bridging the gaps among the public, private, and international development sources of funding is likely to improve the effectiveness, impact, and implementation of green growth policies.

These initiatives demonstrate ways in which long-term finance could be attracted for green investments and accelerate participation of private and institutional investors within green sectors as investment grade policy starts to emerge.

Next steps

While this chapter has examined a wide range of promising green growth policies, it would be premature to claim that a comprehensive list of best practices has been identified.

The available evidence suggests that there has been significant policy experimentation in both developing and developed countries, which highlights potential growth policy options. There has, however, been relatively little comprehensive analysis of the effectiveness, efficiency, and robustness of these policy options, under a range of political, economic, and social conditions. A major conclusion of this chapter, therefore, is that governments and their policy analysts need to address this significant gap in information.

This is especially true for analysis of policy portfolios. One of the difficulties in analyzing policy portfolios stems from the issue of attribution—which of the policy portfolio parts is responsible for the greatest change. Accordingly, increased research is needed on natural policy experiments, where

differing combinations of similar policies have been applied under varying enabling conditions.

It is also important to conduct deeper research on specific types of policies that can drive green growth transformation. This includes further assessment of the conditions under which countries should pursue policies designed to support breakthrough innovations in technologies and business models versus supporting more incremental innovations and adaptations of existing technologies. In addition, a more extensive understanding is required for the policies and measures that improve skills of new and existing workers and ease the transition to new green industries for displaced employees. Governments and other practitioners would also benefit from more detailed analysis of sector level green growth policies that will achieve the greatest impacts in reducing poverty and achieving social inclusion, while advancing green development objectives.

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Chapter 7

Public-private collaboration

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Public-private collaboration (PPC) can be a powerful means for achieving green growth outcomes. It enables the knowledge, resources, and creativity of diverse stakeholders to be harnessed to create outcomes which none could achieve on their own.

At the same time, experience shows that creating effective partnerships is not easy, and efforts may fail to achieve their objectives or deliver public value for money. Partners and collaborations should be selected strategically, designed with care, and applied when appropriate.

Roles of public and private collaboration

In this chapter, PPC is used as a broad term covering a range of possible forms of collaborations between public and private entities that can be driven either by the private sector or by the public sector, or through collaboratively governed initiatives where public and private participants engage in collective decision-making to solve a common problem. Collaborations range from formal contracts between public and private entities to loose forms of mutual support. The scope of this chapter includes but also goes beyond 'public-private partnerships' (PPPs) in which a consortium of companies bids to operate assets or services traditionally provided by the public sector.

The role of public sector entities in collaborations can be as a resource provider, information source, or regulator, providing an environment where the private sector can develop and deploy solutions which generate green growth. The private sector can provide knowledge, finance and innovation, and the ability to deliver products and services at scale, allowing governments to achieve broader social and economic objectives. The appropriate pairing of these capabilities can result in powerful outcomes.

This chapter looks at the experience of public-private collaborations aimed at:

green innovation and market development, natural resource management and the development of green and resilient infrastructure.

Best practice for public private collaboration

Collaborations to support green R&D and innovation work by providing greater market certainty for innovators and building research and innovation capacity. During the early stages of innovation processes, most of the resources generally come from public efforts, while later innovation stages are mainly supported by private development. In order to support the transition from mainly public to private sector efforts, the public sector can provide long-term and stable financial support, regulations, price signals, and other mechanisms so that businesses will invest in innovative

solutions and the private sector can become increasingly engaged in further developing and deploying these solutions.

Collaboration has proven effective in management of natural resources, especially where co-operation starts early in resource management planning and strengthens resource valuation and enforcement. Many of the natural resources that underpin economies are overexploited, and policies have often failed to enable their sustainable management. Collaboration can create a shared understanding of the value of natural resources, enable the development of more effective management practices, and support buy-in and help overcome compliance challenges. Ecosystem valuation and related resource management measures (such as payment for ecosystem services) are promising approaches.

Appropriate collaboration can enable development of large-scale green infrastructure as well as distributed systems. Traditional PPP approaches that have proven to work well in areas such as energy, water, transport, and telecommunications can be applied in other green growth areas where large 'public good' infrastructure is needed but cannot be provided cost effectively by governments alone. Infrastructure investments which have a less strong 'public good' character can be initiated by both public and private entities. In particular for small-scale distributed infrastructure investments, collaboration can help to bundle these to overcome financing and weakest link problems, such as for technology deployment by smallholder farmers. Collaboration can also be used to unleash entrepreneurial innovation in new growth areas led by the private sector, as in the case of e-commerce services in the agriculture sector.

The PPC examples reviewed in this chapter have identified several critical factors. Common features that have contributed to success include:

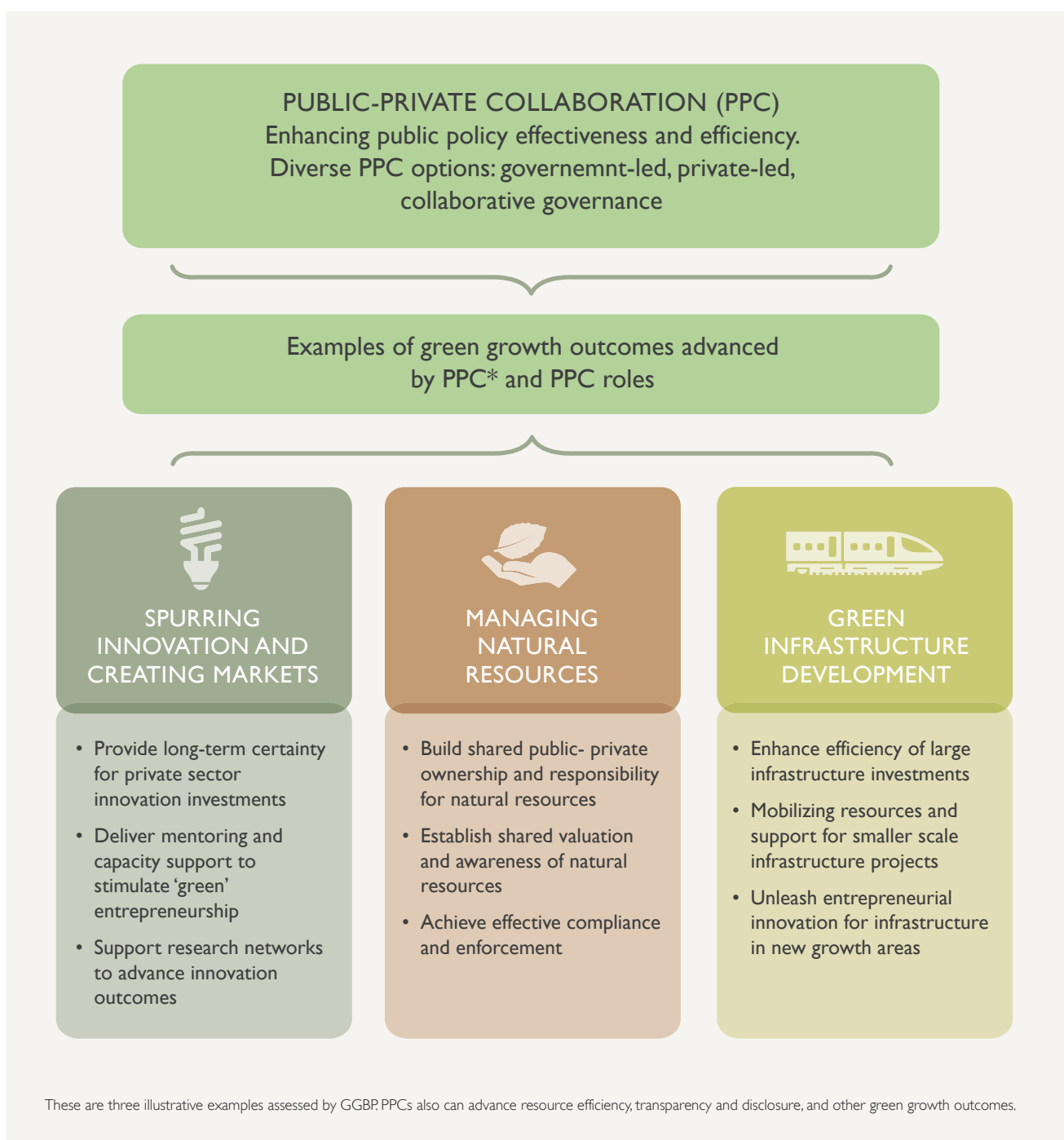
- The establishment of a process or forum that brings actors together in a way that builds trust and enables innovation;
- The development of a shared vision, supported by clear and articulated goals, a clear definition of roles, and responsibilities between collaborators;
- Transparency and accountability within the partnership and of its outcomes; and
- Deep and thorough stakeholder engagement at all stages.

At the same time, **stakeholders should consider and balance the risks, costs, and benefits of any collaboration.** Setting up and governing effective collaborations can require long-term human and financial resource commitments; the cost of

negotiating a fair and transparent arrangement can be high; and the implementation costs can be considerable. These factors should be carefully balanced to ensure sustainability of any potential initiative.

Figure 1:

Examples of green growth outcomes achievable through public-private collaboration



1. Introduction

As noted by Ban Ki-moon, UN Secretary General, at Rio+20, achieving sustainable development and green growth requires an “extraordinary mobilization [...] of corporate leaders, civil society groups, ordinary citizens and others clamoring for change” (United Nations, 2012). This chapter analyzes how public private collaboration (PPC) can achieve such broad mobilization in achieving green growth objectives; and **what PPC approaches have been most successful in mobilizing private sector leadership and action.**

The case for collaboration is that it “creates synergies between governments and private participants, allowing them together to produce more than the sum of what their separate efforts would yield” (Donahue and Zeckhauser, 2011). However, PPCs may not always be successful or the best solution and should be carefully designed. Collaborative initiatives often seek to overcome specific barriers that impede partners’ from achieving their goals. In particular, with increasing resource constraints, governments and business look for support from other stakeholders to overcome barriers such as lack of information, capital, technologies, and skills (3GF, 2012). A PPC may also be specifically driven by the cost-savings potential of contracting private entities to perform tasks at lower costs than the public sector.

This chapter explores how PPC can support green growth, and the lessons and success factors in practice. Studies on green growth (World Bank, 2012; Baietti, 2013; and World Bank and PPIAF, 2012) highlight a number of possible areas where collaboration can support green growth, including innovation, natural resource management, green and climate resilient infrastructure, resource efficiency and productivity, and transparency and disclosure such as green accounting metrics, labels, reporting protocols or standards. This chapter explores three of these areas:

1. **Spurring innovation and creating markets** (section 2) – including mostly public discretion (e.g. Research and development (R&D) innovation stage) and mostly private discretion (e.g. commercialization innovation stage).
2. **Managing natural resources** (section 3) – where collaborations tend to be in the form of shared discretion (e.g. natural resource management schemes).
3. **Development of green growth supporting infrastructure** (section 4) – including both public and private discretion collaborations (e.g. information technology in the agricultural sector).

In addition to these three areas, **enhancing resource efficiency and productivity and enhanced transparency and disclosure** are also important areas for green growth extensively explored in other studies. However, due to space and resource limitations, PPCs in these areas are not addressed in this chapter.

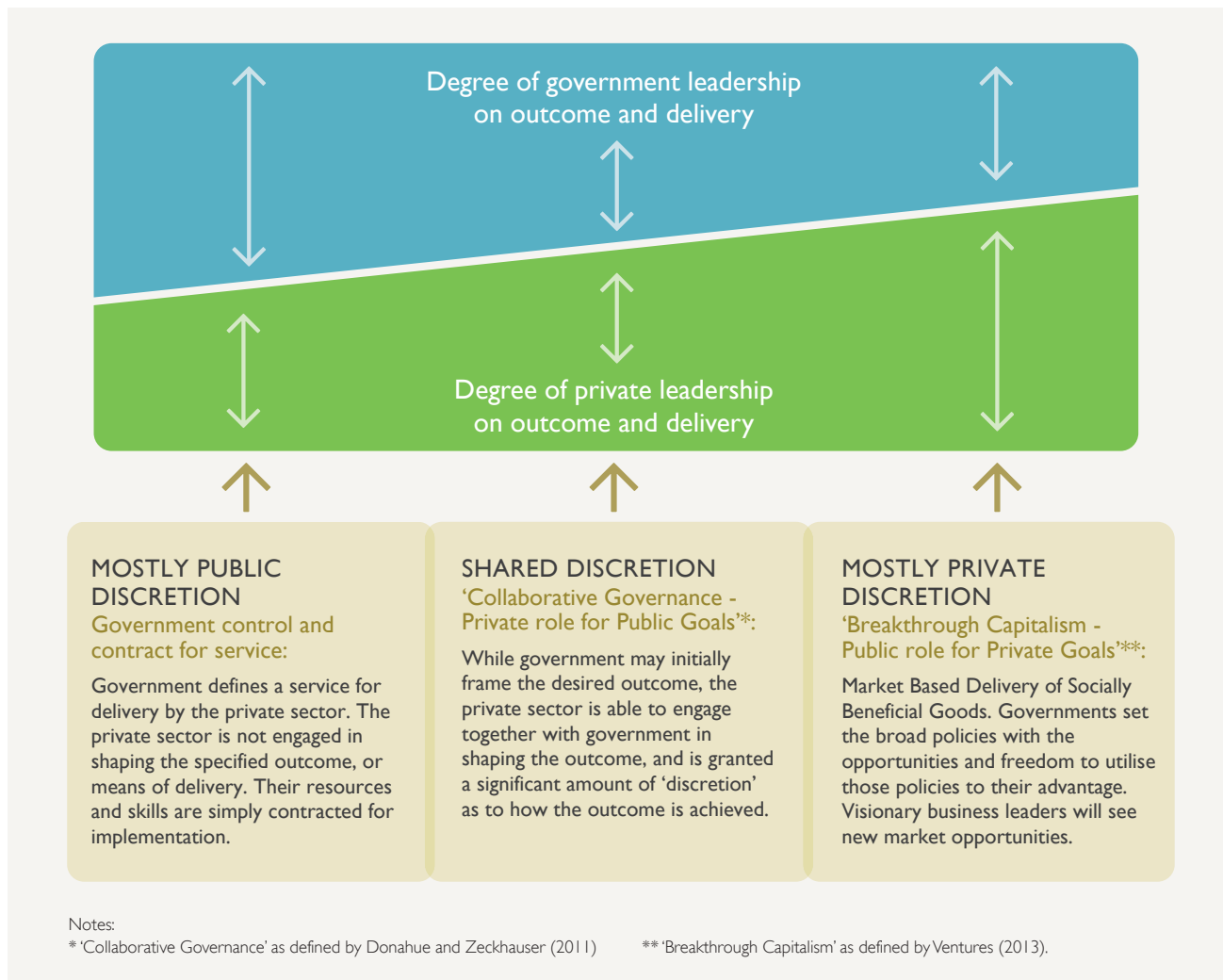
What do we mean by public-private collaboration?

Relationships between government and the private sector can range from economy-wide government policies that set the framework for private investments to project-specific engagements. For the purpose of this chapter, three archetypes of collaboration are considered:

- **Mostly public discretion** (government control and contract for service). These are usually termed ‘public-private partnerships’ (PPPs) and are characterized by contracts and sharing of risks between public and private entities whereby companies design, build, finance, operate, and/or maintain assets or services traditionally provided by government (IMF, 2007; De Vries and Yehoue, 2013; and OECD, 2008). They are most useful when the desired outcome has been identified by government and can be clearly defined in contractual terms. One example is the delivery of state and local wastewater treatment services by private sector actors under contract with US municipalities (Bhan, 2013).
- **Shared discretion** (‘collaborative governance’ with joint decision making). This can be effectively applied when a problem requires broader engagement to coordinate and negotiate actions. For example, Sacramento county officials initiated the *Sacramento Transportation and Air Quality Collaborative* with participation of 48 public and private sector organizations to jointly assess problems, negotiate solutions, and to implement policies (Henton and Melville, n.d.).
- **Mostly private discretion** (scaling-up private leadership through government support). In this situation, businesses and government interaction is at arm’s length through enabling regulations and policies that support business to mobilize resources, skills, innovation, and entrepreneurship. For instance, development of electric vehicles is primarily occurring through private sector leadership, however, government has provided some R&D and infrastructure support (Volans Ventures, 2013).

Figure 2 illustrates how these three archetypes are characterized by different degrees of business and government discretion.

Figure 2:
Forms of public-private collaboration



Cases examined in this chapter include:

Country /Region	Case
Africa	Biodiesel for energy security in West Africa
Brazil	São Paulo's Metro Line 4
Global	Business Innovation Facility – India, Bangladesh, Malawi, Nigeria and Zambia
Global	Pneumococcal Advanced Market Commitment (AMC) and potential application of AMCs in green growth
Global	Forest Stewardship Council
Global	Paying for Methane Emission Reductions as a climate finance pilot

Country / Region	Case
India	Mobile phones and agriculture
India	Punjab Grain Silos
Kenya	Climate Innovation Center
Madagascar	Forest Carbon Credits
Netherlands	Netherlands' innovation agreements
Netherlands	DBFMO contracts for public-private partnership for Highway construction in the Netherlands
United States	Alaska's individual fishing quota
Zambia	Chiansi Irrigation Project

2. Spurring innovation and creating markets

This section identifies four key lessons with use of PPC in advancing green innovation and market development:

1. During the early stages of innovation processes, most of the resource allocation and attention to innovation aspects generally come from public development efforts, while later innovation stages are mainly supported by private development efforts.
2. In order to avoid a 'valley of death' with a halt to the innovation process, the public sector can provide greater certainty through long-term and stable financial support, regulations, price signals, and other mechanisms. These will incentivize businesses to invest in innovative solutions and the private sector can become increasingly engaged in further developing and deploying these solutions.
3. The public sector can support 'green' entrepreneurs through the provision of mentoring and capacity support. It can further provide support for the green transformation of existing industries.
4. The government can furthermore act as a facilitator and connector of research institutions and actors to enable effective collaboration and optimal research outcomes throughout the innovation process.

Public private collaboration can play a key role in enabling the movement of new ideas and technologies from the lab (R&D) to the market (commercial maturity). Innovators face challenges in each stage when trying to advance their ideas, technologies, or business solutions (BNEF, 2010) and effective PPCs could address these (Jenkins and Mansur, 2011). Industrial innovation processes require a long period of learning, network building, and policy support (Van der Gaast and Begg, 2012), and therefore it is important to note that along the innovation chain, different *forms* of collaboration may be required.

Public investment is common in early stage of R&D because of well-known market failures in which private investors tend to underinvest as the private benefits of new knowledge are less than the social benefits (Corfee-Morlot et al., 2013). Typically, therefore, during the early stages of innovation processes, most of the resource allocation and attention to innovation aspects come from public efforts, while later innovation stages are mainly supported by private development, often led by forward-thinking businesses and supported by enabling government policy.

A 'valley of death' phase has been identified at the cross-over between public and private efforts, where perceived risks, limited familiarity of the private sector with a technology, or an inefficient enabling environment can prevent a technology scaling up (Van der Gaast and Begg, 2012).

There are two parts to the 'valley of death'. The first part is in the development of private sector research and innovation. While most large companies are able to invest

in R&D, they tend to specialize in incremental rather than radical innovation (with the exception of a few fast-moving industries such as IT and telecommunications). In a mature sector, incumbents tend to favor investment in R&D that serves existing markets and are more reluctant to make large investments in uncertain markets.

The second part of the 'Valley of Death' is during early commercialization or deployment, where innovators face challenges in scaling up their products or processes. In this stage, the role of the public sector is to help provide greater certainty through long-term and stable financial support, regulations, price signals, and other mechanisms.

The two parts of the 'valley of death' and the appropriate PPC approaches are discussed below. Further discussions on financing innovation and innovation policy are available in [Chapter 6: Mobilizing investment](#) and in [Chapter 5: Policy design and implementation](#) respectively.

2.1

Stimulating R&D and innovation

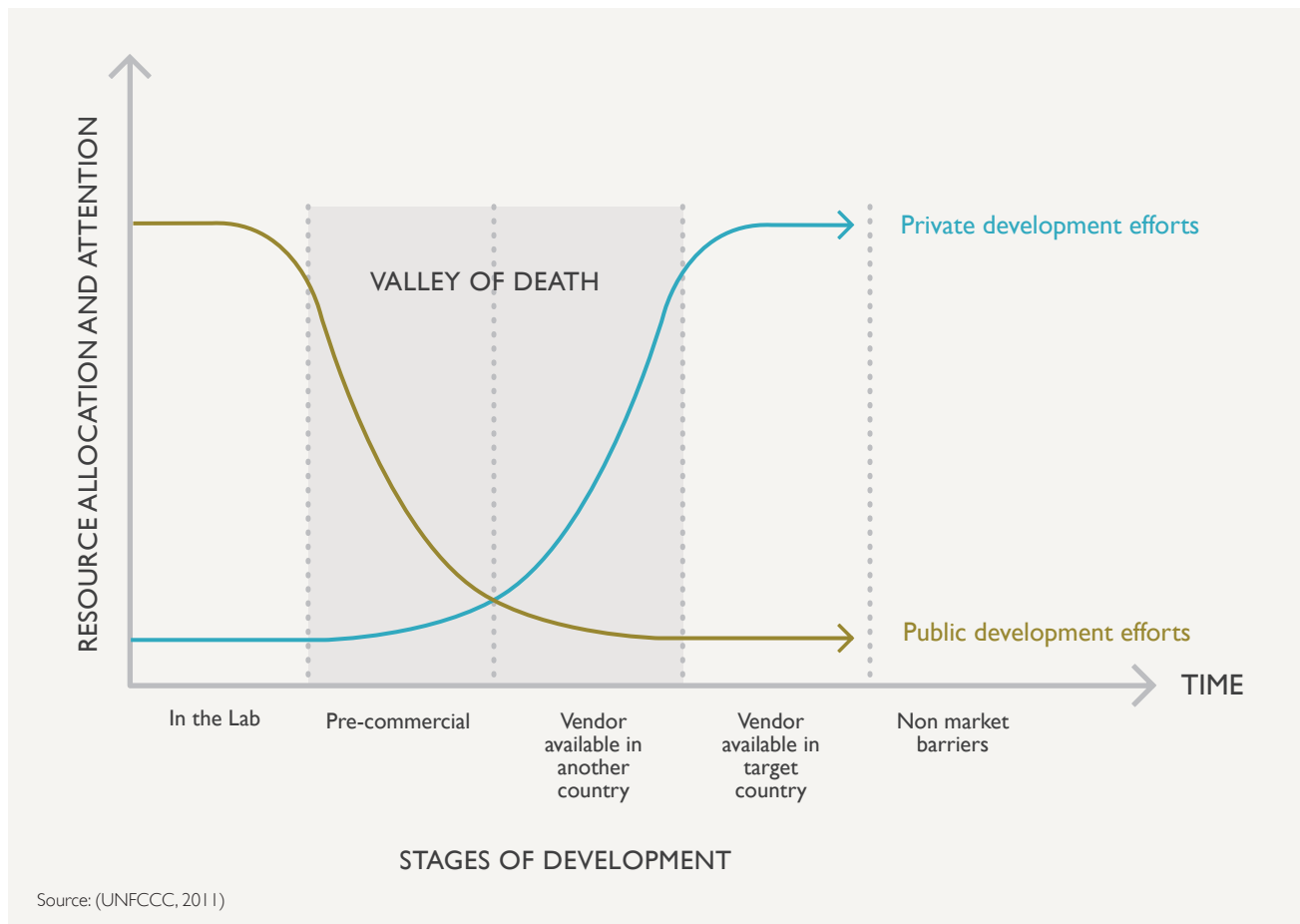
Government support for R&D in green technologies can help bring forward innovation and technology breakthroughs and reduce the costs and the risks of private sector investment in new technologies.

Mechanisms to support long-term investments in innovative technologies and business can include grant or research funding, subsidy mechanisms, innovation agreements (as outlined in Case 1), tax credits or deductions for private R&D investments and support mechanisms such as innovation facilities. Less common but increasingly used are challenge funds, prizes, and advanced market commitments.

Collaborative initiatives can also support the creation of enabling environments and networks for successful innovation through the availability of finance, support for firms and appropriate policy frameworks to create and sustain innovations that are applicable to the local context and build local capacity for local technologies. This is especially important for developing countries, where innovation and deployment are often hampered by weak institutional systems for protection of intellectual property and lack of sufficient physical infrastructure. An example of this approach are the UNFCCC-backed Climate Innovation Centers, which build local capacity, provide support for firms, facilitate finance, and advocate for enabling policies (see Case 2).

In addition to spurring innovation by creating an enabling environment, governments may need to pay special attention to building capacity of small- and medium-sized businesses to develop and deploy green technologies and systems. Small and medium-sized enterprises (SMEs) in many fields lead the way in developing new innovations (EC, 2005 and Bárcena et al., 2013). At the same time, SMEs may lack expertise to manage commercial risks or scale their businesses.

Figure 3:
Valley of Death Concept



Case I:

Netherlands innovation agreements

In the Netherlands, companies, research institutes, universities, and the government collaboratively drafted contracts to stimulate innovation and improve economic competitiveness. These contracts set sector-wide research agendas, commit participants to invest financial and human capital towards R&D and describe measures, plans, deals, and targets. The government has such contracts in place within nine sectors: agrifood, horticulture, high-tech, energy, logistics, the creative industry, life sciences and health, chemicals, and water (Bunzeck, 2013).

A 'Top Consortium for Knowledge and Innovation' develops a research agenda, establishes collaboration

between participating actors, and disseminates knowledge to develop innovative products, services, and technologies. The government co-funds innovation by top consortia and invests EUR 0.25 for every euro invested by a company (Rijksoverheid, 2011). This approach has proven effective, although recent EU Council recommendations warn that the "focus on 'top sectors' should not come at the cost of fundamental research nor exclude innovative firms not in one of the 'top sectors'" (EC, 2012).

Case 2:**Kenya Climate Innovation Center (CIC)**

Climate Innovation Centers (CICs) aim at supporting UNFCCC goals and providing comprehensive support to climate technology innovators from incubation, including seed financing facilities, specialized policy interventions, network linkages, technical facilities, and business training. Recognizing different countries may have different needs and gaps in their innovation systems. Each CIC needs to be tailored to the local context, involving local stakeholders in the design and implementation. The first CIC opened in Kenya in September 2012, with the aim of providing “incubation, capacity building services and financing to Kenyan entrepreneurs and new ventures that are developing innovative solutions in energy, water and agribusiness to address climate change challenges” (CIC Kenya, 2012). The Kenyan CIC aims to create tangible impacts in its first five years, with projections of creating over 70 sustainable climate technology ventures, generating 4,600 direct and indirect jobs, mitigating 1.5m tCO₂ emissions, providing 1 million people access to electricity and 440,000 people access to water and increasing the agricultural efficiency of 22,000 farms (Crawford, 2012; InfoDev, 2010; and Sagar, 2011).



Bárcena et al., (2013) summarize innovation challenges that SMEs face in Latin America, the Caribbean and the EU. The private sector in these regions identified product and process innovation as the highest priority. While differences in emphasis by region could be observed, key areas identified for supporting innovation capacities are: training of people (to improve products and services and management skills), creating infrastructure (e.g. promoting use of information and communications technology (ICT)), and establishing stronger linkages between business and technology research centers (e.g. use of business incubators, science and technology parks) (Bárcena et al., 2013). This suggests that often the barriers are not financial.

An example of how governments can stimulate more radical innovations through non-financial, strategic support is the UK government's Business Innovation Facility program (BIF). It provides advice and technical assistance to support businesses in tackling environmental and social challenges (see Case 3).

Based on the above examples, two factors stand out that require attention when supporting innovation in developing economies. Firstly, due to weak institutional systems to facilitate and promote innovation, there is no enabling environment in many developing countries (López-Claros and Mata, 2011 and Ulku, 2011). Secondly, until recently market

demand from consumers in developing countries is not as 'visible' to innovators as compared to that of consumers from more affluent regions (Pralhad and Hart, 2002). Donor organizations and foundations, such as BIF, are increasingly targeting this issue through support mechanisms for business-led environmental or social innovation in developing countries. As with other donor capacity building initiatives, ensuring sustainability over time is a major challenge.

2.2**Providing greater market certainty for deployment**

As technologies mature beyond R&D, support mechanisms could become less generous as costs fall. Overcoming the “valley of death” stage requires credible mechanisms to encourage the deployment of maturing technologies. Creating market certainty for private companies at this stage is particularly important. Investors require “long, loud and legal” policy frameworks to unlock capital for green growth (Hamilton, 2009). This implies policies that are *long-term* to provide sufficient investment certainty, *'loud'* enough for a measurable impact on investment decisions (i.e. frameworks should make a real difference), and *legally* sound, building

Case 3:**Supporting innovators: Business Innovation Facility**

Funded by the UK Department for International Development, the Business Innovation Facility (BIF) has piloted an approach to provide advice and technical assistance to business models that advance social and environmental objectives. BIF technically supports hands-on engagement with companies, drawn from a vast network of national and international experts. Over 90 projects have been implemented in Malawi, India, Zambia, Bangladesh, and Nigeria.

While the approach is resource and time intensive, and its hands-on nature relatively expensive, BIF's impact on the businesses it supports, and other market players that might adopt or adapt similar business models, can be transformational (BIF, 2014). Key to the success of BIF is that it was tailored to developing country needs.

confidence and ensuring that investments are protected. Meeting these requirements contributes to investment risk reduction for entrepreneurs, which helps unlock private sector investment in R&D and innovation. Public funding can be used as leverage for attracting private funding for further technology development and deployment (Nassiry and Wheeler, 2012).

The OECD has developed a five-point *Green Investment Policy Framework*, a non-prescriptive tool to help governments mobilize private investment in low-carbon, climate-resilient infrastructure by establishing "investment grade policies" (Corfee-Morlot et al., 2013). Although the tool is not solely focused on R&D and innovation, it describes the wider range of public measures, which can enhance certainty for private investments during the different R&D and innovation stages. The five points of the tool are:

1. Set clear, long-term strategic policy goals, and align them across and within levels of government;
2. Implement policies and incentives to support low-carbon, climate-resilient investment;
3. Provide the right financial instruments to help leverage private investment and access to financing;

Case 4:**Pneumococcal Advanced Market Commitment**

The pneumococcal Advanced Market Commitment (AMC) incentivizes vaccine makers to produce suitable and affordable vaccines for developing countries. The AMC works by donors committing funds to guarantee the price of vaccines once they have been developed. These financial commitments provide vaccine manufacturers with the incentive they need to invest in vaccine R&D, to expand manufacturing capacity, and a confidence in the market. In exchange, companies sign a legally-binding commitment to provide the vaccines at an affordable price to developing countries in the long-term. Once the market has reached critical mass and becomes self-sustaining, AMCs can be withdrawn.

Source: (GAVI Alliance, 2013)

4. Harness resources and build the capacity for action, including R&D for green technology, and human and institutional capacity building to support innovation; and
5. Promote greener consumer and business behavior and build demand for green technologies and services through education, awareness, labeling, and similar programs.

Advanced market commitments (AMCs) are one type of collaboration that develops innovative solutions (Edwards et al., 2011; Müller et al., 2012; and Edwards, 2010). Through AMCs private companies are guaranteed a price and market as an incentive to invest in technology R&D. Case 4 shows an example of how the Pneumococcal Advanced Market Commitment has proven to be a successful model for supporting pharmaceutical R&D investments.

AMCs can be used to spur green growth and action on climate change, as described in the example below for methane abatement (see Case 5), whereby a pre-commercial technology is supported by generating additional upfront revenues.

Case 5:**Paying for Methane Emission Reductions as a climate finance pilot**

The project 'Using Pay-for-Performance Mechanisms to Finance Methane Abatement' explored how public funds may be used to encourage reductions of methane emissions by making payments to project implementers based on independently verified emission reductions measured in terms of CO₂ equivalent. The project was carried out by an international group of experts, the Methane Finance Study Group, facilitated by the World Bank.

The suggested approach builds on accounting procedures developed for carbon offset standards such as the Clean Development Mechanism (CDM), the Verified Carbon Standard and the Climate Action Reserve. The level of funding that each project will receive is determined through

Source: (Methane Finance Study Group, 2013)

a competitive auction, guaranteeing the lowest possible cost to the funder. The report discusses various implementation options for the payment program, such as multi-donor funding, bilateral programs or a specialization of the Green Climate Fund's private sector facility.

As part of the project, using the pay-for-performance concept, immediate opportunities could be found to some of the 1,200 new methane mitigation projects that were initiated but not implemented, under carbon offset standards in developing countries. This representing at least 850 Mt of CO₂e in emission reductions over the period 2013–2020. These opportunities could be utilized in the form of a pilot program, as suggested by the project.

3. Managing natural resources

This section identifies three key lessons for the use of PPC in managing natural resources:

1. Collaboration between the private and public sectors early in resource management planning can support strong buy-in and compliance.
2. Natural resource valuation can serve as a powerful tool to engage private sector entities and local community groups in supporting natural resource management and viable enforcement regimes.
3. Building awareness and understanding by businesses (and others) of natural resource constraints and the benefits of wise resource management is of vital importance.

Natural resources, including mineral and energy sources, soil resources, water resources, and biological resources, underpin economies, but tend to be overexploited due to market failures that result in them being undervalued (MEA, 2005). An important challenge is to internalize the environmental, social and economic costs of natural resource degradation into the market price of goods and services which use them (IPCC, 2001 and Bishop, 2012). Other problems are lack of strong policies to protect resources and insufficient funding to effectively implement policies where they exist (MEA, 2005).

At the same time, the need to conserve natural resources, the risks associated with their disappearance, and opportunities for sustainable use and management are increasingly recognized (Bishop, 2012). Recent surveys have shown that businesses recognize direct impacts from declining biodiversity on their operations. A 2010 survey of 1,200 CEOs found that 27% were either 'extremely' or 'somewhat' concerned about 'biodiversity loss.' More than half of the survey respondents felt that governments alone do not effectively protect biodiversity and ecosystems (WEF, 2010).

Government policies tend to control access to common resources through quotas, tradable permits, allocation of access rights, or strict conservation measures to prevent access. Too often, however, such public sector-led approaches have been relatively weak in terms of achieving goals. This has partly been due to limited private sector buy-in which reduces compliance with targets, and limited government capacity to monitor and enforce schemes. Therefore, it has been argued that natural resource management policies can become more effective when public and private entities collaborate (Kurian et al., 2002 and Uddin and Hamiduzzaman, 2013). The increased private recognition of the benefits of natural resource protection enhances the scope for collaboration (BSR, 2013).

The 2011 Aichi Targets for Biological Diversity underline the importance of participatory planning, knowledge management, and capacity building “with the full and effective participation of indigenous and local communities, at all relevant levels” (CDB, 2011). The example of Irrigation Management Transfer (Kurian et al., 2002) shows how decentralized development approaches (with more management responsibilities for farmer’s groups or other private sector groups) potentially improve irrigation systems, enhance sustainability and reduce detrimental environmental impacts of irrigation management. According to Kurian et al. (2002), public irrigation agencies have fewer incentives to optimize management performance than farmers who have a direct interest.

Newborne (2012), however, points out that transferring natural resource management tasks to private entities may also lead to negative allocation consequences. The specific role of the private sector in natural resource collaborations should therefore be carefully considered. The example of water management in developing countries shows that engaging for-profit companies in water management could result in private business entities “occupying local water rights”. Therefore, Newborne (2012) argues that alongside private involvement, the public good characteristic of water must be secured.

3.1

Collaboration to enhance buy-in and enforcement

As noted above, even where natural resource management laws and policies exist, effective outcomes are not guaranteed. Responsible officials often lack the capacity to effectively monitor and enforce policies and regulations in place (Cross et al., 2013), resulting in governance gaps and suboptimal resource management. Effectively engaging with the private sector as a collaborator in sustainable resource management rather than seeing them as pure ‘takers’ of government policy can help overcome this challenge. Governments and the private sector can collaborate to develop a shared understanding of the benefits and costs of sustainable natural resource management and work together to design policies and monitoring and enforcement.

For example, Brazil’s National System of Conservation Units in Brazil requires companies to make offset payments to state authorities when carrying out environmentally high-impact projects. The revenues are used for the creation of protected areas to address the loss of habitat and biodiversity. However, state capacity to monitor and maintain the conservation areas is constrained. Some companies have developed more collaborative relationships with state authorities, working together to integrate the protected area as part of the spatial planning of the project,

so that the companies themselves can contribute to ongoing maintenance and monitoring of the area (WBCSD, 2012).

The World Business Council for Sustainable Development sets out useful principles for collaboration in natural resource management policy design:

- **Establish clear, shared goals that reflect resource value.** Governments and businesses, along with community groups, should work together to understand the full value of the resource for economic, environmental, and social development. Based on this common understanding of the value, shared goals can be established for resource management to optimize efficient resource use and conservation.
- **Design and implement key policy mechanisms and instruments** that create incentives for sustainable resource management. Resource use and protection standards, financial incentives, disclosure programs, education and consumer awareness, and labelling and award programs can all be used to create strong incentives for businesses to steward resources in partnership with governments.
- **Monitoring and enforcement** of resource management and use by all actors should ensure transparency, accountability and accuracy of process evaluation through adequate indicators and their measurement, verification and reporting. Governments should maintain their independent enforcement authority while also promoting self-enforcement and reporting by businesses.
- **Continuous co-ordination and re-alignment as resource conditions and demands change.** Effective management of natural resources requires dynamic processes to coordinate action among all public and private actors and to continuously re-evaluate resource conditions and demands and adjust policies and programs as needed. (WBCSD, 2012)

Successful implementation of this approach is seen in the case of the Alaskan Halibut Fisheries management scheme (see Case 6). In this case, close collaboration between government policy makers and private fishing vessel owners in the design and implementation of the fisheries management scheme has made Alaska’s fisheries one of the most sustainable in the world. This was achieved through development of a robust multi-stakeholder process and through collaboration in the enforcement mechanisms associated with the scheme.

The development of the Forest Stewardship Council (FSC) standards represents another example of how collaboration can advance sustainable natural resource management. A broad international multi-stakeholder process resulted in global, national, and regional sustainable forestry standards, as well as a broader support network to share

Case 6:**Alaska's individual fishing quota**

Alaska is long renowned for its successful fisheries management practices, which has resulted from long-term collaboration between government policy makers and private fishing vessel owners to design a scheme that meets rigorous environmental standards, while enabling the industry to thrive. During the 1970s and 1980s, Alaskan fisheries saw an important increase in capacity, with an open access fisheries policy and an increased number of vessels entering the area. To avoid overexploitation of stocks, the fishing season was reduced from nine months to 2-3 days in the 1990s. While this ensured maintenance of a sustainable catch level, it led to a number of other challenges including conflicts between vessels, poor fish quality, low product value, and small amounts of fish available for the fresh market.

After the industry raised concerns about this management approach, a new system was established, based on a fishing rights-based approach that sees the allocation of transferable individual fishing quotas, differentiated by vessel size to enable smaller-scale private players to maintain operations. To ensure compliance with quota allocation and provide scientific data, an 'Observer Program' places government scientific experts on fishing vessels. From the beginning of the fisheries management approach until implementation, vessel owners were actively engaged, supported by strong government monitoring and enforcement mechanisms. This combination has resulted in the program's successful long-term implementation (MRAG, 2010).

information, support forest certification, verification, and capacity development (FSC, 2013). As of February 2014, the government agencies, private companies and other actors have jointly certified over 180 million hectares of forest across 81 countries (FSC, 2014).

In the Nzoia River Basin Management Initiative in Kenya (NRBMI) private and public entities have developed a "collective vision that 'sustainable and equitable water resources will be enhanced through a process that recognizes the river as a unit and embraces local initiatives, while simultaneously adopting an integrated and ecosystem approach to basin management.'" (Water Resources Management Authority, n.d.).

An important goal of developing a joint public and private vision on natural resource management is to mutually agree on the value of a resource and how to protect it. Involvement of private sector entities in this valuation is important to support recognition of the full longer term value of a natural resource that they use. Bishop (2012), for instance, explores the role of the private sector in valuing the ecosystems they use and from which they derive benefits. He describes, the example of the Biodiversity Risk Matrix designed jointly by Holcim and the International Union for the Conservation of Nature to assess the potential impact of Holcim's operations on biodiversity at a local, national, and global level (Bishop, 2012).

One means of mobilizing private sector resources for natural resource management has been in the development of tradable carbon emission reduction, and ecosystem services certificates in relation to land use, land-use change and forestry projects in developing countries (Case 7). Similarly, but with a broader scope, payments for forests' ecosystem services, UN (2013) are an additional PPC opportunity for jointly valuing forest management activities.

These examples illustrate how collaboration can support natural resource management, without claiming that PPC will be successful in all such situations. Several conditions can be identified that will determine whether a collaborative approach is appropriate to pursue natural resource management, including: 1) existence of shared ownership and responsibility for natural resources; 2) willingness of both the government and the private sector to develop a common agreement on valuation of the resources; and 3) interest in engaging in long-term collaboration on natural resource management.

Case 7:**Madagascar Sells First Forest Carbon Credits to Microsoft**

On 12 February 2014, the Wildlife Conservation Society announced that the Government of Madagascar approved carbon sales with Microsoft, the CarbonNeutral Company and Zoo Zurich. The carbon credit sales will support the government's REDD+ Project in the Makira Natural Park and mark the first sale of government-owned REDD+ credits in Africa.

Through carbon credit sales from avoided deforestation, the Makira REDD+ Project will finance the long-term conservation of one of Madagascar's most pristine remaining rainforest ecosystems harboring rare and endangered plants and animals. It will at the same time improve community land stewardship and support the livelihoods of the local people.

Source: (Wildlife Conservation Society, 2013)

4. Enabling green infrastructure and systems

This section identifies three key lessons for the use of PPCs in advancing investment in green infrastructure:

1. Governments can use traditional PPP approaches that have proven to work well in areas such as energy, water, transport, and telecommunications in other green growth areas where large 'public good' infrastructure is needed but cannot be provided cost effectively by governments alone.
2. PPCs can also play a critical role in advancing infrastructure development for smaller scale distributed systems, such as that to support smallholder farms, where they seek to overcome financing and other weakest link problems. In cases where infrastructure investments may only benefit certain segments of the population, they can be initiated by both public and private entities, but still benefit from bundling of support.
3. PPCs can also be used to unleash entrepreneurial innovation in building infrastructure in new growth areas led by the private sector, as in the case of e-commerce services in the agriculture sector.

Development of green infrastructure is fundamental to green growth (Baietti, 2013). As infrastructure investments often have public good characteristics, effective infrastructure supply often requires government intervention. In the case of infrastructure investment for smaller scale distributed systems, there is less of a public good characteristic, and new markets could be initiated by both the public and the private sector. However, collaboration is often important for success.

4.1

Large-scale infrastructure collaboration

Public private partnerships have been increasingly used to finance and operate infrastructure developments. Japan had its first PPP examples in 1987; the UK Private Finance Initiative was initiated in 1992. Governments can draw from experience and lessons, good and bad, from over 25 years of investments in large-scale infrastructure with contract-based PPPs in areas such as energy, water, transport, and telecommunications (Garvin and Bosso, 2008). Possible benefits for the public partner in a large-scale infrastructure PPP is that a task can be fulfilled at lower costs and paid for over time, with the upfront investment provided by the private partner. If user revenues are enough to cover the investment and operation costs, government expenditure may not be required at all (Martins et al., 2011; UNESCAP, 2011; and Jooste and Scott, 2012).

PPP tendering processes may also help remove barriers to infrastructure innovation as infrastructure markets are traditionally monopolistic, with very high entry barriers, creating a lack of incentive for incumbents to embrace new technologies (Corfee-Morlot et al., 2012).

Private engagement takes place in different stages of infrastructure development: design, construction, financing and operation (Alfen et al., 2009; Kaminker et al., 2013; and Kaminker and Stewart, 2012). When designing and implementing the expansion of infrastructure, public authorities must make key decisions between public and private provision of the infrastructure or some combination of both. This can include using PPC mechanisms, and elaborating on principles for private sector participation in infrastructure (OECD, 2007).

For instance, a government could contract a private consultant to develop an infrastructure investment or perform funding, building and maintenance tasks. It could also develop more holistic concepts such as 'Build-Operate-Transfer (BOT)', 'Build-Transfer-Lease (BTL)', 'Design-Build-Finance-Maintain-Operate (DBFMO, see Case 8)' or 'Build-Operate-Own (BOO)' (Alfen et al., 2009). These models differ in terms of ownership and to whom project revenues accrue. For selecting a PPC form with the highest value-for-money for taxpayers and end-users, the following aspects can be considered: effectiveness of current government infrastructure initiatives, governance strength of state-owned enterprises responsible for infrastructure development and operation, and implementation challenges that public authorities may

Case 8:

DBFMO contracts for highway construction in the Netherlands

DBFMO is a contract form where the Design, construction (Build), Finance, Maintenance and possibly the Operation of a project are integrally transferred from the government to a private party. The private party is usually a consortium of several companies providing all project services during its entire lifespan, including the funding. The consortium can sometimes be (partly) compensated by user fees, for example in the case of a railway or a toll road or fees from the government on the basis of performance during the full lifetime of the project.

In the Netherlands, several road, rail and canal projects are carried out through DBFMO contracts. An example is the N31 highway in Fryslân, where two extra lanes were constructed by the Wâldwei consortium during 2004-2008. Until 2022, the consortium will be responsible for the management and maintenance of the road. An assessment showed that contracting private entities for this infrastructure task would result in a 21% reduction of the total costs during the lifecycle of the project compared to a situation in which the task would have been performed by a public entity (Ministerie van Financiën, 2012).

face if a PPC route is selected instead of a government-driven program (Beltramello et al., 2013).

However, in terms of cost-effectiveness and value-for-money, PPP could also induce higher costs than government action due to, for instance, the private sector's higher cost of borrowing. In order to check whether PPC delivers 'value for money' for taxpayers, tools such as the *Public Sector Comparator* may be used before tendering (Alfen et al., 2012; ADB, 2012; and Burger and Hawkesworth, 2011). The literature also highlights that many governments have failed to take full advantage of the PPP mechanism owing to a lack of public sector expertise in the identification and procurement of projects with PPP potential (OECD, 2010).

Case 9 shows an example from Brazil of a large-scale public transport infrastructure project (using BOT concept), which serves as an example of a 'traditional' PPP on infrastructure investments. The example shows that the application of PPP in this infrastructure development project could not, due to flaws in the design of the partnership, prevent considerable delays with the project completion. It also describes how such delays could be avoided in the future through an improved PPP design. PPPs can be used to procure a wide range of social infrastructures, such as community sanitation, agricultural facilities, government offices, education, or health services (see Case 10).

The success of infrastructure PPPs depends on conditions such as the creation of an (internationally) open investment environment for private sector participation in large infrastructure investments, dismantling unnecessary barriers to private sector entry in the bidding process, and implementing and enforcing adequate competition laws (OECD, 2007).

4.2

Small and distributed systems and new growth areas

The larger scale infrastructure investments discussed above could generally be characterized as public goods to be initiated by the public sector and performed contractually by the private sector. This section, instead, focuses on infrastructure investment examples for smaller scale systems and for new markets which could be initiated by both the public and the private sector and where collaboration is often important for success. Examples include irrigation systems for smallholder farmers, infrastructure development for production and distribution of biodiesel, off-grid rural renewable energy, and the use of ICT infrastructure within the agricultural sector in developing countries. Such distributed investments, which may not be commercially viable for private investors but still economically and socially desirable, could be supported by the government through, for instance, land acquisition, financial support, favorable regulatory arrangements, or risk sharing (UNESCAP, 2011).

Case 9:

São Paulo's Metro Line 4

Strong population growth in São Paulo's periphery coupled with a lack of employment in these areas has led to long and overly crowded commutes between the city's suburbs and the urban centres. Metro line 4 addresses this need and was implemented through a 30 year operating concession to a consortium of private companies and a separate contract for the construction of line.

However, delays in the approval of the PPP law by the State of São Paulo meant that the original plan to have one concessionaire execute all works and acquisition of equipment and system was replaced with a separate procurement of civil works and electrification (World Bank, 2012). Based on this negative experience, it has been recommended that in the future, for similar projects, it would be better to entrust the full project implementation and operation to a concessionaire selected on an open and competitive basis (World Bank, 2012).

The line-4 project has demonstrated that PPPs could be viable for urban rail in Brazil, but that due to the high and intrinsic complexity of major infrastructure projects implementation problems and delays may occur. The project has shown that very stiff penalties for construction delays are needed, and that there should be a clear mechanism and responsibilities for handling unexpected changes in the project design (Rebelo, 2012).

Case 10:

Punjab Grain Silo in India

In recent times, the increase in food prices due to threats to food security and huge losses of nutritional value from insufficient and inadequate public-owned storage capacity for rice and wheat has been a growing concern in India, leading to violence and instability in some areas. In order to prepare for increasing food demand and food shortage, the government of Punjab state, with the assistance of the International Finance Corporation (IFC), decided to build state-of-the-art, long-term steel storage silos through a public-private partnership scheme. In July 2010, LT Foods limited, an Indian grain exporting, commodity trading and handling company, bid on the first pilot project to build silos with a 50,000-ton-capacity. LT Foods will finance, build, own, operate and maintain grain silos for 30 years. The project became operational in March 2012 and this PPP model is now being replicated in other states in India and Pakistan (IFC, 2013).

Collaboration to enable technological upgrading by smallholder farmers is particularly important for green growth. It is estimated that there are 400 to 500 million small farms, supporting two billion people (Conway, 2011). Agricultural development for smallholder farmers is a classic 'weakest link' problem, in which each individual player depends on many others to succeed. For example, a fertilizer company will not invest in developing distribution channels targeting smallholder farmers, if those farmers lack access to financing or to markets for the extra output they could produce.

Collaborative initiatives can contribute to overcoming the weakest-link problems and reach scale thresholds to make finance available. The Chiansi Irrigation Project in Zambia (see Case 11) is an example where public and private players are working together to make financing available for an irrigation system for smallholder farmers. The key to success in this case was an innovative governance model that bundled financing needs from many smallholder farmers, and combined capital from the international public sector effectively with the expertise and entrepreneurial capacity of private companies. Additionally, to ensure broad buy-in and equitable

representation, the governance arrangements allowed access to decision-making for smallholder farmers, a commercial agriculture company, and the local authority.

Case 12 opposite is another example of a small-scale collaborative project to enhance energy security in Mali and Burkina Faso with help of low emission energy technologies. In this project, the government provides support to the private sector through the provision of an infrastructure for production and distribution of biodiesel, providing a market to farmer cooperatives and supporting energy security.

Developments in ICT, in particular the growing use of mobile devices is a key area of public private collaboration towards green growth. OECD (2010) and Dutz and Sharma (2012) emphasize how such innovation helps decouple growth from natural capital depletion and environmental pollution and how innovative tools and approaches can increase resilience to environmental shocks.

In their joint initiative, FAO and the World Bank (2012) highlight the importance of ICT to improve land management and land use planning in agriculture, make farming practices more environmentally sustainable, get climate-smart



Case 11:

Chiansi Irrigation Project in Zambia

The Chiansi project area has long been characterized by poverty and under-utilization of available resources such as land, labor, and water. The abundant source of water from the nearby Kafue river would be able to transform the livelihoods of subsistence farmers reliant on rain-fed irrigation flows. The barrier was that small-scale, poor farmers could never afford the upfront costs of the irrigation system infrastructure that could make this water available to them. Neither was there the local capacity to design, finance, and implement such a system. Therefore, even though smallholder farmers hold water rights, they were not able to utilize these rights. The core idea of the Chiansi project is to provide irrigation to the smallholder farmers to support commercial-scale farming. An initial successful pilot project of 156 hectares is being scaled up to over 1700 hectares. This model is also being considered for other parts of Zambia, and Africa more widely.

The Chiansi irrigation project was brought to fruition because of collaborations between the public and private sectors. The actors on the public side, being international donor entities and the government of Zambia, were brought together by innovative private sector actors such as development finance specialists in London and African development project specialists.

Source: (Palmer et al., 2010)

Case 12:**Biodiesel for energy security in West Africa**

Farmers' cooperatives in Mali and Burkina Faso integrate the Jatropha plant, which can be used for the production of biofuel, into their production systems. Jatropha is grown on unproductive land, thus avoiding a conflict over food and fuel production and doing no harm to food security. Biodiesel is produced by a private company, MBSA, which has also set up local foundations in both countries aiming to strengthen farmer capacity.

The governments of Mali and Burkina Faso have created an enabling environment for foreign and national private investment, and support in the form of technical services. In this way, more than 10,000 smallholder farmers could benefit from the co-operation with MBSA. The collaboration between the private and public sectors has thus been vital for the success of the project (IFAD, 2013).

Case 13:**Mobile phones and agriculture**

Agricultural productivity levels can vary widely from country to country. India, for example, is the second largest producer of cotton after China, but yields only one third of those in China. Many factors may contribute to differences in productivity, including lack of access to finance to invest in more productive technologies, insurance to manage weather risk, and small farm size. Another possibility is that farmers lack information about increasing their crop productivity. An alternative to traditional agricultural extension services is to deliver agricultural information to farmers via low-cost information and communications technologies like mobile phones. There are also an increasing number of examples, most notably in Africa, of using mobile phones to deliver a range of financial services such as payments, credits, insurance, and savings. Success stories seem to be scalable and transferable across countries, as evidenced by the experiences in Africa and also the adoption in India of mobile finance approaches first proven in Africa.

Source: (Foodtank, 2013)

agricultural information to and from farmers, and support climate adaptation and risk management in agriculture (see also Conway and Waage, 2010). The example of the use of mobile phones in agriculture shows how private sector commercial technology is applied for rural economic development (see Case 13). While the leadership in these collaborative initiatives primarily comes from private sector actors, the public sector plays a critical enabling role such as in the sale of spectrum rights, issuing of licenses to mobile operators, providing trusted information, and protecting consumers.

The aforementioned examples show how public sector involvement in infrastructure investments for small and distributed services and new growth areas such as ICT can enable more vulnerable groups to also benefit from these services. Dutz and Sharma (2012) conclude from empirical analysis that frontier green innovations are mainly concentrated in high-income countries, with innovations in most technology-sophisticated developing countries limited to a few technology fields, and innovation to meet the needs of poor consumers almost completely absent. Collaboration could strengthen skills and improve a country's business environment for innovation, support technologies for neglected problems, facilitate technology access, and stimulate technology absorption by firms. Demand can be spurred by public procurement, regulations and standards, and can also help strengthen skills and improve a country's business environment for innovation. Important conditions for successful collaboration in this area, as identified in this section, are that innovative governance models exist to bundle financing needs from (e.g., smallholder farmers) and to combine capital from the public sector with the expertise and entrepreneurial capacity of private companies. Moreover, the success of collaboration in small-scale infrastructure can be further enhanced by allowing access to decision-making for relevant stakeholders including smallholder farmers, a commercial agriculture company, and the local government.

5. Lessons in effective PPC design

Achieving green growth will require engagement from all parts of society to build new skills, unlock innovation, achieve more sustainable management of resources, and create new visions and pathways for how economies are developed and communities interact. This chapter has presented examples of how and under what circumstances resources, expertise, and innovative leadership can be mobilized through collaboration.

Whether collaborations are initiated by the government or by the private sector, their successful outcome is the result of careful design of the collaboration arrangements from the onset. Key attributes of successful collaborations are:

- **Willingness to enter into collaboration.** The most fruitful collaborations often emerge when unlikely partners come together to find solutions to the most pressing challenges. However, changing traditional government decision-making and societal structures to embrace and support collaboration can be difficult (Wondolleck and Yaffee, 2000). Entering into collaborations requires trust and willingness to think beyond traditional norms and processes. Facilitating this may require the creation of a process of forum that enables unlikely partners to come together as was the case with the Chiansi irrigation project.
- **Development of a shared vision, supported by clear and well-articulated goals.** While the individual benefits that partners derive from the collaboration may differ, partners need to work towards a common vision and outcome for collaborations to succeed. This is highlighted through the Alaskan Halibut Fisheries Management example, whereby safety and profitability was a key driver for private vessel owners, while they shared a common understanding that sustainable fish stock management was the core goal of the program.
- **Careful evaluation of the costs and benefits of collaboration.** In design of PPPs, government agencies should formally assess costs and benefits during negotiations and express these in monetary terms through public value-for-money assessments. In collaborative PPCs, however, clearly determining and accounting for costs and benefits can be more challenging, since many issues and roles are complex and unfamiliar. While not all costs and benefits of PPCs can be expressed in monetary terms, partners should map these issues prior to engaging and deciding whether collaboration is appropriate.
- **Clear definition of roles and responsibilities through transparent governance systems.** Studies examined here highlight the importance of transparency, accountability, identification, and avoidance of potential conflicts of interest, addressing information asymmetries, upfront specification of conflict resolution, understanding differences in drivers for businesses versus governments, and anticipating challenges as the collaboration evolves (OECD, 2010 and UNESCAP, 2011). This will ensure that resources are effectively used, and governance of the collaboration is clear. Good practice for these differs widely depending on the partnership and goals it seeks to advance. In some cases, roles and responsibilities need to be defined in contractual relationships. In the case of the Punjab Grain Silos, contractual agreements clarified the roles and responsibilities of the private and public sector actors to ensure an efficient and effective outcome, while allowing flexibility in the means by which the outcome was achieved. The Business Innovation Facilities case, on the other hand, offers a much more flexible distribution of roles, with simple support for innovation through technical support.
- **Broad and extensive stakeholder engagement.** Consultation, along with the design of open and transparent collaboration processes, helps align the views of a large number of stakeholders such as international organizations, leading businesses, civil society organizations and communities. This was essential to the successful uptake and implementation of the Forest Stewardship Council standard, and the Alaskan Fisheries individual fishing quota management system.

The collaboration attributes listed above can be applied to all forms of collaboration – whether they are government-led, private-led, or collaboratively undertaken. While government-led collaborations will focus more on ensuring that roles and responsibilities are clearly defined through contractual agreements, collaboratively governed initiatives will have to carefully balance all of these attributes to ensure success.

This highlights the most important limitation demonstrated by the analysis of case studies: building capacity and establishing effective governance of the **public and private collaboration can be costly** in both financial and human capacity terms. Both public and private sector actors can find it hard to commit to collaboration over the long-term. As a result, it may not be a surprise that across all cases reviewed achieving scale with PPC is difficult. For example, the Business Innovation Facilities effectively create capacity in the private sector, but this success required extensive technical support with a high overhead. Similarly monitoring and evaluation systems used in the Alaskan Halibut Fisheries Management case are costly. If such costs are appropriately balanced against the positive outcomes, however, evidence suggests that public private collaboration can indeed be worthwhile.

Next steps

There are a number of important challenges in effectively evaluating public-private collaborations. First, a thorough evaluation and quantification of collaboration outcomes is seldom undertaken. While collaboration success stories are shared, critical analysis of collaboration outcomes is often not available. Given the potential costs associated with collaborations, a more systematic process for monitoring and evaluating collaboration outcomes may be to the advantage of all partners.

Second, while the governance approach and design of collaborations is one of the most critical components of success, details related to the structure and implementation process of collaborations are rarely given strong attention. Sharing learning about governance and design of initiatives can help other collaborations learn from past experiences, including challenges and failures.

Third, further analysis is required on the long-term impacts of public-private collaboration for achieving different types of green growth objectives. This should consider not only the three areas addressed in this chapter – innovation, natural resource management, and infrastructure, but also the impact of public-private collaboration in advancing resource efficiency, transparency, and disclosure.

Fourth, additional research is warranted to examine effective approaches for combining public-private collaboration with government led policies and programs in enabling private sector leadership and investment. Determining the roles for collaboration relative to this broader government policy portfolio, and the conditions under which public private collaboration can best reinforce these other measures, will help governments determine when and how to pursue partnerships with the private sector.

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Chapter 8

Integrating subnational action

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Subnational governments are increasingly implementing green growth strategies, and in some cases are leading or catalyzing national efforts. Successful implementation of both national and subnational efforts requires close collaboration in order to be mutually reinforcing. This chapter explores the key question of how national green growth objectives can be achieved more effectively through enhanced and integrated subnational action. Specifically, we address the following:

- **Enabling subnational actions** – what approaches effectively enable green growth at the subnational level and across different layers of government?
- **Integrating national and subnational actions** – what practices are most effective for integrating national and subnational green growth actions?

Subnational and national action can interact in a range of ways, such as subnational government directly implementing national policy, national government promoting subnational action or subnational action informing and inspiring national action. From the review of the literature and related case studies we identify four strategic themes of interaction; incentives, capacity building, joint action and communication. Key lessons which emerged under these themes include:

Incentives

Establish financial incentives, regulations, and targets to motivate and support subnational governments in promoting green growth.

- **Provide financial incentives to subnational governments.** Offering funding for programs and other types of incentives can help overcome the lack of resources that prevents subnational governments from delivering on green growth objectives.
- **Introduce targets for subnational governments.** National targets in the form of regulations and guidance to develop and implement green initiatives mandate and motivate local authorities to take action.

Capacity building

Enable subnational governments to implement green growth by providing new powers, budgets, human and technical resources, and peer learning.

- **Provide subnational government with human resources, technical expertise, and long-term fiscal capacity.** Local authorities often lack the human and financial resources and technical expertise needed to implement

green growth strategies. By providing technical training and sufficient funds for capacity development, national governments can play an active role in mainstreaming green growth across all levels of government.

- **Devolve powers to subnational governments.** Appropriate level of decentralization, such as delegation of program implementation responsibility, allows subnational authorities to play a more proactive role in promoting green growth, and encourages innovation and the development of local initiatives.
- **Facilitate peer learning.** Sharing of experiences among officials from subnational governments provides inspiration, raises awareness, and enhances the diffusion of good practices.

Joint action

Develop interlinked green growth national and subnational strategies and measures where national governments enable and motivate subnational replication; and state and local governments provide leadership and support for national goals.

- **Act jointly with subnational governments in the development of new national strategies, policies and regulations.** Engaging subnational government in strategy and policy development increases policy coherence, helps decision makers to account for subnational delivery needs and conditions, ensures strategies and policies are more effective.
- **Engage subnational governments in the development of new investment opportunities.** Assisting in the development of new investment opportunities helps local authorities to see the economic value of adopting green growth strategies. It also helps secure buy-in from political, business, and community leaders and builds capacity to finance and deliver green investments.

Communication

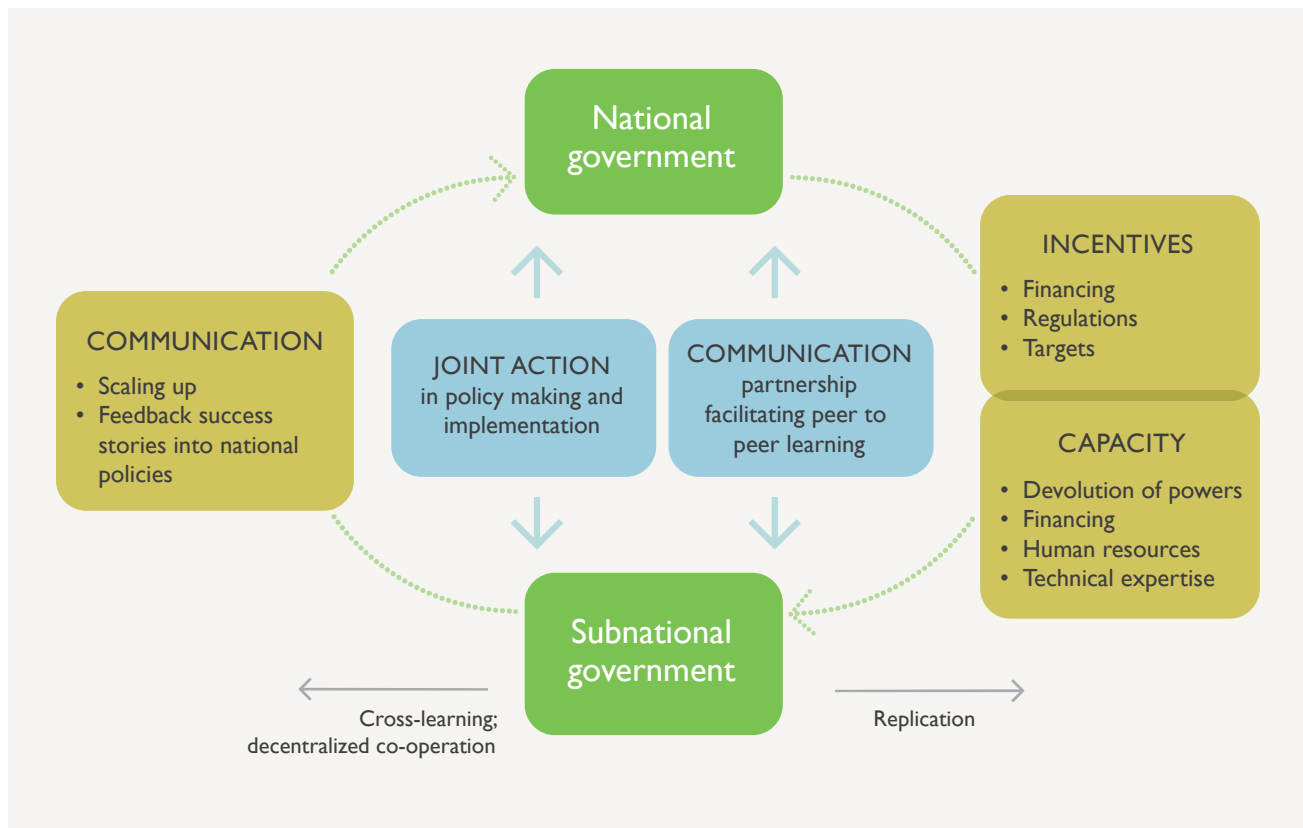
Facilitate dialogue between subnational and national governments that provides feedback of success stories at the subnational level and actively engages stakeholders who can bridge and help sustain actions across levels of the government.

- **Develop national and subnational partnerships.**
Developing and facilitating partnerships that involve national and subnational governments and stakeholders from diverse sectors can help to bridge multiple levels,

particularly in countries with poor subnational capacity. Equitable partnerships between diverse groups of stakeholders can mobilize all of their strengths, and foster mutual trust and action towards green growth goals.

- **Create a mechanism to feedback subnational successes into national policies and initiatives for scaling up.** Create a mechanism to facilitate lesson drawing and transfer of insights on good practice from subnational actions to national policies and initiatives for scaling up of good practice across the country.

Figure 1:
Model of national and subnational integration



1. Introduction

It is increasingly recognized that enabling green growth requires action at both national and subnational level (UNDP, 2009). Many significant public policies and programs, about transport, land use planning, infrastructure, waste management, and energy production are made at local level. Local authorities may have greater opportunities for policy innovation in developing tailored solutions and identifying policy complementarities between 'green' and 'growth' objectives. For example, the rapid growth of cities creates opportunities to address economic and environmental goals simultaneously (OECD, 2012).

In 2013, 110 city governments reported to the Carbon Disclosure Project (a 50% increase from 2012), with over 90% stating that climate change presents economic opportunities, and 70% reporting that they have a plan for adapting to the effects of climate change (CDP, 2013). Over 400 local governments have reported on climate actions to the Cities Climate Registry, registering 4000 actions up to 2020 (Cities Climate Registry, 2013).

Two examples of subnational governments known globally for their strong green growth policies, for example, are the State of California and the Tokyo Metropolitan Government. California's green regulations have gone ahead of federal measures, with state-wide emission reduction targets established in 2005 and incorporated into law with enforceable penalties. These have been complimented by measures to enable green technology growth, including the California Solar Initiative and the Hydrogen Highways Network. In Tokyo, the Metropolitan Government introduced a mandatory Green Building rating system for large new buildings and launched the world's first urban cap-and-trade program (Tokyo Metropolitan Government, 2010). The Tokyo Metropolitan Government states that it "*is paving the way for the commitment of the central government of Japan to the implementation of a nationwide cap-and-trade program*" (Tokyo Metropolitan Government, 2010).

The impact of subnational action can be substantial. In the United States for example, recent evidence suggests that with ambitious state action, the country can meet its commitment to reduce global warming pollution by at least 17 % below 2005 levels by 2020 even if federal action is limited. The fact that such a national commitment could be made is largely due to the existence of state-level instruments and programs that would contribute to the national target. However, if federal effort is extremely poor, states will be hampered in their efforts and unable to achieve the aggregate goal (Bianco et al., 2013).

The emergence of the green growth agenda for local government is often linked with two other important trends: (i) *decentralization* of power from subnational to national governments to local authorities, and (ii) *internationalization* of subnational actions through, for example, enhancing co-operation between cities and regions. As Andonova and Mitchell (2010) state, "*Global environmental politics*

and governance have been rescaled vertically down toward provincial and municipal governments and up toward supranational regimes."

Nonetheless, in many parts of the globe, green growth action at the subnational level is not yet underway, or is undermined by national policy frameworks. Advancing governance of climate change and environment across all levels of government is therefore crucial to avoid policy gaps, and to encourage learning between relevant departments or institutions in national and local government (Corfee-Morlot et al, 2009).

National governments have two clear roles to play in enabling subnational governments to achieve their potential for advancing green growth. The first is to create favorable environments for subnational action; and the second is to integrate national and subnational actions to improve coherence, promote learning, and exploit synergies. This chapter explores:

how national green growth objectives can be achieved more effectively through enhanced and integrated subnational actions.

What do we mean by subnational integration?

Subnational governments refers to all administrative subdivisions below the nation state, this includes *inter alia* states, regions, provinces, counties, and cities. The term 'integration' refers to improved coherence between the policies and goals of national and subnational governments.

We identify three key modes of action through which national and subnational governments interact in practice, to advance green growth:

- **Subnational implementation of national policy.** Where policies or targets are set at the national level, but implemented by cities, states and other local authorities.
- **Independent subnational action promoted by national action.** Where national frameworks support or encourage local authorities that are taking green growth steps through their own mandates as policy-makers, investors, and developers – for example through compact city policies and public transport investment.
- **Subnational action informing and inspiring national action.** Where ideas, lessons, and policies demonstrated by individual local authorities are scaled-up nationwide.

In this chapter we address the following two sub-questions:

- **Enabling subnational actions:** What are the effective approaches that enable green growth delivery at the subnational level and across different layers of government?
- **Integrating subnational actions:** What practices are most effective for integrating national and subnational green growth actions?

The chapter identifies *establishing incentives, setting targets, and providing resources for capacity building* as key enabling roles for national government, and joint action and dialogue as the key means for integrating national and subnational action.

The assessment of cases in this chapter is based on a review of experiences documented in research reports, case studies, and other literature. While much of the available literature focuses only on climate change, efforts are made

to identify literature with a broader green growth focus as far as possible. Cases for analysis are carefully selected from sources that clearly document the policy instruments and that consider the roles of sub-national and national governments. A geographic balance is also considered. For some cases, interviews are used to obtain additional information.

A case assessment framework was used consistently to evaluate impact, efficiency, and robustness of each case. *Impact* was assessed in a number of ways, including the number of new rules and frameworks adopted, the number of cities/states engaged, the number of policy targets being met, the number of green jobs created, and the level of greenhouse gas emissions reduction. *Efficiency* refers to the adoption of plans or policies within a specified time frame, or even ahead of schedule or the implementation of projects or programs with efficient use of financial and human resources. *Robustness* refers to stakeholder alignment and durability of the institutional arrangements to support green growth.

Country / Local authority / Region	Cases
State of California	Air quality regulations
India	Jawaharlal Nehru National Urban Renewal Mission (JnNURM)
Morocco	Jiha Tinou program
UK	Devolution and innovation for low carbon growth in UK cities
France	Regional Climate-Air-Energy Plan
Sub-saharan Africa	Partnerships for agricultural and climate change initiatives
Belo Horizonte, Brazil	Waste and recycling
International networks	International city and regional networks for climate change / sustainable development: ICLEI Local Governments for Sustainability (ICLEI), C40 Cities Climate Leadership Group (C40), United Cities and Local Governments (UCLG), The Climate Group (TCG), Network of Regional Governments for Sustainable Development (NRG4SD), R20 Regions of Climate Action (R20)

2. Incentives and targets

Enable subnational programs for green growth by providing financial incentives and introducing regulatory measures and other forms of targets and standards to motivate and support subnational governments in promoting green growth.

There is clear evidence that subnational governments are recognizing the opportunity for green growth, but that they

require the support of national governments to achieve ambitious goals. In many cities and regions around the world, local green growth policy implementation is at early stages. The Going Green City survey of 90 cities conducted in 2012 found that while 93% of city governments said they expect their green policies to have a positive economic impact on growth, job creation and innovation, only 24% have coordinated strategies for green growth (Rode and Floater,

2012). 60% of responding city governments reported that national policy frameworks fall short of providing full support to the green agenda.

The viability of subnational green growth policies often depends on national pricing signals for carbon and natural resources (OECD, 2013). However, national governments are also taking a range of other complementary actions to support and enable action by local authorities.

2.1

Incentives

Lack of financial resources in subnational governments is frequently cited as preventing them from delivering policies, programs, and regulations to support green growth (OECD, 2013 and GIZ, 2013). Financial support and incentives from central government can take various forms – including direct grants and low-interest loans; green funds for supporting local projects, funding for infrastructure pre-feasibility assessment, contracting agreements (often used for energy efficiency projects with private sector energy suppliers) and financial bonuses (or penalties) to ensure targets are met (GIZ, 2013). In India, the national government's program on urban development and renewal – the Jawaharlal Nehru National Urban Renewal Mission (JnNURM, 2013) – provides co-financing for cities to improve efficiency in urban infrastructure and service delivery and to promote transparency, accountability, and public participation. The program's success can be attributed to national leadership accompanied by financing, a demand-driven approach, capacity building and peer-to-peer learning in local government (Case 1).

In Rwanda, the FONERWA Environment and Climate Change Fund channels domestic and international environment and climate change finance to line ministries, districts, charitable and private entities (Government of Rwanda, 2012). The Philippines' government has established the People's Survival Fund, which provides dedicated financing at the local level, with clear operating rules and a board to coordinate and mobilize resources (World Bank, 2013).

Another barrier is a lack of funding for conducting the green infrastructure feasibility studies needed to attract investors. Thus, national governments can enable green growth action at the subnational level through the creation of pre-investment facilities to allow local authorities to produce crucial feasibility studies. To address this gap, the R20-Regions of Climate Action (R20) and the United Nations Office for Project Services (UNOPS) have also launched a facility to help subnational governments to carry out feasibility studies on renewable energy and energy efficiency, and design portfolios of bankable projects to attract both public and private investors (R20, 2013 and UNOPS, 2013).

Effective practice usually includes some combination of 'carrots and sticks' in the form of incentives and regulations. For example, the UK Government's Committee on Climate

Case 1:

India's Jawaharlal Nehru National Urban Renewal Mission (JnNURM)

The Jawaharlal Nehru National Urban Renewal Mission of India (known as the JnNURM) effectively integrates green growth policies at national and subnational levels. In order to access JnNURM funds, States must enter into tripartite agreements with Urban Local Bodies (ULBs) or Parastatal Agencies and the Government of India. The agreement states the milestones for achieving mandatory and optional reforms. The design of the program integrates national and subnational actions through:

- **Co-financing as an incentive for reform:** The central government funds up to 90% of approved projects with fund release dependent on implementation of reforms (MOUD, 2012).
- **National leadership and a demand-driven approach:** Instead of simply mandating urban development reforms, JnNURM invites states and local governments to enter into an agreement with national government to combine reforms (mandatory and optional) with financing for urban infrastructure and basic services provided. This approach increased ownership, buy-in, and accountability of states/cities in undertaking reforms. A shift of approach from 'one-size-fits-all' to 'tailor-fit' state/city-specific reforms is considered to enhance local responsiveness (Grant Thornton, 2011).
- **Capacity building in local government:** The JnNURM Peer Learning and Knowledge Sharing Network (PEARL), enables experience sharing and networking among city officials (ICLEI, 2012 and MOUD, 2012).

Change (2012) found that while 65% of the country's largest city authorities had developed Low Carbon Action Plans it recommended further action could be stimulated by providing additional funding and introducing a statutory duty for local authorities to develop and implement them.

In India, the JnNURM program linked funding incentives to implementation of reforms (see Case 1) and China's Renewable Energy Law has had significant impact requiring provinces, autonomous regions, and municipalities to set up medium-to-long term objectives and plans for renewable energy development (ADBI, 2013). Both China and India have introduced feed-in tariff schemes operating at subnational level and other initiatives such as China's national green energy demonstration awards have provided subsidies to over 100 cities to demonstrate development and use of renewable energy (ADBI, 2013).

2.2**Targets**

Central governments can establish responsibilities for local governments by introducing targets, regulations and guidance on developing and implementing green initiatives. This can include laws or guidance requiring subnational governments to develop their own plans and strategies. This type of national intervention can be effective in setting a long-term green growth agenda and fostering green growth actions across regions in an integrated way.

For example India's National Action Plan on Climate Change (NAPCC) provides strategic guidance and structure for each state to develop its own State Action Plan on Climate Change (SAPCC). Prior to the NAPCC few state governments were directly engaged with climate change concerns. Now, more than 20 states have prepared documents on the SAPCC – for example, the state of Orissa

has developed a comprehensive plan of climate change programs which it aims to finance from federal, state, and donor sources (Mishra et al., 2011).

Central governments have also developed building energy efficiency codes adopted by subnational governments (UNEP, 2012). Analysis of experience of building codes in countries including China, India, Egypt, Mexico and the US State of California finds that one of the main drivers for successful implementation is a political commitment at the national and the subnational level to energy efficiency or sustainable energy sector development (Feng et al., 2010). A potential downside of this type of approach is that it is not clear whether diverse regional contexts and different needs are taken into account, as national regulations tend to set uniform standards. Therefore, engaging subnational government in the development of relevant regulations at the national level is crucial.

3. Building capacity and devolving authority

Provide new powers, budgets, human and technical resources and opportunities for peer learning.

Implementation of national green growth strategies often depends on the financial and human capacity of subnational government. In many countries, the tasks devolved to subnational governments substantially exceed their capacity to raise revenues from sources under their control. Such governments must therefore depend on intergovernmental fiscal transfers to close the resulting fiscal gap (Bird, 2011). This is also true in the case of national green growth strategies, and therefore central governments often need to allocate funding to subnational governments or to provide a delivery mechanism that enables them to have direct access to such finance. Research in India assessing the progress of development and implementation of state action plans on climate change found that while most states had identified capacity building priorities and financial needs, only one had identified sources of finance (Mishra et al., 2011).

3.1**Capacity building**

Subnational governments may lack technical expertise. Capacity building has therefore been identified as a key measure for enabling green growth. National and international subnational networks play a significant role in providing

such capacity building and advancing implementation on the ground.

The US Environment Protection Agency (EPA) provides technical assistance to States and local governments to assist in implementation of subnational climate and energy plans. This program provides technical assistance, peer exchange opportunities, analytical tools, and outreach support to state, local, and tribal governments. Using these resources, state and local governments can develop policies and programs that can reduce greenhouse gas emissions, lower energy costs, improve air quality and public health, and help achieve economic development goals. Some resources include best practice guidance, policy maps, competitive grant funding opportunities, and searchable resource databases (EPA, 2013).

While additional allocations of public funding may be needed for subnational governments to implement its own action plans and public investment, catalyzing green growth means mobilizing much larger flow of private investment sources such as sovereign wealth funds, equity investors and banks, as well as international financial institutions. Subnational governments are seeking to enable this flow through supportive political decisions, co-funding, and new approaches such as those led by the R20 – Regions of Climate Action – to overcome barriers to investment by bringing together subnational decision makers, private sector technology providers and investors (R20, 2014).

3.2

Devolving authority

While national governments are responsible for designing policies across a range of areas, it is at the local level that many policies ultimately take effect and where their competing demands are integrated. Devolving powers to subnational government can encourage innovation, local leadership, and tailored local initiatives. In addition, transferring decisions on revenues and expenditures to lower administrative levels may result in more efficient resource use adapted to local conditions and with active stakeholder participation.

Regulatory approaches that allow subnational entities to go further than the national regulation can be a powerful tool, as there may be stronger incentives for ambitious action and fewer barriers at the subnational level. In some cases, subnational governments have even implemented regulations stricter than that of their central governments.

The US state of California (Case 2) provides an example where the federal government allowed them to adopt more protective air quality standards than the national standard. Under the Clean Air Act, California has the right to pass auto emissions standards that are tougher than federal ones. This enabled the state government to reflect local needs and innovate. Other states are allowed to adopt California's standards or federal ones.

Other federal countries such as Germany and China also allow their states to implement their own laws and policies on energy efficiency, but they are less autonomous from federal legislation and the policy framework and therefore have less flexibility. A comparative study of five subnational regions on energy efficiency financing shows that in Guangdong, China, and North Rhine Westphalia, Germany, the provincial governments implement energy efficiency financing policies designed primarily at a national/federal level. On the other hand, California has been active in developing its own energy efficiency financing policies since the 1970s, independently from federal government involvement. In Guangdong and North Rhine Westphalia, state-owned banks directly provide funding for energy efficiency projects, whereas in California, the government tries to promote a well-functioning energy service company (ESCO) market that can arrange for funding from private sector finance providers (Gandhi et al., 2012).

The Jiha Tinou program in Morocco is a good example of a national government devolving authority and resources by using a pilot project framework. This allows subnational governments to have ownership of their renewable energy and energy efficiency development initiatives with the support of the national government (Case 3).

In the UK, city deals have given municipal governments new freedoms and powers to promote growth in ways that

draw on their strengths and priorities (Case 4). This reflects a widespread recognition that cities are often the engines of growth. Many of the first cities to participate have used their new powers to promote green economy strategies (Scott, 2012). At the same time, the UK case highlights important roles of national governments in setting the long-term green growth agenda and coordinating across levels of government.

Case 2:

California: subnational activism for air quality

Currently, the state of California leads the US in air quality policy and planning. Key lessons from the California experience include:

- **Subnational governments can undertake green growth measures that go beyond the requirements of national policies.** Subnational governments better understand local issues and can work out strategies to engage local businesses and citizens more effectively. Looking at the unique air quality issues in the region, the responsible state agency (California Air Resources Board - CARB) adopted a more proactive approach and set unique standards beyond the mandate of the national government. By doing this, the state served as a model for other states and influenced national air policy.
- **Build political commitment and coordinated efforts at all levels of government.** The state set a clear mandate within the national policy framework and laid out a comprehensive strategy for achieving its goals. Support and leadership from the federal level, especially the unique flexibility of setting its own standards empowered and contributed to the success at the subnational level¹. The EPA also provided financial and technical support and worked closely with CARB to meet its targets (EPA, 2012).
- **Make continuous efforts to engage and inform stakeholders throughout the process.** Since regional green growth plans involve multiple stakeholders, it is important to work to inform and engage them early with technical and scientific data so these plans can achieve credibility². Government efforts to understand the challenges, efforts to work with industry to reduce costs of compliance, communicate the benefits, and form public private partnerships resulted in active government industry collaboration which strengthened over time.

1. Interview with Terry Tamminen, previous Secretary of the California Environmental Protection Agency, in November 2013.

2. Interview with La Ronda Bowen, Ombudsman, California Air Resources Board, in November 2013.

Case 3:

Jiha Tinou Programme, Morocco

The National Agency for the Development of Renewable Energy and Energy Efficiency (ADEREE) launched the Jiha Tinou pilot program in Morocco (2012-2014), with the long-term goal of reducing energy dependence, and increasing the use of renewable energy at the subnational level to contribute to the national energy targets for 2020 (ADEREE, 2012).

Three municipalities were selected via a call for proposals for the pilot program based on criteria such as previous involvement in renewable energy development. The national government's role, in this case, King Mohamed VI, launched the 'advanced regionalization' process in parallel with 'decentralization reinforcement'. Such initiatives provide a legal framework for transferring resources authority to subnational levels of government, thus allowing regions/territories to have ownership of their renewable energy and energy efficiency development initiatives with the support of the national government. Some key lessons have already emerged from this on-going pilot program³:

- **Mainstreaming energy considerations in territorial and urban planning:** the importance of integrating the project requires a very deep understanding of local planning processes already underway, and of their specific agenda and stakeholders involved.
- **Playing the role of an active facilitator between municipalities and international partners:** International partners and municipalities seldom share the same interests; they differ in terms of vision, mission, objectives, and strategic direction, etc. It is therefore not a simple task to bring them together, and lead them under a common goal and purpose.
- **Establish quantitative targets and roadmaps to assess and quantify local impacts:** Subnational energy planning has rarely been quantitative and based on a solid baseline. While renewable energy and energy efficiency indicators have been developed for use at the national level, they have yet to be identified for the subnational level. However, several institutions have begun identifying such indicators, and the Jiha Tinou process is likely to contribute substantially to these efforts, by partnering with institutions like the National Department of the Environment and its regional observatories, and the EU Covenant of Mayors.

Case 4:

Devolution and innovation for low carbon growth in UK Cities

In many UK cities, local authorities are using newly devolved powers to find innovative ways of financing the transition to a low carbon economy. The development of a new low carbon economic strategy in the Leeds City Region was made initially through the publication of a report and an evidence based on the economics of low carbon cities (Gouldson et al, 2012 and 2014). This report suggested that the Leeds City Region spent GBP 5.4 billion a year on energy, but that it could profitably invest GBP 4.9 billion on commercial terms to exploit cost effective low carbon measures with a payback of just over 4 years, while reducing carbon emissions by 36% by 2022, and generating 4,500 jobs. This report has underpinned the creation of a GBP 44 million domestic energy efficiency program to retrofit 12,000 homes, as well as a GBP 66 million low carbon development program. A similar report for Birmingham helped to inform the activities of a new Green Commission (Gouldson et al., 2013). The City Council developed a Carbon Roadmap that seeks to deliver a 60% carbon cut (on 1990 levels) by 2027. A key part of the Roadmap is to support the Birmingham Energy Savers scheme that will invest GBP 100 million in domestic energy efficiency in the coming years.

These innovations are now being diffused to other cities with lessons of good practice being transferred through both formal and informal networks. Key lessons from these cases include:

- **National governments can play a key role in enabling innovation and learning on the green economy at the local level.** They can do this, for example, by setting targets, devolving powers and resources, and creating funding and cost recovery mechanisms.
- **Local governments need a convincing investment opportunity and a viable investment strategy if they are to mainstream green growth.** With these, they can secure buy-in from political, business and community leaders, and build capacity to finance and deliver green investments.
- **Robust evidence is needed to 'future proof' green growth strategies.** There is a real risk that green growth strategies will invest in measures that lock local economies into relatively but not radically decarbonized development paths.

3. Interview with Zineb Raji, Communication Expert, ADEREE.

Case 5:**International city and regions networks and sustainability**

Transnational municipal networks started to emerge in the late 1980s but it was only from 1982 to 2004 that the number of sustainability-related city networks rose from 8 to 49 (Keiner and Kim, 2007), some working at the international level and others exclusively at the national level. The 1992 Rio Earth Summit was an important milestone in local action and sustainability and since then, many more networks and initiatives have flourished, including ICLEI's Local Agenda 21 Campaign, UNDP's Capacity 21 and UNEP/UN-Habitat's Sustainable Cities program, Energy Cities, the World Mayors Council on Climate Change, C40 Cities, The Climate Group, the African Local Agenda 21 Cities, the Global Network of Regional Governments for Sustainable Development (nrg4SD), R20 – Regions of Climate Action, Covenant of Mayors, United Cities and Local Governments (UCLG), Citynet, Metropolis, Eurocities, European Sustainable Cities Platform (ESCTC), the Climate Alliance Klima-Bündnis, the Alliance in the Alps (Allianz in den Alpen), the Union of the Baltic Cities (UBC), and EUROCITIES.

These networks are fulfilling a range of functions including:

- **Enabling subnational learning and action at the international level:** International city and regions networks, in different scales and jurisdictions, are enabling subnational learning and action through international campaigns, programs and projects, twin-cities programs, 'city-to-city Cooperation' (C2C), international and national events which connect leaders worldwide, share experiences and best practices and decentralize co-operation.
- **Enabling subnational learning and action with support from the national government and through national-city networks.** National governments in many countries, such as Austria, Germany, Japan and Sweden, are supporting local action with publications, good practices reports, in-

person and telephone consultation on funding programs, conferences, trainings, facilitation of networking and information events and general public relations.

- **Contributing to policy formulation and implementation.** City and regions networks are fostering the integration of subnational and local actors into a multi-level governance system, bringing closer global challenges to citizens, decentralizing, and strengthening local authorities.
- **Fostering peer-learning and dissemination of best practices.** Evidence shows that the rapid development of local sustainable development practices in Europe was in part due to the work of networks and support for their role with best practices dissemination. Over the past decades, such local networks have become effective and influential players, to some extent taking over the role of international organizations and national governments, by filling in gaps to expedite and advance sustainability (Keiner and Kim, 2007).
- **Different impact in each region and city.** The programs developed by cities as part of the Cities for Climate Protection (CCP) Campaign led by ICLEI differed in success and impacts between small local governments and global cities in delivering sustainable urban policies (Toly, 2008).

Moving from awareness to commitment, and then to action still remains a challenge for many local governments. There is still a need for more technical capacity and access to financial resources, as well as empowerment from national governments and in the international agenda. Multilevel governance and interaction is crucial. Linking the various networks and their respective efforts is important to avoid duplicated work and to identify areas for collective action.

3.3**Facilitating peer learning**

Sharing experiences and best practices between officials across subnational governments can provide inspiration and helps address the awareness and knowledge deficit that often constrains action. In the US, for example, the adoption of municipal climate mitigation policies are influenced by internal factors such as the presence of staff members committed to energy and environment planning, and by external factors

such as the level of community environmental activism and the influence of neighboring jurisdictions (Pitt, 2010).

Networks bringing together cities and regions engaged in green growth have proliferated in recent years, and have shown to be an effective channel for learning and the diffusion of good practice (Kern and Bulkeley, 2009). Emerging urban and regional networks such as C40 and ICLEI have played a

significant role in facilitating the implementation of sustainable climate related actions (Case 5). These organizations raise awareness, facilitate learning and showcase local examples at the national and international levels. Moreover, they play a very important role in connecting leaders between municipalities enabling them to engage in international dialogues.

Organizations such as the EU can also facilitate communication and learning across national borders, and

similar regions are learning from each other's experiences through documents that highlight real examples of existing programs. For example, the EU provides guidance to local and regional authorities on best practices, EU initiatives and available funding for achieving EU 2020 goals (EU Committee of the Regions, 2012). Japan also facilitates cities' actions towards sustainability and green growth by enhancing networking and peer learning⁴.

4. Joint action

Improve integration by developing interlinked national and subnational green growth strategies and measures where national governments enable and motivate subnational replication, and state and local governments provide leadership and support for national goals.

The relationship between national and subnational action is crucial. For example, regional policies on land use urban planning and transportation would be unviable, if not aligned with national development policies, technical standards, budget, and funding policies (Martinelli and Midtun, 2012). In this regard, national governments have important roles to play to achieve policy coherence with subnational governments. Two distinct, yet related practices emerge in terms of effective practices for integrating national and subnational green growth actions: engaging subnational governments in the development and implementation of national green growth actions, developing partnerships between national and subnational government, and creating a mechanism to feedback subnational successes into national policies and initiatives.

National green growth plans and strategies often do not account for, nor fully mobilize the potential contribution of subnational actions. Key factors include diverging or contradictory objectives; geographical mismatch between green growth challenges and administrative borders; uneven information and capacity; and lack of transparency (Charbit, 2011; OECD, 2013b). An acute risk is that subnational green growth actions do not effectively align with and contribute to national goals. It is thus crucial for national governments to recognize the potential contribution of subnational actions and engage subnational government in the planning process to ensure national ambitions are supported.

4.1

Developing and implementing national strategies, policies, and regulations

Engaging subnational government closely in the development and implementation of new national strategies, policies, and regulations increases policy coherence and helps take account of important information about subnational delivery needs and conditions to ensure strategies and polices are more effective.

The French Regional Climate-Air-Energy Plan (SRCAE) is an example of how a regional government has worked together with national governments and pro-actively developed a holistic green growth plan. Instead of requiring regional governments to develop a plan independently, SRCAEs are co-developed by the central government and the regional councils (Case 6).

In Nepal, vertical integration of the planning process ensured that local information informed the preparation of the National Adaptation Program of Action (NAPA). Nepal's NAPA used novel approaches to consultations to promote integrated, cross-sectoral adaptation strategies and aggregate information from the local level to inform national-level priority setting. Local Adaptation Plans of Action (LAPAs) were designed to help the implementation of the national plan (Dixit, 2011).

In Costa Rica and Brazil, the involvement of subnational government has played a key role in implementation of command and control measures to prevent deforestation (UNEP, 2012).

Indonesia's direct cash transfer program was implemented jointly by national and local organizations – the ministries of health, education, social affairs and planning agencies at the central level, national statistical agencies, local institutions including post offices and local administrators (UNDP, 2009). Direct cash transfer was provided to 19.2 million households

4 For details, see Eco Model Cities website (<http://ecomodelproject.go.jp/en/plcc/>) and Future Cities Initiative website (<http://futurecity.rrgo.jp/en/about/>).

Case 6:**The French Regional Climate-Air-Energy Plans**

The French Regional Climate-Air-Energy Plans (Schéma Régional du Climat, de l'Air et de l'Energie, SRCAEs) were created under the Grenelle II Law (passed in 2012) for the purpose of guiding climate and energy policy in the 26 French regions through to 2050 (de Charentenay et al., 2012).

The approach to develop the SRCAEs was a hybrid one involving:

- A top-down approach whereby the development of the SRCAEs was imposed by the national government on the regions, through the Grenelle Law.
- A collaborative approach, where the SRCAEs were co-authored by Regional Prefectures (state representatives) and Regional Councils (subnational representatives).
- A bottom-up approach, where regions were given ownership of the SRCAE process, and the freedom to choose their methodologies for conducting GHG inventories and scenarios. Findings were then fed back to the top for policy decisions and energy laws, as well as for measurement against national and EU targets.

Contribution to national energy plans: The SRCAEs aim to contribute to the European Union's 2020 Renewable Energy

Directive in the short term, and the targets for 2050 in the long-term.

Regional ownership of GHG inventories and scenarios:

The responsibility of conducting regional GHG emissions' inventories falls on the Regional authorities, thereby allowing them to identify sectors that generate most GHG emissions, and therefore enable targeting of green growth actions and policies for emissions reduction. The resulting plans, with input from both the Regional Council and state representatives, take into account regional needs and means – as identified by the region. In order to enable regional comparison or a consistent national overview, however, some form of standardization is required.

Engaging stakeholders: Regional conferences and debates on the transition to renewable energy and energy efficiency were organized, and actively involved private actors from the energy sector, experts, elected and non-elected officials, and scientists resulting in 123 proposed actions for the transition to renewable energy and energy efficiency. This process of active and democratic stakeholder engagement ensured that voices from diverse backgrounds and fields were heard and taken into account⁵.

at a cost less than a quarter of the savings from reduced fossil fuel subsidies. An important factor for the success of such programs was the coordinated use of the capacity across agencies to support planning, co-ordination, and delivery and selection of appropriate institutions (DFID, 2011). The experience suggests that such cash transfer programs need good preparation, along with deployment and monitoring mechanisms in order to effectively assist the poor (Beaton and Lontoh, 2011).

4.2**Developing new investment opportunities**

Engaging subnational government closely in the development of new investment opportunities helps them see the economic value of green growth; secures buy-in from political, business and community leaders; and builds capacity to finance and deliver green investments. National government can play a key role in engaging subnational governments by

setting targets, providing incentives and devolving powers.

In the United Kingdom, providing incentives and conditions for private sector success at the city level contributes to transforming the way local leaders drive economic development. In many English cities, local authorities such as Leeds and Birmingham City Councils are using newly devolved powers to find innovative ways of financing the transition to a low carbon economy (see Case 5). UK "City Deals" build on lessons of successful urban policy across the world, including: (a) putting cities at the driving seat of their economic development; (b) partnership and collaboration between government, cities, neighboring authorities, and local business leaders; and (c) providing incentives and conditions for private sector success (UK Government, 2011). In general, subnational governments are well positioned to make investment in cities for high returns as well as multiple economic, social, and environmental benefits, such as retrofitting of existing building stock, energy efficiency and use of renewable energies in buildings, and energy efficient lighting, offers a huge energy saving potential (UNEP, 2009).

5. Based on email questionnaire responses by Philippe Robert SAT/ Joëlle Colosio DR-IDF (July 2013).

5. Dialogue and communication

Effective communication between subnational and national government is vital for effective co-ordination of action, optimizing resource use, and for sharing learning.

As both national governments and local authorities develop and test their own green growth strategies at different speeds, and in response to different drivers and challenges, one of the key difficulties emerging is the knowledge and information gaps between central and local government.

Dialogue and communication are crucial to introduce the concept of green growth to local authorities, to share knowledge and to feed back into national policies. Clear contact points are needed; local authorities need to know which agencies they should contact for support, advice, and collaborate in implementing green growth activities, while

national government should view these relationships not only as means for disseminating information from the top down, but for learning from experience about what works.

5.1

Developing and facilitating partnerships

Partnerships involving national and subnational government and key stakeholders from diverse sectors, including citizens can promote mutual trust and unlock action towards green growth goals.

For example, the efforts to enable climate-resilient development in rural communities in sub-Saharan Africa (Case 7) demonstrate that partnerships led by national governments to engage local governments can be an effective,

Case 7:

Partnerships for agricultural and climate change initiatives in sub-Saharan Africa

Partnerships, encouraged by international and national actors, are drawing in contributions from public, private, and civic actors at the subnational level to promote climate compatible agricultural development in sub-Saharan Africa. In Zambia, public sector actors at the provincial and district levels are harnessing the financial resources of private sector mining companies with a view to advancing agricultural development initiatives. In the Democratic Republic of the Congo (DRC), a private sector mining company has formed a partnership with an international consultancy and local communities to apply

their expertise to the mine's Sustainable Development Plan on a conservation agriculture project. Similarly, in Malawi and Mozambique, private sector biofuel companies are forming partnerships with communities and Traditional Authorities to promote biofuel production (Dyer et al., 2012a; Dyer et al., 2012b; and Dyer et al., 2013). These public, private and civic partnerships build the governance capacities needed to implement climate compatible development priorities on the ground.

Case 8:

Waste and recycling in Belo Horizonte, Brazil

One key component in the transition to a green economy is the improvement in the generation, management and reduction of waste. The city of Belo Horizonte took innovative actions towards more efficient waste management, years before a national policy was approved, by integrating the local associations and cooperatives of waste pickers into the formal recycling strategies.

- **Pioneer on waste management and engaging different stakeholders:** Belo Horizonte's Integrated Solid Waste Management (ISWM) Strategy is often cited as a model for Brazil as a whole. The city includes the informal sector and other stakeholders in municipal recycling strategies as well as in a continuous program of construction of waste management facilities.

- **Background for the National Policy on Waste Management:** The ISWM from Belo Horizonte provided a solid background for the National Policy on Waste Management adopted in 2010. It inspired national-level policy on (i) legitimizing the informal work sector (Rode and Floater, 2012), (ii) improving targets of energy efficiency and conversion, and (iii) improving selective collection and recycling rates, thus showing both top-down and bottom-up leadership as it introduced innovative technological, environmental, and social aspects to waste management.

efficient, and equitable tool. Such partnerships not only help to build capacities for local delivery of climate compatible development, but also facilitate the cross-leveraging of resources, knowledge and expertise.

5.2

Closing the feedback loop to national policy

Creating a mechanism to feedback subnational successes into national policies and initiatives supports national innovation and scale-up of good practice. The waste management and recycling program in Belo Horizonte, Brazil, provides a good example in which a bottom-up approach by local government has inspired national-level policy on legitimizing the informal

work sector (ICLEI/IRENA, 2013; and Rode and Floater, 2012) (Case 8). Similarly, in China, cases of good practice in the greening of development in larger eastern cities have been formally evaluated to inform national policies and plans, with the particular aim of encouraging green development in other cities, especially in western China (CCICED, 2012). California's clean air program is another example – the State's standards and initiatives were adopted by the federal Clean Air Act Amendment of 1990, for scaling up to all US states⁶. Another example where subnational collaboration has already led to action, but where further action is urgently needed to inform national government, is the development of subnational measuring, reporting and verification (MRV) of green growth actions (Case 9).

Case 9:

Subnational measuring, reporting and verification (MRV) of green growth actions

At the recent **Nantes Declaration of Mayors and Subnational Leaders on Climate Change**, adopted on 28 September 2013 in Nantes, France, mayors and subnational leaders of the world have called for stronger action on MRV. Point 18 of the Nantes Declaration (2013) states:

"In terms of our vision for financing to scale-up local climate action (we, Mayors and subnational leaders) ... invite national governments and intergovernmental bodies to support, facilitate and ensure vertical integration of local GHG emission accounting, management and reporting within the national procedures and practices, taking into account the evolving experience of local and subnational governments in measurable, reportable and verifiable (MRV) climate action."

The Nantes Declaration represents the collective power of subnational collaboration that can lead to real green growth action at the national and even international level, by pushing both horizontal and vertical integration. More recognition of subnational green growth actions can be encouraged, especially as a way to feed into and support international protocols and declarations on green growth.

An important milestone and background for the Nantes Declaration is the **Mexico City Pact** (<http://www.mexicocitypact.org>), adopted in November 21, 2010 by mayors from 138 world cities. Today, 207 cities are signatories. The Pact is a voluntary initiative of mayors and local authority representatives committing to advance

local climate action, including the reduction of emissions, adaptation to the impacts of climate change and fostering city-to-city cooperation, and by reporting these subnational activities through Carbons Cities Climate Registry.

Carbons Cities Climate Registry is one of the biggest subnational reporting platforms for GHG emission reductions and other subnational actions for green growth. As of March 2013, the Carbons registry contains data from 302 cities from 42 countries. In addition, the Carbons registry has reported 561 energy and climate commitments, 578 GHG inventories and 2,471 mitigation/adaptation actions/action plans. These subnational green growth actions range from city biodiversity plans, to water conservation programs, to pilot recycling programs, to rapid transit studies, and to awareness-raising workshops in local schools (Cities Climate Registry, 2014). Many of the reporting cities are C40 cities, and/or ICLEI member cities, including most cities and prefectures of Japan, plus 1 or 2 regions of Europe. Indeed, one of the long-term objectives of the Carbons Cities Climate Registry is *"to help national governments and the global climate community gain a better understanding of the achievements, performance and ambitions of local climate action and formulate appropriate global climate (green growth) policies which also incorporate involvement of local governments"* (Cities Climate Registry, 2014).

6. Interview with La Ronda Bowen, Ombudsman, California Air Resources Board, in November 2013.

Next steps

This chapter highlights the important role that subnational actions can play in developing and advancing green growth, and in parallel has explored some of the key challenges in integrating national and subnational efforts to achieve this. Although we can learn much from cases of good practice, it is clear that we also need to pay more attention to the underlying preconditions for their successful implementation, which is often context specific. Attempts to transfer good practice that do not also take into account or replicate the preconditions for sustained implementation are much less likely to succeed.

There is now fast growing international recognition of the benefits of improving integration between national and subnational actors to address the green growth challenges which national governments cannot effectively face alone. If these benefits are to be fully realized, there are a number of areas where further developing our understanding may be helpful. These include:

- How should good practice implementation differ by size of subnational government and what are the potential limits of green growth strategies at the subnational level?
- What factors prevent the development, take-up, successful implementation or scaling up of good practice?
- What might be the optimal allocation of responsibility among national and subnational governments under different political, economic and social contexts?
- What are the most effective approaches for engaging with key stakeholder groups such as private companies and investors?

Addressing these questions will help to ensure that efforts to improve the integration between national and subnational actors are further improved. Where the practices highlighted in this chapter are effectively employed, it is clear that groundbreaking approaches to green growth can be enabled to emerge at the subnational level, which in turn will make a substantial contribution to delivering green growth at both national and global scales.

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Chapter 9

Monitoring and evaluation

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Effective monitoring and evaluation (M&E) increases government accountability, enhances public trust, improves stakeholder engagement, and facilitates learning. It plays a crucial function in development planning, and consequently has a key role to play in ensuring the effective design and implementation of green growth plans, policies and interventions.

This chapter focuses on the key question:

What practices enable effective green growth monitoring and evaluation?

We explore three aspects of M&E to answer this question: indicators, institutional arrangements and communication and engagement.

Key lessons include:

Indicators

Incorporate indicators which cover economic, environmental and social objectives relevant for green growth, and combine a small number of headline indicators to facilitate easy communication with more detailed indicator sets measuring specific outputs and outcomes.

- **Include social, economic and environmental dimensions in monitoring.** For example, South Korea's green growth monitoring strategy includes 23 indicators distributed across four thematic areas: socio-economic context; environmental and resource productivity; natural asset base; and economic opportunities and policies (Statistics Korea, 2012).
- **Combine a small number of easy-to-communicate headline indicators with more detailed sets of indicators measuring specific outputs and outcomes.** Headline indicators such as Resource Productivity and Natural Asset Base and composite indicators like the Ecological Footprint synthesize or aggregate complex environmental, economic, and social data into metrics that are easy to communicate. Detailed indicator sets allow for monitoring of various underlying changes required to achieve green growth in key sectors such as energy, transport, and agriculture.
- **Draw on existing frameworks.** Indicator sets such as the Sustainable Development Indicators used to track the Millennium Development Goals or National Development Indicator sets can be framed for green growth purposes (OECD, 2011).

Institutional arrangements

Establish institutional arrangements for green growth monitoring and evaluation that are fully accountable and transparent; provide clear roles across government agencies and partners; and are harmonized with existing monitoring and evaluation systems.

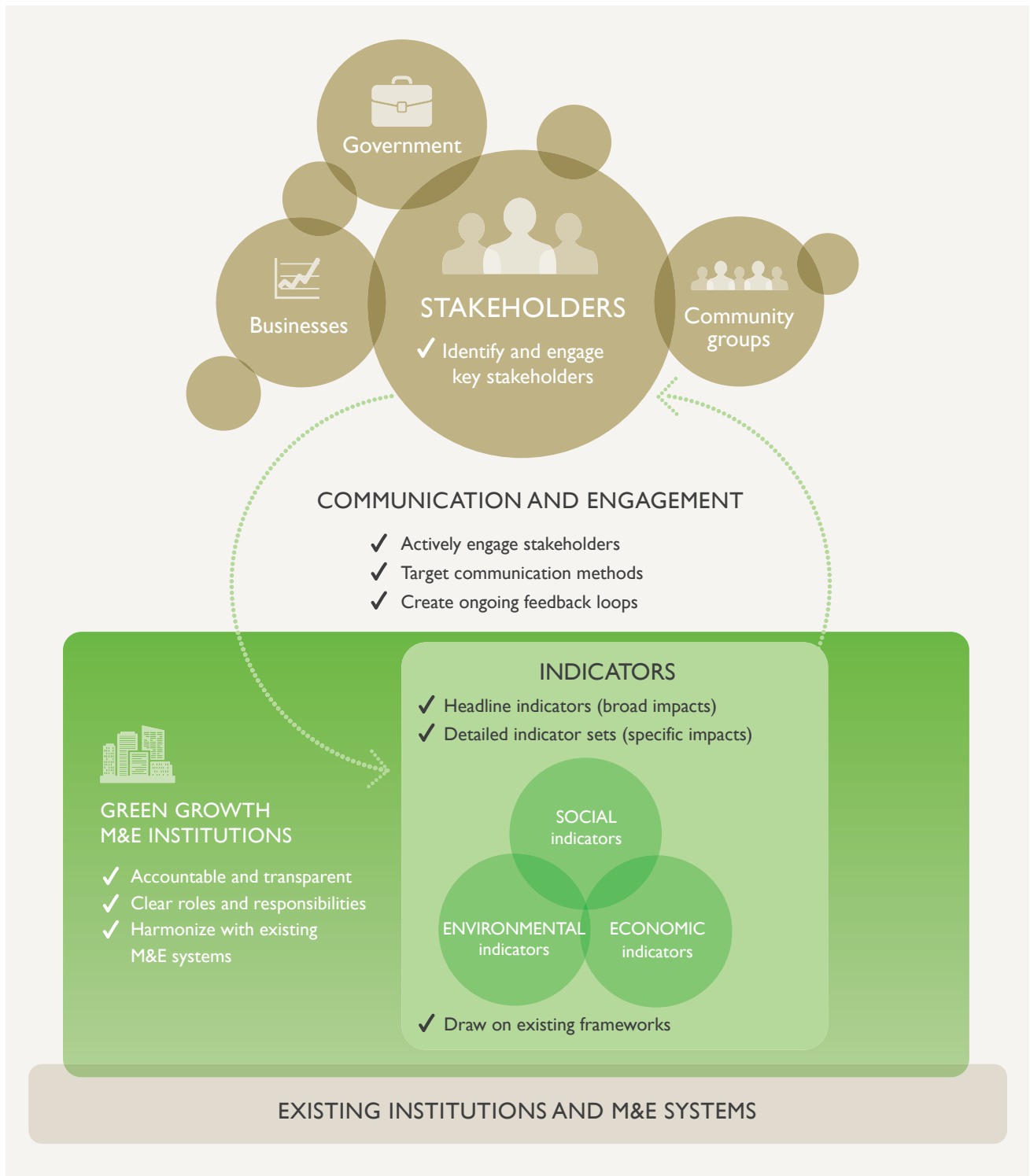
- **Ensure green growth M&E institutions are accountable and transparent.** Institutional arrangements need to maintain independence and autonomy to ensure accountability (Holvoet et al., 2012, Morra-Imas and Rist, 2009). For example, intergovernmental organizations like the World Bank, UNDP and the Global Environment Facility, all have evaluation offices that report directly to the organizations' governing body rather than operational management.
- **Establish clear roles and responsibilities.** Government units and others actors that are essential in meeting green growth objectives should also be involved in M&E. For example, the Australian National Greenhouse and Energy Reporting (NGER) Scheme, provides clear mandatory requirements for industrial organizations to report their emissions through the government's Clean Energy Regulator (Department of Climate Change and Energy Efficiency, 2012; ANAO, 2013).
- **Harmonize with existing M&E systems.** Ensuring green growth M&E arrangements are harmonized with existing M&E systems is important for efficiency and sustainability. For example, in the Kenyan MRV+ system, key ministries such as transport and agriculture are included in the steering committee and specific attention is given to avoiding duplication of effort by building on existing institutions (Republic of Kenya, 2012).

Communication and engagement:

Share monitoring and evaluation information in a timely and audience-appropriate manner using communication methods, messengers, and channels to target and engage green growth relevant stakeholders with often divergent interests.

- **Actively engage stakeholders at every stage of the process.** Identify and engage key stakeholder groups, adapting engagement strategies appropriate for

Figure 1:
Monitoring and evaluation of green growth



government (such as officials from finance, planning and environment ministries) and other actors (such as businesses and investors, citizens and communities). M&E results should be disseminated to key stakeholders as soon as possible. Active participation in the M&E process can help improve buy-in from local stakeholders which in-turn improves program accountability. For example, the Sujala Project in Karnataka, India, actively involved stakeholders in developing indicators and reviewing data (Raju et al., 2010).

- **Target communication methods to diverse stakeholders.** The language, messengers, and communication channels for M&E results should be credible and appropriate. Headline indicators are suitable for communicating with the public via the mass media while more detailed statistical data are best for communicating with specialists via technical reports. Involving high profile or influential figures in public announcements concerning the implications (economic and others) of climate change or environmental degradation can be a powerful way of raising public awareness and cultivating a sense of urgency for taking actions (Regehr et al., 2007). Furthermore, common language and data visualization are useful for

communicating complex or technical M&E results to targeted public audiences.

- **Create ongoing feedback loops.** M&E processes can create communication channels between green growth planners and stakeholders. For example, the national aquatic policy in Denmark was characterized by a high level of transparency and public involvement. Data and methods were regularly provided through a specific website produced for the development of the action plan, which contributed to significant public discussion and debate over the results and, eventually, policy change (Frederiksen and Larsen, 2013).

This chapter sheds light on several examples of good practice for effective green growth M&E. The separation of various elements of a green growth M&E system highlighted above – indicators, institutional arrangements, and communication and engagement – is simply for the clarity in analysis and presentation. In practice, all of the pieces have to come together to make an effective green growth M&E system that enables decision makers and stakeholders to improve the effectiveness of interventions and in time, leads to greater ambition and impact.

1. Introduction

Green growth monitoring and evaluation (M&E) aims to inform and strengthen program and policy decisions to transform economic development towards more environmentally benign and inclusive pathways. This chapter presents international experiences and lessons-learned on M&E practice relevant for green growth, and provides recommendations for developing an M&E system that facilitates effective green growth. In exploring the key question:

What practices enable effective green growth monitoring and evaluation?

we examine the following three sub-questions:

1. **Indicators:** What indicators enable effective green growth M&E?
2. **Institutional arrangements:** What institutional arrangements are required for effective green growth M&E?
3. **Communication and engagement:** What communication and engagement approaches enable effective green growth M&E?

Additionally we consider if the M&E programs are conducted in a robust and efficient manner.

What do we mean by green growth M&E?

Green growth M&E supports decision-making on policies and programs that are working to achieve both economic growth and environmental protection in tandem. It provides a means to judge whether policy and programs are effective and to learn from experience (Li and Li, 2012).

The purposes of M&E systems are broadly three-fold:

- **Transparency and accountability:** providing evidence on the effectiveness of policies and measures and enable their instigators and implementers to be held accountable for performance.
- **Adaptive management:** adjusting measures to be more effective; and
- **Learning:** informing the development of future phases or new interventions by building understanding of successes and failures and their causal factors.

As Kusek and Rist (2004) state, “*building an M&E system essentially adds... the feedback component with respect to outcomes and consequences of governmental action*”.

The underlying assumption for this analysis is that effective M&E ultimately influences and informs green growth policy making and objectives (Lopez Acevedo et al., 2012).

M&E is needed to provide feedback at multinational, national, local, and project levels, with approaches and metrics tailored to the appropriate scale, population, and sectors involved. At the same time connections need to be made across different scales. M&E systems are designed around targeted strategic objectives and intermediary results as determined by the theory of change of the intervention. These factors then should determine the indicator selection, institutional arrangements and the strategies for communication and engagement with stakeholders.

This chapter is based on a literature review and analysis of specific cases of M&E systems relevant for green growth. The focus of investigation includes the indicators utilized, institutional set up, and communication strategies. Besides variables and parameters reported in each case, we also give attention to contextual factors such as internal political dynamics and leadership at national and local levels. It should be noted that given the nascent stage of green growth efforts, and long time period requirements of M&E systems to reach final results and demonstrate durability, the assessment is preliminary.

2. Indicators

Combine headline indicators to facilitate easy communication with more detailed sets of indicators measuring specific economic, environmental, and social outputs and outcomes.

Indicators form the heart of M&E systems. They need to relate directly to green growth objectives and wider social, economic, and environmental goals which are set as part of the government's vision (see [Chapter 2: Establishing vision, baselines, and targets](#)). If designed and chosen well, they provide decision makers with data for effectively monitoring progress towards realizing these goals.

According to the EU-funded Policy Use and Influence of Indicators (POINT) project, there are three primary roles for green growth indicators: (1) instrumental, to manage environmental problems or improve environmental conditions; (2) conceptual, to shape ideas in public debates, and (3) political, to legitimize (or delegitimize) policies or policy actors (Bell et al., 2011). While the instrumental role is the most relevant for M&E to influence decision making, indicators are also needed to fulfill conceptual and political roles in order to strengthen the general support and communication of the green growth agenda.

A number of countries including Denmark, Ethiopia, Kenya, South Korea, Rwanda, and Vietnam have green growth

Cases included:

Country	Case
Denmark	Green energy strategy
South Korea	Green growth monitoring strategy
Kenya	MRV+ system
Australia	National Greenhouse and Energy Reporting (NGER) Scheme
South Africa	Government-wide monitoring and evaluation system, Management Performance Assessment Tool
Karnataka, India	The Sujala Watershed Management and Poverty Alleviation Project
USA	Environmental Monitoring and Assessment Program (EMAP)

and green economy strategies, with related indicators and monitoring systems. At this point it is too early to judge how effectively such programs and associated monitoring systems have performed, as they are in the early stages of implementation. However, we can see two complementary approaches emerging: (a) the use of a small set of headline indicators (including an overarching composite indicator) capable of combining complex environmental, economic, and social data into metrics that are easy to communicate and useful to policy makers (see Figure 2), and (b) the use of more detailed thematic indicator sets that allow the monitoring of the various underlying sectoral and cross-sectoral changes required to achieve green growth (GGKP, 2013).

Effective M&E systems are likely to require indicators at multiple levels of aggregation, from high-level headline indicators to more detailed thematic indicator sets.

2.1

Headline indicators

Indicators such as gross domestic product (GDP), inflation, unemployment, Gini coefficients, average income, and related measures have long provided a focus for economic policy making. Governments in a growing number of countries

(including Bangladesh, South Africa, and China) set explicit nominal GDP targets on a regular basis (Hoelle and Peiris, 2013). Many countries also set inflation rate targets (Roger, 2010).

In order to pursue green growth, governments need a new set of indicators that supplement conventional economic indicators with information on green job creation, resource consumption, natural capital and pollution (including greenhouse gas emissions) as well as human welfare.”

The OECD has developed a framework of headline indicators through consultation and testing across a range of countries (OECD, 2011). It is focused on the socio-economic context and characteristics of growth, environmental and resource productivity, the natural asset base and economic opportunities and policy responses.

The Czech Republic, Denmark, Germany, Korea, and the Netherlands have all produced green growth indicators following the OECD framework. Korea's green growth monitoring strategy, for example, includes 23 indicators distributed within these four thematic areas (Statistics Korea, 2012). These indicators are used to assess if key trends are heading in the right direction, to determine how a country or region stands in relation to others, and to identify policy responses that could help improve performance. As another example, the City of Copenhagen has created the first local-level green indicators study using the OECD Framework. It includes a 'dashboard' of 21 indicators that are being used to identify areas of excellence, areas of needed improvement, and appropriate policy responses (Martinez-Fernandez et al., 2013). Green skills were noted as one area for improvement, and a list of policy interventions was then identified, such as fostering green vocational education and training.

The use of common themes across international, national, and local levels allows comparison of trends and patterns. In some cases, it may be possible to use the same metric or indicator at all levels, but in many cases indicators that are meaningful at the national level may not be meaningful or relevant at the community level. For example gross domestic product (GDP) is important at the national level while income is important at the local level. By allowing cities or communities to choose indicators that are relevant to a theme such as economic growth, trends between the national and local levels can be compared meaningfully and in a way that is both relevant to national policy goals and to communities.

Additional to these headline indicator sets, it is also useful to include at least one overarching composite headline indicator that provides an even higher level of aggregation. The advantage is that it provides a clear message for policy makers to communicate to the media and citizens (OECD, 2011). Bhutan for example developed a 'Gross National Happiness' Index; assessing both green economy elements like pollution as well as factors such as political freedom that underpin well-being (Ura et al., 2012).

A number of composite indicators have been developed by international institutions, including the Ecological Footprint, Genuine Progress Indicator and the World Bank's measure of Genuine Savings. No global consensus has yet emerged on which of the various options are most effective (Case 1).

2.2

Sectoral and thematic indicators

Sectoral indicators are needed to assess key economic sectors and progress towards specific targets. UNEP's Green Economy Initiative provides a framework demonstrating this approach. UNEP identifies renewable energy, clean technologies, energy-efficient buildings, public transport, waste management and recycling, sustainable management of land, water, forests, fisheries, and eco-tourism as the priority sectors for target setting and associated indicators. Denmark's Green Energy Strategy provides a national example of this sector-target approach. It includes a number of time bound targets such as 100% renewable energy across power, heat, transportation, and industry by 2050 (Danish Ministry of Climate Energy and Building, 2012).

Sectoral and thematic indicators complement headline indicators and allow the monitoring of the various underlying changes required to achieve green growth (GGKP, 2013).

There are a range of supporting concepts, methods and frameworks available which relate sectoral performance and impacts (Rademaekers et al., 2012). Prominent among these are the System of Environmental Economic Accounts (SEEA), Wealth Accounting and Valuation of Ecosystem Services (WAVES), and The Economics of Ecosystems and Biodiversity (TEEB).

A statistical indicator particularly notable is that of 'green jobs' as it can potentially provide a direct measure of something which is a fundamentally important characteristic of green growth. Most other green growth related indicators are either proxy indicators of green growth or measure one or another aspect of green growth without being able to assess how much of the growth is green, or which parts of the economy can be considered green. Green jobs indicators are particularly useful in this respect as they can potentially provide information on what contribution different parts of the economy are making to green growth as a whole. They also provide politically important data to support the economic case for pursuing green growth.

The United States, Brazil, Spain, and the European Union have all made assessments of green jobs (ILO, 2013 and Rademaekers et al., 2012). In the case of the United States, the green jobs survey was initiated following statements regarding green jobs during Barack Obama's 2008 presidential campaign.

Case 1:**Composite headline indicators**

The Ecological Footprint (EF): The ecological footprint is a spatial measure of how much of the Earth's renewable carrying capacity on land and in the sea has been appropriated by production, consumption, and waste. When the footprint exceeds renewable carrying capacity – for example, when poor agricultural practices cause soil erosion – ecological overshoot and natural capital depletion is said to occur (Ewing et al., 2010). The footprint could thus provide a useful headline composite indicator of environmental sustainability. While there are several theoretical and computational issues that still need to be refined, the Global Footprint Network has now engaged 57 countries and many other units of state and local government on plans for use of this headline sustainability metric (global Footprint Network, 2010). Governments that have adopted the EF are using it as a guide for planning a more sustainable future. For example, the City of Calgary (2013), Canada is using footprint analysis to promote home energy savings, local food consumption, and green offices to its residents.

The Genuine Progress Indicator (GPI): Pioneered in the late 1980s and refined in several iterations since that time, the GPI is designed to be an aggregate measure of sustainable economic welfare. In contrast with GDP, which measures economic activity alone, the GPI is designed to measure the true benefit or 'net psychic income' humanity receives from its consumption of market and non-market goods and services after all externalities are accounted for. It also provides an indication of the extent to which this consumption is sustainable over time after taking into consideration depletion

of the natural, human, social, and built capital stocks on which all economic activity ultimately depends (Lawn, 2003). GPI accounts and applications have been completed in 17 countries that account for 53% of the world's population and 59% of gross world product (Kubiszewski et al., 2013). As governments adopt the new metric, it can be a catalyst for change. For example, in the US, the State of Maryland (2013) has adopted the GPI and is using it "to measure how development activities impact long-term prosperity, both positively and negatively."

Genuine Savings (GS): Genuine Savings was developed for the World Bank and is defined as "the true level of saving in a country after depreciation of produced capital; investments in human capital (as measured by education expenditures); depletion of minerals, energy, and forests; and damages from local and global air pollutants are taken into account" (Hamilton, 2006). It thus provides an important indication of sustainability. The GS has been calculated for 120 countries. One significant finding detailed from GS applications is that increased wealth in a country is primarily the result of an increase in intangible wealth-human capital and the formal and informal institutions that humans create. The GS has been used in Ghana, Ecuador, Egypt, Indonesia, and other countries to show the value of natural resource assets and assess the costs of degradation. In these places, the GS "helped strengthen the World Bank's dialogue with countries about economic growth and sustainable development strategies" (The World Bank, 2013).

2.3**Using existing indicators**

Establishing green growth indicators does not imply starting from scratch. Many of the OECD indicators come from pre-existing work and as such are a grouping and reorganization of indicators already in use, but framed to assist in monitoring of green growth. In Germany, the OECD green growth

indicators were tested, and it was found that 20 of 23 indicators could be produced using existing data (Statistisches Bundesamt, 2013). Many relevant indicators for green growth may already be found with sustainable development and national development goal indicators (see Case 2)

Case 2:**Existing indicators provide the basis for green growth indicator sets**

Millennium Development Goals (MDGs) and Sustainable Development Indicators (SDIs): Indicators are reported for almost all developing countries for such Millennium Development Goals as poverty reduction, school enrollment, and maternal health while many countries report also on a broader set of Sustainable Development Indicators such as to the United Nations Commission on Sustainable Development (UNCSD, 2014). These indicators cover important social, environmental, and economic aspects of development and as such can be framed in relation to green growth for example by selecting indicators related to green growth priorities or targets. These MDG and SDI indicators will serve as an important reference for green growth assessments.

National development goal indicators: Many countries, particularly developing countries, have national development goals and related indicators to monitor progress towards achieving these goals. In many cases, these national goals



and indicators take into account national situations more effectively than universal or international goals and indicators, and as such are more relevant to the country. It is possible to frame national development indicators to allow for the monitoring and evaluation of green growth.

3. Institutional arrangements

Establish institutional arrangements for green growth monitoring and evaluation that are accountable, transparent, clear, and integrated with existing monitoring and evaluation systems.

Robust institutional arrangements are crucial for M&E to be able to impact on policy. Key institutional qualities include legitimacy, relevance, transparency, inclusivity, flexibility, and reliability. Because green growth M&E systems will be tracking long-term transformative change in the economy and environment, the institutional arrangements need to be robust – sustainable and resilient in the face of political or other shocks – and efficient in terms of use of human and financial resources.

Accountability and transparency should be priority principles of any institutions charged with monitoring and evaluating green growth programs and strategies. In order to ensure the standard for evaluation and for those conducting evaluation, professional associations such as the American Evaluation Association, the German Evaluation Association and the International Development Evaluation Association have developed codes of conduct and evaluation standards

that can be used as tools to ensure a minimum level of reliability, independence, and methodological rigor.

Independence and autonomy are key factors for institutions carrying out evaluation (Holvoet et al., 2012 and Morra-Imas and Rist, 2009). This is why most intergovernmental organizations, such as the World Bank, UNDP, and the Global Environment Facility, have evaluation offices that are independent of the operational work of the organization and report directly to the governing bodies, not to the management of the organizations.

M&E systems should make data and results accessible in a timely, useful format and language for stakeholders (Casillas and Kammen, 2012 and Stiglitz et al., 2009). This is especially true of green growth M&E systems, which involve many stakeholders from diverse sectors and positions. Transparency helps ensure that indicators and data are interpreted and used correctly and that decision makers and public stakeholders understand the implications (GGKP, 2013). The national aquatic policy in Denmark was characterized by exceptionally high transparency where data and methods were provided through a webpage for the action plan. This enabled significant public discussion and debate over the results which

supported ongoing debates and policy change (Frederiksen and Larsen, 2013).

3.1

Roles and responsibilities

Greening economies often involves addressing issues which cut across different departmental mandates and jurisdictions. Whether centralized or decentralized, ensuring co-ordination and alignment requires particular clarity on the roles and responsibilities within the M&E framework (Morra-Imas and Rist, 2009; Casas et al., 2012; and Lopez Acevedo et al., 2012). All actors need to know whom to go to for what types of information.

Clear roles and responsibilities can assist in sharing the burden of implementation (Lopez-Acevedo et al., 2012). The Kenyan MRV+ system, although still in its design phase, has outlined clear reporting lines and responsibilities in great detail (Republic of Kenya, 2012). The Australian National Greenhouse and Energy Reporting (NGER) Scheme, which commenced from 1 July 2008, replaced a patchwork of voluntary industry surveys and programs with a set of mandatory reporting requirements under the Clean Energy Regulator (Department of Climate Change and Energy Efficiency, 2012; ANAO, 2013).

The institution in charge of M&E for green growth needs to have influence, authority and capacity. For example, South Africa's government-wide monitoring and evaluation system is implemented by the Ministry of Performance Monitoring and Evaluation, and makes quarterly reports to the President. Through this process, it was highlighted that R&D investment targets were being repeatedly missed, forcing the Minister to take action to rectify problems in management. This example suggests that operating M&E systems out of a central agency or office with decision-making authority and from a position of limited operational involvement can be an effective approach.

3.2

Integration with existing M&E systems

Many policies and programs have objectives relating to green growth, and new policies and reforms take place in the context of existing institutions. Therefore harmonization and alignment are critical to avoid duplication, maximize efficiency (Lopez et al., 2012), and reduce costs (Holvoet et al., 2012). The M&E system should build on existing data collection systems and integrate green growth M&E requirements into existing systems to avoid the risk of duplicative or parallel systems.

For example, in Kenya's green growth MRV+ system, specific attention is given to avoiding duplication of efforts by building on existing institutions and not requiring too many

new resources to manage the system. Capacity challenges are acknowledged and the proposed system endeavors to minimize the number of extra staff needed. It is estimated that up to 100 people will need to engage in setting up and running the MRV+ system, but that these would not necessarily be new roles or full-time staff (Republic of Kenya, 2012). In the South African case, the system has been effectively incorporated into M&E requirements of most public sector departments across the government and at various scales of government. However, a key challenge was getting ministers to work together.

Integration is also important for avoiding reporting fatigue amongst the organizations providing the information (Boyd et al., 2012). Existing institutional structures were utilized for green growth M&E in Australia. To support harmonization across existing reporting requirements, a streamlining protocol was agreed by national, state and territory governments in July 2009 (ANAO, 2012). The Council of Australian Governments agreed that *"a single streamlined system that imposes the least cost and red tape burden is the preferable course of action."* The Clean Energy Regulator is responding to this mandate and examining methods to reduce the reporting burden within the regulatory system (ANAO, 2013). In South Africa, the Management Performance Assessment Tool (MPAT) brings existing management systems, measures and standards into one system to enable benchmarking and good practice development.

The institutions involved in green growth M&E are not only environmental institutions. Kenya's MRV+ steering committee includes key ministries such as transport and agriculture to ensure sectoral coverage (Republic of Kenya, 2012). Although the MRV+ system focuses primarily on climate change, it has also been designed to incorporate M&E of development projects, which would also touch on broader green growth priorities.

While integration is important, for an M&E system to be viewed as fair and objective it must also ensure an element of independence, such as data verification by an outside entity or impact evaluation by an independent third party. For example, the Sujala Project in India determined that embedding the M&E structure within the natural resource institution managing the project would not be seen as sufficiently objective and trustworthy. The project instead employed an independent Indian government statistics agency for data collection and analysis and employed an outside M&E organization that was reputed, technically sound and independent, with a multidisciplinary team that spanned natural resources, information technology, sociology and economics (Raju et al., 2010). This was seen as an important measure to ensure that data systems remained independent and robust and the findings and suggestions from the M&E program were respected and acted upon.

4. Creating feedback loops

Share information in a timely and audience-appropriate manner using communication methods, messengers and channels to target and engage green growth relevant stakeholders with often divergent interests.

Engaging and communicating with stakeholders is intrinsic to the effective design and implementation of M&E, especially for complex agendas which have direct or indirect consequences for stakeholders' livelihoods and well-being. Stakeholder involvement and participation in green growth M&E can increase its legitimacy (GGKP, 2013) and for this reason, green growth implementation is best served by inclusive, participatory approaches that capture both social and environmental impacts of policy implementation (AfDB, 2012). This includes considering who initiates and undertakes the process, and who learns or benefits from the findings (Zukoski and Luluqisen, 2002).

Communication should be two-way, creating feedback loops that enable stakeholders to provide information to the M&E process itself, as well as to provide feedback on the results of the M&E system. Feedback loops strengthen transparency, help ensure that indicators and data are interpreted and used correctly and ensure decision makers and public stakeholders understand the implications and can act on them (GGKP, 2013).

The use of communication and reporting mechanisms to facilitate the flow of knowledge, information and resources throughout the process can provide clarity on the scope of assessment, roles, and progress achieved, (UNDP, 2009) and as result strengthen stakeholder buy-in and acceptance of M&E results.

4.1

Stakeholder engagement

Implementing green growth involves a diverse range of stakeholders including decision-makers from government, business, and communities who will often have differing experiences, perspectives and interests (UNCSD, 2007 and IPCC, 2012). Communication and engagement with these stakeholders as part of the M&E process may be undertaken at the local level, for example, in relation to a specific project or system, or at a national level for example in relation to a national green growth policy or plan.

Effective communication and engagement inclusive of these varied stakeholders and their priority issues ensures the results are relevant (Chess and Johnson, 2007; Degnbol, 2005; and Schiller et al., 2001). Furthermore, this approach improves efficiency in the system as more people at different levels are allowed opportunities to work together to implement the system and follow-up on the results. A meta-analysis by Danielsen et al. (2010) on environmental monitoring found that the level of involvement by local stakeholders profoundly

influenced the scope and speed of resultant decision-making. When locals were involved in monitoring, it took less time between data collection and action. The study found that the more locally-based and participatory approaches led to 3 to 9 times faster management decisions than macro-level scientist-executed monitoring (Danielsen et al., 2010). For this to occur, local stakeholders must understand the data, methodology, and the issue being addressed (Ura et al., 2012).

The Sujala Project in India (Case 3) was characterized by a highly inclusive M&E approach with processes implemented to enable the local community to engage in everything from indicator development to data collection and reviewing results. An information management system was used to provide timely and appropriate information to both project managers and beneficiaries and engaging them in assessing performance. This inclusive participation of local communities throughout the project helped foster agreement on the program priorities and activities and by responding to their needs and input, built credibility which made the program more robust over the long-term and lead to expansion of the program (Raju et al., 2010).

Formal on-going involvement of stakeholders can enable ownership and learning. Specific measures have to be built into program and project management processes to ensure continued and effective involvement of stakeholders (UNDP, 2002). For example, environmental monitoring committees made up of representatives from relevant stakeholder groups can ensure consistent communication between green growth planners and stakeholders, providing an important advisory, monitoring and watchdog role (Deaton, 2010).

The timing of communication is also important, with the aim being to disseminate and communicate M&E results to key stakeholders as soon as possible (UNDP, 2002). If this is not done, the process is deprived of reliable and regular adaptive management and M&E cannot serve its purpose effectively. It is also important that the lessons extracted have the potential for broader application, and can be shared for wider organizational or sectoral learning. In relation to green growth, the sharing of lessons and best practices is critical to the institutionalization and integration of green growth strategies in national development planning and programming.

4.2

Targeting communications

Selecting the methods, messengers and channels for communicating green growth M&E is essential to effectively engage the diverse stakeholder audiences involved. In an increasingly well-connected world a diverse range of options are available from printed, broadcast and online media, to SMS texting and face-to-face public gatherings. For example, after developing environmental accounts, Statistics New Zealand produced brochures highlighting data and indicators

Case 3:**The Sujala Watershed Management and Poverty Alleviation Project, India**

The Watershed Management and Poverty Alleviation project in Karnataka, India (known as the Sujala Project) was characterized by an intensely inclusive and flexible M&E process with active stakeholder engagement, which led to the project's overall greater effectiveness, efficiency and robustness. In a review of the project, many of the project's approaches have been incorporated into India's national watershed policy guidelines (World Bank, 2013).

The Sujala project targeted around 500,000 hectares of the Karnataka watershed, a semi-arid zone subject to periodic droughts, severe soil erosion, erratic rainfall, and depleting groundwater. Impoverished farmers in the region generally produced only one crop per year with yields 2 to 5 times less than optimal (Raju et al., 2010). The World Bank invested USD 100.4 million into this project from 2001 to 2009 with goals of alleviating poverty, increasing productivity of the natural resource base, and improving environmental management in a region where the primary livelihood was rain fed agriculture (World Bank, 2012).

The project undertook a combination of capacity building, development planning, and data provision to help both technical experts and local community members make improved agriculture and natural resource decisions. M&E was a key facet of the project. The overall M&E objective was to develop an information management system that provided timely and appropriate information to a large number of implementing partners, including community-based organizations (CBOs) and beneficiaries, to facilitate the sharing of information and to regularly assess project performance. The monitoring was employed in a way that

de-mystified the monitoring technology for communities. A local agency in Karnataka conducted the monitoring and generated the maps and reports, and presented the information through a bi-lingual database customized for local users (Raju et al., 2010). The data generated was also shared with local implementing partners to use in participatory planning sessions with beneficiaries. According to the World Bank, *"this was also the first time that high resolution satellite images were placed before grassroots communities to help them plan interventions"* (World Bank, 2012).

The M&E system involved extensive community engagement from indicator development to data collection to reviewing results. Inclusivity with the local communities throughout the project helped foster agreement on the project priorities and activities, and ultimately led to more sustainable impact of the project (Raju et al., 2010). Including stakeholders throughout the process, responding to stakeholders' needs and input, and building credibility along the way also made the project more robust over the long-term. This was evidenced by the decision to add a second phase and expand the project after the initial period (Government of Karnataka, 2012). The M&E system was not without challenges. The intensively inclusive process required significant time and effort by local managers and beneficiaries – an aspect that doesn't appear to have been captured in the overall cost estimate. For example, an official from the central District Watershed Office stated, *"The frequent audio-conferencing backed by regular [results] reports was very useful in monitoring progress. It helped keep all of us on our toes throughout the duration of the project. Of course, this was useful as a management tool, but I would not like to be monitored like this for other watershed activities that we do on a regular basis. It is too intense"* (Raju et al., 2010).

related to New Zealand's fisheries. From this news media picked up the story, which then reached environmental managers in a provincial environmental authority who made enquiries regarding detailed fish stock data for their area. Non-governmental and civil society organizations can play an important role in mobilizing and engaging key groups of stakeholders (Marcus and Geffen, 1998).

As with the New Zealand example, interested stakeholders may require more detailed information, and may want to scrutinize green growth and related data more carefully than is possible from news media alone. To enable this, it is important that M&E be communicated in layers and by various means (Stiglitz, 2010). At the top level are headline indicators, policy briefs and media releases, and below this indicator sets and summary reports, supported by more detailed methodological and analytical reports for those that

want to verify the quality of the information (Figure 2). The role of the messenger is also important and M&E findings must attract the attention of decision makers (Mahundaza, 2009).

To be effective, the language, messengers, and communication channels should all be credible and appropriate for the stakeholders as highlighted in Figure 2. For example, the Sujala project case study used models and maps to explain complex M&E findings to partially-literate stakeholders. In the USA, the Environmental Monitoring and Assessment Program (EMAP) developed indicators to assess ecological conditions and trends across the country targeted to the environmental aspects valued by stakeholders. The EMAP program found that descriptions of scientific indicators were less important to non-scientists than the environmental implications on 'valued aspects of the environment' described

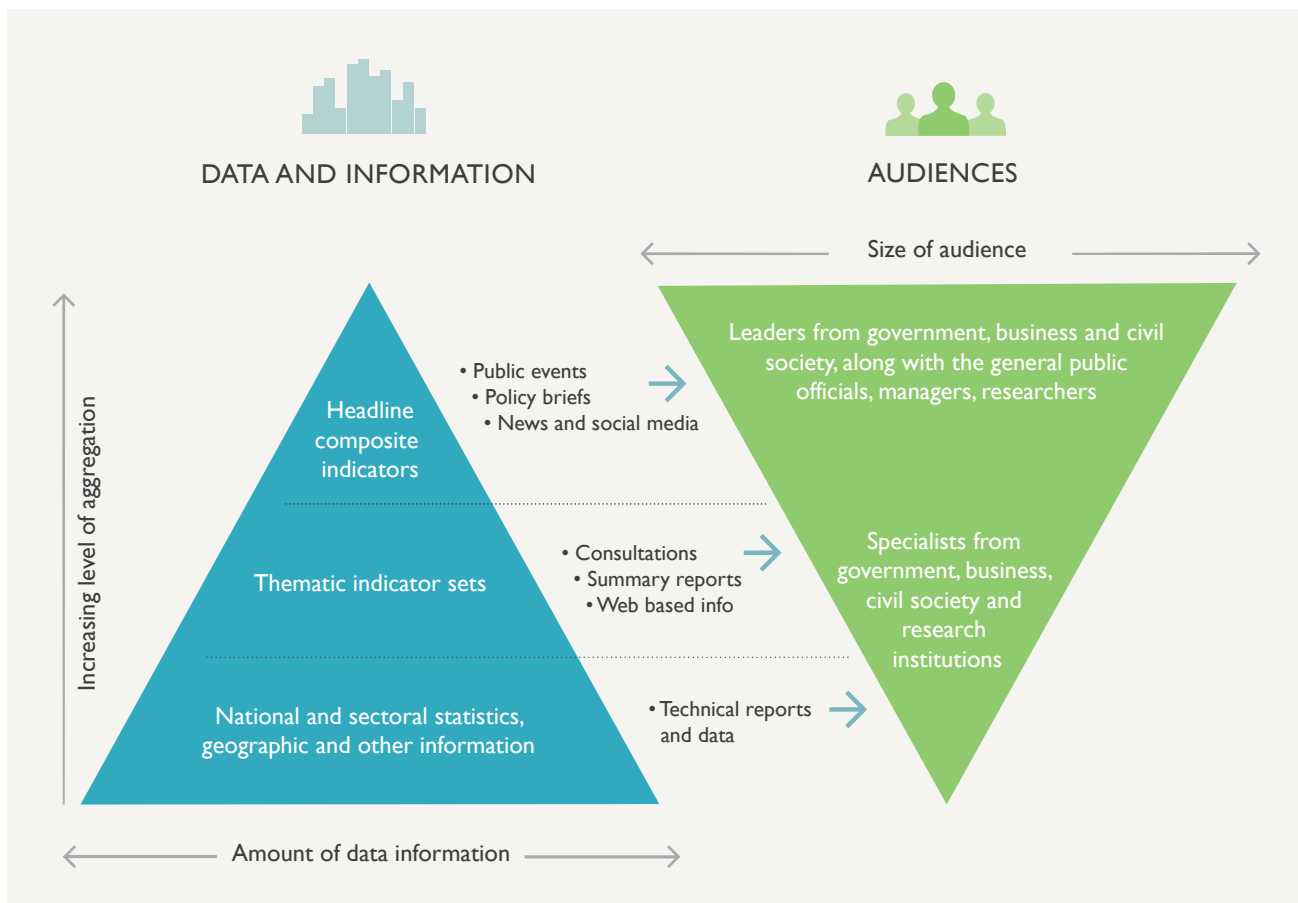
in a few words drawing from a set of indicators (Schiller et al., 2001). Making M&E understandable and meaningful to stakeholders is not a simple task and EMAP undertook extensive stakeholder engagement before being able to complete the development of its indicators. **Chapter 3: Assessing and communicating benefits of green growth** discusses in detail effective communication of green growth benefits.

Visualizing or demonstrating negative consequences of environmental degradation is a useful way to raise public awareness and to call for public support or action. For example, in one local case, the town Mayor took up an annual challenge to see how far he could wade into the river before he could no longer see his white tennis shoes. Serving as a proxy measure for water quality, the exercise provides an entertaining media stunt to raise awareness of water quality (Gasteyer and Flora, 2000). Novel ways of communicating the results of monitoring and evaluation, and making them meaningful for stakeholders can also raise awareness of green growth progress.

Furthermore, economic valuation of potential gains (or losses) from possible green growth initiatives (or failure to take action) is another powerful way to raise public awareness and stimulate positive changes.

Where livelihoods are at stake, the differences between stakeholders in terms of formal versus informal education, experiences, understanding of surroundings, and underlying values will be very important to the success of M&E programs (Degnbol, 2005). In the case of fisheries management, fishermen are typically focused on the allocation of the catch as this is the basis of their livelihood. Only if M&E is compelling from their own experience, will they accept any changes in allocation or resource management (Degnbol, 2005). As such, the quality of information alone does not ensure M&E results will be accepted and there is a body of literature that demonstrates information is only accepted if it relates to values already found in the audience (Degnbol, 2005; Chess and Johnson, 2007; and Schiller et al., 2001). Stakeholders in the Sujala Project in Karnataka were engaged in a continuous M&E feedback loop throughout the project,

Figure 2:
Information, communications and audience model



from indicator development to data collection to reviewing results. As a result of this feedback, a mid-term review led to a decision to shift funding into providing revolving funds

for self-help groups, which resulted in a sharper focus on addressing poverty and improving opportunities for women and the landless (Raju et al., 2010).

Next steps

We have highlighted in this chapter a number of important practical elements to be considered when designing and implementing monitoring and evaluation for green growth planning. It is the authors' hope that by reading this chapter and learning from these initial insights, practitioners can improve the impact of their efforts and enable more effective green growth monitoring and evaluation practices to emerge over time.

As an evolving area of practice, green growth practitioners are, to some extent, learning as they go and for this reason further systematic research into these emerging experiences would be invaluable to explore practical application in greater breadth and depth. As green growth is in its infancy, it would be helpful to revisit the lessons presented in this chapter as more time passes in an effort to explore the longer term effectiveness of interventions. To enhance its usefulness for practitioners, further more in-depth analysis would be useful to identify specific considerations which contribute to effective green growth M&E, including:

- What are effective enabling conditions that ensure effective green growth M&E (e.g. leadership, inter-agency co-ordination)?
- What specific capacity and resources are necessary for the effective design and implementation of green growth M&E (e.g. financial, human and technical resources)?
- What indicators are proving most effective for green growth M&E in practice? Is international standardization and harmonization of indicators possible?
- What are effective ways to measure impacts or outcomes such as inter-agency co-ordination, policy change, and green growth results?
- What methods of Institutionalization have proven most robust in the face of political and socio-economic changes?

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Opportunities for further green growth learning

The Green Growth Best Practice (GGBP) assessment explored the strategies that governments are taking to achieve economic success in the face of environmental risks and constraints, and the processes and policies that they are developing to put this vision into practice. However, the initial findings of what works in green growth planning and implementation process are not comprehensive or final, since green growth efforts are relatively recent, and are pursuing long-term impacts. Many of the practices highlighted in the analysis are emerging lessons demonstrated in a particular country and context, but they may not yet be fully tested and proven in the longer term, and across contexts.

During the course of assessing best practices and sharing initial findings, a large number of countries and institutions have expressed strong enthusiasm and interest in learning from this analysis. There is particularly a high demand from officials and technical experts to have access to information on successful practices and lessons from programs pursued by other governments and to learn about practical lessons across countries available through the GGBP report and the individual case studies. GGBP has taken initial steps to respond to this demand through policy dialogue workshops, tailored outreach in selected countries, and collaboration with others on e-learning materials. However, much more can be done to enhance this outreach to promote broad awareness and foster 'learning in real-time' across countries.

The recommendations below discuss opportunities for both deepening the assessment and enabling continued outreach activities to disseminate the results. We suggest that at least three steps are required to strengthen knowledge on green growth best practices and foster active peer-learning across governments and practitioners.

1.

In-depth research of practices in green growth planning, implementation, and monitoring

Building on the initial GGBP assessment, more comprehensive and in-depth research of individual cases on the national and subnational level would be valuable. This could enable deeper analysis of green growth processes, themes, sectors, or regions and track the full cycle of policy and program development, implementation, and monitoring.

Further efforts are needed to assess and validate long-term benefits of green growth and to evaluate the impact and effectiveness of specific types of analysis, planning, implementation, and monitoring approaches. While emerging evidence, such as that collected by the GGBP, is

demonstrating the value of green growth in moving countries and regions on paths toward inclusive green economies, there is not yet adequate information to fully determine the long-term economic, social, and environmental impacts of green growth and whether it is achieving the desired scale of impact.

2.

Open infrastructure for knowledge management

As a second step, it is crucial to make analyses and lessons accessible to all stakeholders. The GGBP has made its resources available online to enable users to access the chapter content and case studies in an interactive and customized way so that users can search for and extract information on specific topics of interest. GGBP is working in close collaboration with other programs that are managing and disseminating green growth related information. This includes partnering with the Green Growth Knowledge Platform (GGKP) in contributing to its online portal <http://www.greengrowthknowledge.org/>, which allows searchable access to a wide range of green growth documents and data. Other partners also include the LEADS Global Partnership <http://www.LEADSGP.org> which provides resources for country teams developing and implementing low emission development plans. It is important to maintain and strengthen this infrastructure and to develop systems that will facilitate sustained and open sharing of experiences across governments and practitioners. GGBP and partners could jointly go a step further and explore creating a forum for governments to continually share their green growth experiences, results, and lessons.

3.

Peer-learning and knowledge sharing

Finally, interaction among practitioners is the key for on-going peer-learning. Practitioners in governments, international organizations, NGOs, business, think tanks, and consultancies have first-hand experience of implementing and responding to green growth policies. Forums for peer-learning and knowledge sharing would improve the efficiency of future green growth enabling learning from success and failures, and allowing benchmarking of effective practices from the peers.

The GGBP has already made an important contribution to this goal. Over the last year the GGBP has created an extensive network of green growth experts and practitioners:

including 75 authors, more than 150 reviewers, 12 organizations in the steering committee, and an additional 30 institutions in a network of partners. All have actively shared their experience and established a 'community of practice', which has shaped the output of the report. GGBP is partnering with many other global programs to share best practice lessons with a broader audience, such as by organizing face-to-face workshops, seminars, and technical training on green growth with participants from various countries. In particular, GGBP is conducting tailored outreach in countries to present findings to decision-makers and other stakeholders and to assist them in using the results to inform their green growth programs.

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Country	Case	Chapter
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This report is an output from the Green Growth Best Practice Initiative, a project funded by: the Global Green Growth Institute (GGGI); the European Climate Foundation (ECF); the UK Department for International Development (DFID) and the Netherlands Directorate-General for International Cooperation (DGIS) through the Climate and Development Knowledge Network (CDKN); for the benefit of developing countries and the green growth community. However, the views expressed and information contained in it are not necessarily those of or endorsed by GGGI and ECF, DFID, DGIS; or the entities managing the delivery of the CDKN; Ecofys, ECN, NREL or other entities implementing the GGBP; the GGBP Steering Committee organizations; or the organizations affiliated to the GGBP authors, which can accept no responsibility or liability for such views, completeness or accuracy of the information or for any reliance placed on them.

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For reference and citation, please use: GGBP (2014) Green Growth in Practice: Lessons from Country Experiences. Green Growth Best Practice.

June 2014