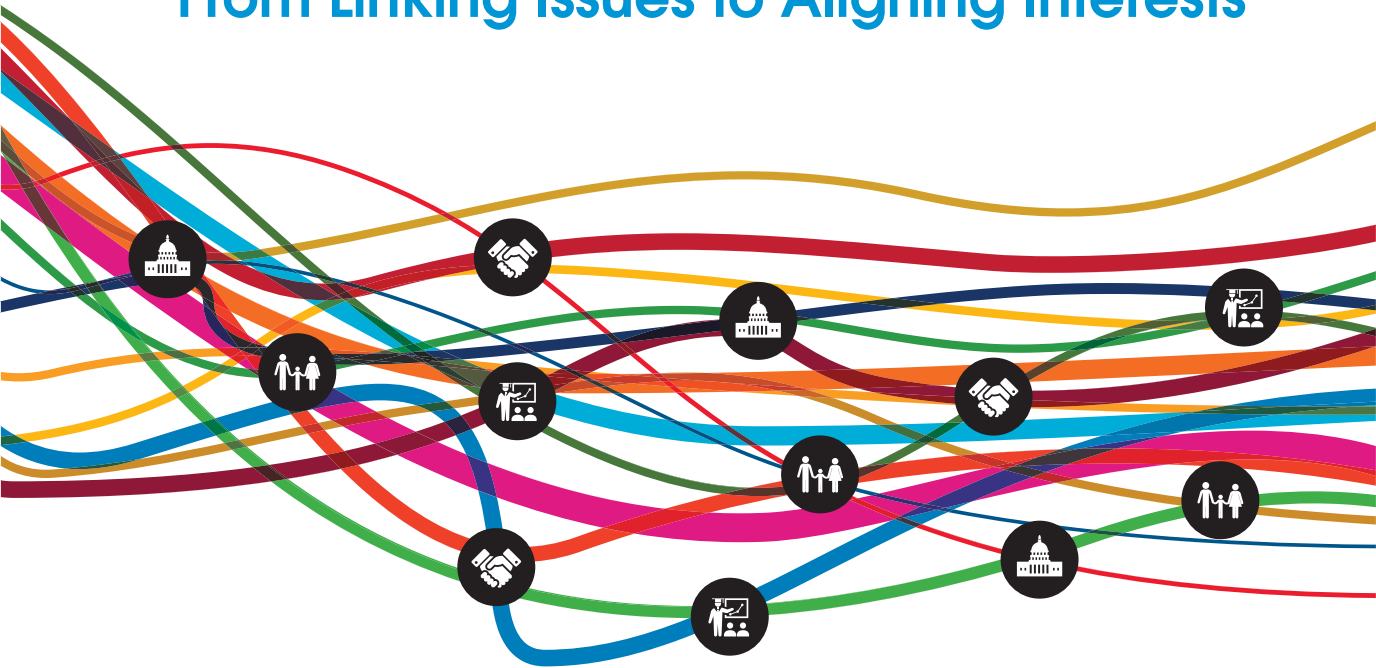




# Governance for Integrated Solutions to Sustainable Development and Climate Change

## From Linking Issues to Aligning Interests



**Eric Zusman and Nobue Amanuma, Editors**



# **Governance for Integrated Solutions to Sustainable Development and Climate Change**

From Linking Issues to Aligning Interests

Institute for Global Environmental Strategies (IGES)

**Governance for Integrated Solutions to Sustainable Development and Climate Change:  
From Linking Issues to Aligning Interests**

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From Linking Issues to Aligning Interests

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# List of Acronyms

ABC	Association of Barangay Councils
ACP	Asian Co-Benefits Partnership
ADB	Asian Development Bank
AMC	Ahmedabad Municipal Corporation
ASEAN	Association of Southeast Asian Nations
ASI	Avoid-Shift-Improve
BC	Black carbon
BCM	Billion cubic metres
BEOs	Barangay Environmental Officers
BSWMB	Barangay Solid Waste Management Boards
CAP	Clean Air Project
CCAC	Climate and Clean Air Coalition
CCENRO	Cebu City Environmental and Natural Resource Office
CCSWMB	Cebu City Solid Waste Management Board
CEA	Central Electricity Authority of India
CEMO	City Environment Management Office
CESET	Cebu's Environmental and Sanitation Team
CLGOO	City Local Government Operations Officer
CNG	Compressed Natural Gas
CSWMB	City Solid Waste Management Board
DENR	Department of Environment and Natural Resources
DIE	German Development Institute
DILG	Department of the Interior and Local Government
EMB	Environmental Management Board
ESC	Environmentally Sustainable City
ESCAP	Economic and Social Commission for Asia and the Pacific
EPI	Environmental Policy Integration
ESWM	Ecological Solid Waste Management
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
GDP	Gross Domestic Product
GENESYS	Global Environment and Nature Ecosystems Society
GHG	Greenhouse Gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
JIT	Joint Inspection Team
ICT	Information and Communications Technology
IEA	International Energy Agency
IEC	Information, Education, and Communication
IEE	Intelligent Energy Europe
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute

IGES	Institute for Global Environmental Strategies
IPCC	Intergovernmental Panel on Climate Change
IRA	Internal Revenue Allotment
IRENA	International Renewable Energy Agency
IRR	Implementing Rules & Regulations
ISWA	International Solid Waste Association
ISWM	Integrated Solid Waste Management
ITS	Intelligent Transport System
IUCN	International Union for Conservation of Nature
IWRM	Integrated Water Resources Management
LET	Law Enforcement Team
LGU	Local government unit
LNG	Liquefied Natural Gas
MOEFCC	Ministry of Environment, Forest, and Climate Change
MOEJ	Ministry of the Environment, Japan
MOI	Means of Implementation
MRF	Materials Recovery Facility
MSWM	Municipal Solid Waste Management
MW	Mega Watts
NDC	Nationally Determined Contributions
NEC	National Ecology Centre
NEERI	National Environmental Engineering Research Institute
NSWMC	National Solid Waste Management Commission
NTPC	National Thermal Power Corporation Limited
SDG	Sustainable Development Goal
SIF	Swisscontact Indonesia Foundation
SWM	Solid Waste Management
PEMO	Provincial Environment Management Office
PHP	Philippine Pesos
PPP	Public and Private Partnerships
RA	Republic Act
RCA	Residual Containment Area
REC	Regional Ecology Centre
ROK	Republic of Korea
SCDBI	San Carlos Development Board, Inc
SEI	Stockholm Environment Institute
SLCP	Short-lived climate pollutant
SLF	Sanitary Landfill
TAR	Third Assessment Report
TERI	The Energy and Resources Institute
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNCHE	United Nations Conference on the Human Environment
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNEP	United Nations Environment Programme

UNEP-IETC	UNEP – International Environmental Technology Centre
UNEP-TNT	UNEP – Thomas Nationwide Transport
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations Children's Fund
UNU	United Nations University
USA	United States of America
USD	United States Dollar
USEPA	United States Environmental Protection Agency
UWEP	Urban Waste Expertise Programme
WACS	Waste Assessment and Characterisation Study
WBCSD	World Business Council for Sustainable Development
WEF	Water-Energy-Food
WEFN	World-Energy-Food-Nexus
WHO	World Health Organisation
WUE	Water use efficiency
WWF	World Wildlife Fund for Nature



# Chapter 1

## Governance for Integrated Solutions to Sustainable Development and Climate Change: From Linking Issues to Aligning Interests

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# Chapter 1

## Governance for Integrated Solutions to Sustainable Development and Climate Change: From Linking Issues to Aligning Interests

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### 1. Setting the Context

On 25 September 2015, more than 150 world leaders gathered at the United Nations General Assembly in New York to adopt the Sustainable Development Goals (SDGs) as the centrepiece of the 2030 Agenda for Sustainable Development. The SDGs consist of a set of 169 mostly quantitative targets covering issues ranging from climate change mitigation to liveable wages to sustainable infrastructure. It is widely understood that countries will not be able to pursue each of these goals and targets separately; rather, they will likely respond to the SDGs with integrated solutions that capitalise on synergies and manage trade-offs between multiple social, economic and environmental objectives. By incorporating several interrelated issues into cross-sectoral strategies, integrated solutions could prove more efficient and effective than conventional growth strategies that tend to treat each sector separately. Furthermore, by ensuring the environmental dimensions of the SDGs are afforded more weight in policy decisions, integrated solutions also can help to make development more sustainable. Integrated solutions to the SDGs thus hold considerable promise.

Such thinking has led to research that employs evidence-based models and analytical frameworks aimed at assisting policymakers with identifying linkages between multiple SDGs and their targets. However, it is much less clear how to effectively implement integrated solutions, especially since there are many frequently complex interlinkages. A shortcoming of the studies on SDG interlinkages is they pay relatively less attention to

supporting institutions and decision-making processes that are crucial to mobilising different agencies and stakeholders behind multi-issue strategies. Integrated approaches hence may require an identification of linkages as well as the comparatively more difficult task of *aligning different interests* in support of proposed solutions. Thus far there has been little research to carefully examine what types of structures and processes are needed to align interests in support of SDG integration. This limited attention presents an important opportunity to introduce insights from governance research on aligning interests into studies focusing on issue linkages.

Connecting these two areas of research—on linking issues and aligning interests—is pivotal for successfully designing and implementing integrated solutions. In fact, many of the gains offered by integration have long been sought but seldom realised due to difficulties associated with aligning different interests. Ever since the United Nations Conference on the Human Environment (UNCHE) in 1972, a number of high-level meetings and milestone reports have underscored the virtues of integration across multiple dimensions of sustainable development (United Nations 1972; Gilman 2018); nevertheless, policymakers have often struggled to act upon such received wisdom (King 2003). Part of the challenge—clearly reflected by the National Sustainable Development Strategies that followed the arrival of Agenda 21, after the United Nations Conference on Environment and Development (UNCED)—has been that the main agencies tasked with leading the delivery of sustainable development were relatively weak environmental departments, with a limited mandate to coordinate across institutions and decision-making levels (United Nations 2018; Olsen and Zusman 2013; Casado-Asensio and Steurer 2014). The lack of remit and authority to facilitate coordination and engagement are recognised governance problems.

This begs an important question: moving forward, how can policymakers achieve greater success governing integrated solutions? This report maintains that one pragmatic course would be to draw lessons from current efforts focused on narrower integration between climate change and other related policy concerns. Not only does climate change have a bearing on many associated development issues (TERI 2017; Kainuma et al. 2017), a review of past experiences may also be instructive for understanding ways to facilitate the coordination of different interests and other actors more broadly. In addition, experience in the field suggests that different governance arrangements can also serve to align interests for integrated solutions to climate change in parallel with 1) air pollution; 2) transport; 3) solid waste; and 4) water/energy/food.

Such findings demonstrate that integration may necessitate strengthening institutions and processes that ease coordination across agencies and multiple levels of government. It may also require enhancing institutions and processes that facilitate engagement with stakeholders beyond governments, such as business and other non-state actors. However, more coordination within and engagement beyond government may not be needed for all integrated solutions. Particularly when there are already close relationships between issues and sufficient capacities to manage related interests, less coordination and engagement may save time and resources. This suggests that policymakers and researchers may want

to take a step back from advocating for multi-level, multi-stakeholder governance for all integrated solutions. Instead, such recommendations are arguably better seen as contingent, depending on the content of the integrated solution and other factors such as the capacity of relevant agencies to coordinate different interests.

Accordingly, this report also offers this more contingent view on the governance needed for different kinds of integrated solutions. More concretely, it focuses attention on under what conditions three dimensions of governance—horizontal coordination, vertical coordination and/or multi-stakeholder engagement—have helped in advancing different integrated solutions to climate change as well as air pollution (Chapter 2); transport (Chapter 3); solid waste (Chapter 4); and water/energy/food (Chapter 5). In so doing, the report not only offers suggestions to a specific integrated solution but is deliberately organised to demonstrate that necessary degree of coordination and engagement tends to increase with the number and diversity of issues being tackled as well as other context-specific factors such as initial capacities. Chapter 2 requires arguably the least coordination and Chapter 5 entails the most.

Most of the case studies upon which this conclusion is based are from the Asia-Pacific region. The region is widely represented because of its need, as well as relevant experience with the delivery of integrated solutions to climate change and associated development issues. In terms of the former, clear signs of the region’s unsustainable growth are steadily mounting. This evidence begins with an examination of recent reports suggesting developing Asia-Pacific consumes twice as many resources as the rest of the world to produce one unit of GDP, underlining the region’s poor resource efficiency (ESCAP 2017). It also includes findings that ranked Asia as close to last on the 2018 Environmental Performance Index (a widely used measure of environmental sustainability), only ahead of sub-Saharan Africa (“2018 Environmental Performance Index” 2018). The data further reflect that the region is responsible for two-thirds of the global increase in carbon dioxide (CO<sub>2</sub>)

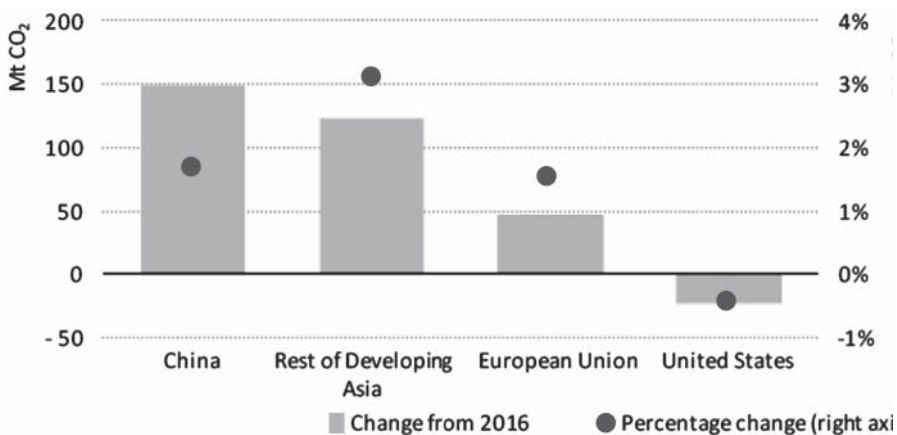


Figure 1.1. Increases in carbon dioxide emissions from 2016 to 2017

Source: International Energy Agency 2018

emissions from 2016 to 2017 (IEA 2017). Due in part to these trends, several countries in the Asia-Pacific region have accumulated valuable experience with integrated solutions to climate change and sustainable development. Ultimately, examining where and how specific governance arrangements may help in advancing integrated approaches across the Asia-Pacific region may also be relevant for applying lessons beyond these contexts as well.

The rest of this introductory chapter is divided into three sections. Section two reviews some of the literature on issue linkages regarding the SDGs, concluding there is a need for more consideration on ways to align various interests. Section three draws on literature focused on environmental governance and environmental policy integration (EPI), emphasising how different types of governance arrangements can help achieve multiple environmental objectives while also noting the drawbacks associated with more extensive coordination and engagement. Section four explains why climate change represents an effective channel for the case studies in the remaining substantive chapters.

## 2. From Linking Issues to Aligning Interests

As noted in the introduction, the last few years have witnessed a significant increase in research documenting linkages between different SDG targets. Such research follows a growing trend towards the application of evidence-based decision-making tools and analytical frameworks that first gained currency in the United Kingdom during efforts to “modernise government” in the late 1990s (Davies, Nutley, and Smith 1999; Sutcliffe and Court 2005). In the nearly two decades since the United Kingdom began popularising these techniques, the work on evidence-based policymaking has found its way into research on integrated planning for sustainable development, including recent work on the SDGs. IGES (2017), for example, has drawn upon social network analysis to create a web-based interface aimed at helping decision makers visualise interlinkages across a wide range of SDGs and targets. Similarly, the Millennium Institute (2017) developed a model that considers multiple economic, social, environmental and governance factors in supporting national mid- to long-term planning. Other similarly themed—but less data-intensive—research has sought to classify sets of connections within and between the SDGs (Coopman et al. 2016; Nilsson, Griggs, and Visbeck 2016; Nilsson et al. 2017).

Although these studies are helpful in capturing the extent to which *interlinkages* exist across issue areas, insights into which institutions and processes are needed to align different interests remain less illuminating in comparison. For example, the International Council For Science (2017) emphasises the need for coherence across sectors as well as across levels and actions (transnational coherence, governance coherence, multilevel coherence, implementation coherence). Furthermore, Nilsson, Griggs, and Visbeck (2016) encourage policymakers to engage in an interactive process involving both sectoral and administrative divisions. Accordingly, such studies tend to treat *governance arrangements that support coordination* (or coherence) as either 1) present or absent, or 2) created through an interactive process. However, the discussion on different kinds of coherence (International Council For Science 2017) fails to recognise that coordination is not just

present or absent but rather sits on continuum, potentially varying for different kinds of integrated solutions as well as other contextual factors. The work from Nilsson, Griggs, and Visbeck (2016) risks confusing the creation and strengthening of institutional structures and decision-making processes with a far simpler interactive activity that facilitates cooperation between people. The lack of attention to coordination or coherence as varying depending on the nature of different solutions may lead to suggestions for more governance than is necessary. At the same time, the limited appreciation of the difficulties of creating and strengthening institutions and processes may make it appear deceptively easy to translate a strategy with many diverse issues into actions coherently supported by many diverse interests. In both cases, a mismatch between governance and the nature of an integrated solution could lead to suboptimal results.

To better fit governance and integrated solutions, it is useful to analyse differences between research on issue interlinkages and governance research focused on the alignment of interests. As noted in Table 1.1, issue interlinkages research largely concentrates on employing evidence-based models and tools to demonstrate connections between sectoral issues with a view to promoting more effective and efficient planning. Conversely, governance research suggests the effectiveness and efficiency of integrated solutions depend on tailoring the level of institutional coordination and engagement to the nature of the integrated solution, the capacities to convene different stakeholders, and other specific conditions. These matters are explored further in the subsequent section on governance.

*Table 1.1. Two views on integration*

	What	How	Why
Linking Issues	Issues/Sectors	Evidence-based decision-making tools/models	Increased efficiency and effectiveness of policies
Aligning Interests	Agency/Stakeholder Interests	Institutional structures and decision-making processes	Possibly increased efficiency and effectiveness of decisions

### 3. Bringing in Governance

One of the main difficulties associated with research on governance is that the term itself is subject to varying definitions and applications (Stoker 1998; Hewitt de Alcántara 1998; Nanda 2006). This has led to different observers pointing to numerous areas that require attention to improve governance (M. S. Grindle 2004; M. S. Grindle 2007). These areas for improvement include but are not limited to “universal protection of human rights; non-discriminatory laws; efficient, impartial and rapid judicial processes; transparent public agencies; accountability for decisions by public officials; devolution of resources and decision making to local levels from the capital; and meaningful participation by citizens in debating public policies and choices” (Weiss 2000).

Though each of the above listed concerns has their own merits, this report concentrates chiefly on elements of governance that involve public agencies and non-state actors exercising *authority* in the pursuit of *collectively desirable goals* (Williams and Young 1994; World Bank 1993). This view on governance is useful because the collectively desirable goals are the integrated solutions featured herein, while achieving them often involves strengthening institutions and processes that support: 1) horizontal coordination; 2) vertical coordination; and 3) stakeholder engagement (Pisano et al. 2013; Betsill and Bulkeley 2006; Bulkeley and Betsill 2005). At the same time, the above definition is helpful since it suggests government agencies, when overseeing a broad range of issues, may require both sufficient *authority or capacity* and a broad enough institutional mandate to coordinate agencies and actors. The conceptual model in Figure 1.2 offers an illustration of potential actors and levels of coordination and engagement that are described throughout this report. The model is followed by a discussion on the potential difficulties of aligning numerous and diverse stakeholder interests when there is a shortage of capacities and a limited mandate for change.

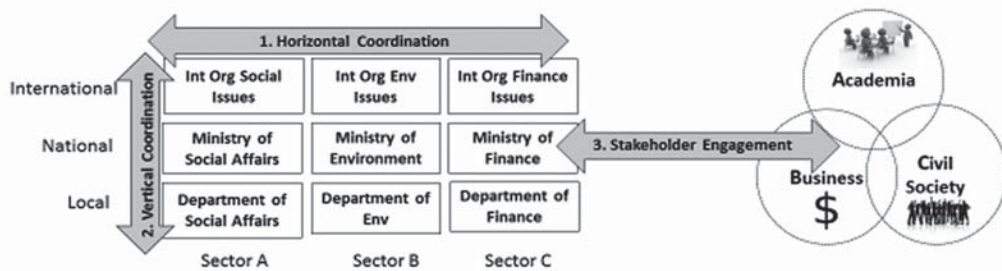


Figure 1.2. Conceptual model

Source: Adapted from Jänicke 2006. Note that Jänicke suggests that stakeholder groups also tend to work on particular sectors and levels. It is arguably better to depict these stakeholder groups as possessing the flexibility to move across different sectors or levels.

### 3.1 Coordination and Engagement

Horizontal coordination involves collaboration between different government departments working in the public domain. Creating these cross-agency alliances frequently involves balancing competing economic, social and environmental objectives as well as inter- or intra-sectoral interests (e.g. economic, environmental, and social objectives) in a manner that helps to raise the profile of environmental issues. Breaking down departmental barriers can further assist government staff in appreciating different perspectives on shared problems, resulting in enhanced solutions and more efficient allocation of resources (Corfee-Morlot et al. 2009). Much of the environmental governance literature stresses enhancing interagency coordination and cooperation to realise greater impacts on environmental sustainability (Thomas 2003). This can involve institutional changes, including establishment of a central authority responsible for managing a multi-sectoral agenda. Other research has highlighted that less ambitious inter-ministerial coordination

mechanisms, especially those that allow different agencies to engage in collaborative processes while retaining their separate administrative portfolios, can also effectively support coordination (United Nations Environment Programme n.d.). Governments may choose to start with more modest changes to decision-making processes, including regular information exchanges or offering multiple agencies the opportunity to comment on proposed budgeting decisions (Peters 1998). A final set of options—suggested as part of longstanding work to support EPI in Europe—might involve the inclusion of environmental considerations into policies that focus primarily on other sectoral needs (e.g., agriculture, transport or industry) (Liberatore 1998).

Vertical coordination involves enhancing lines of interaction between different administrative decision-making levels. Stemming largely from decentralisation reforms that began to gain traction globally nearly two decades ago, this dimension continues to influence the way many countries approach public policy and has arguably become more important for environmental issues over time (Weidner and Janicke 2002). A recent consequence of these reforms is “greater differentiation between the levels of governments and the densification of their interaction” (Balme and Qi 2014). Moreover, vertical coordination is increasingly recognising the global and regional levels as additional tiers of governance as policymakers continue to work towards closing gaps between international goals, and national and local actions (Corfee-Morlot et al. 2009). The redistribution of authority can potentially lead to better outcomes as local governments will frequently possess knowledge of innovative solutions and be uniquely positioned to tailor policy to local conditions; at the same time, national governments can provide appropriate financing, technology and other supportive means of implementation (MOI) (discussed later in the report) to strengthen and scale such local actions. Some have suggested that vertical coordination involves the promotion of institutions and policies that do not merely enact top-down or bottom-up planning but seek to drive continual interactions to enable positive feedback loops that enable learning and progressively align respective interests (Meijers and Stead 2004; Pahl-Wostl 2009). As is the case with horizontal coordination, governments may elect for stronger yet more narrow modes of vertical integration. More extensive institutional changes might involve more robust fiscal and administrative reforms that in turn foster greater interdependencies between levels. Conversely, more modest changes to decision-making processes may also result in greater coherence between the provisions set out in local and national policies (Peters 1998).

A third dimension of governance involves the interface or engagement between government and non-state actors. Reflecting the voices of multiple stakeholders—the public sector, private sector and civil society—may help arrive at more integrated solutions (Stafford-Smith et al. 2017). Much of the relevant literature on this issue underlines potential benefits that can emerge from genuine, sustained consultations. Studies suggest such engagement can “enhance the quality and durability of decisions” (Fischer 2000; Beierle 2002; and Reed 2008); incorporate “a variety of ideas and perspectives” (Dougill et al. 2006); and uncover new information, including possible negative outcomes and countermeasures (Fischer 2000; Beierle 2002; Koontz and Thomas 2006; and Newig 2007). Participatory engagement processes can further enable affected parties to move beyond



confrontational to more cooperative relationships (Stringer et al. 2006). When participants have a strong sense of ownership—often another outcome of engagement—this may also reduce implementation costs, thereby increasing the effectiveness and efficiency of solutions (Reed 2008). As with the above cases, there exists a continuum of options ranging from more extensive criteria for consultation, to more limited engagement with the public on environmental issues.

While the above paragraph focuses on engagement with the general public, especially affected communities, encouraging governments to work with specific stakeholders can also help support integrated solutions as well:

1. Engagement with **civil society groups** can ground decisions in local conditions and needs, promoting learning and mutual understanding. Meaningful engagement with knowledgeable groups can further enrich policy, helping those lacking power to articulate interests and ensuring vulnerable communities and marginalised populations are not left behind. Moreover, effective engagement with civil society can help strengthen implementation capacities while enhancing transparency, responsiveness, and accountability in the government so that proposed goals are actively pursued (Ghaus-Pasha 2005). Finally, civil society groups can work across traditional public agency boundaries in ways that less flexible government agencies may not be able to do on their own.
2. Consultations with **the private sector** could also prove important for several of the same reasons as civil society groups. The private sector may possess valuable knowledge of where and how to promote synergies between related environmental, social and economic policy concerns. They can also be good source of technical know-how and invest in research and development, leading to innovative solutions for addressing issues across sectoral boundaries. Moreover, as businesses tend to be more inventive, focused and agile, they can also make important contributions to programme management, including by providing financial capital and strengthening technological capacity: two of the key MOI (Gupta et al. 2018). Lastly, paralleling the strengths of civil society groups, many businesses may find it easier to engage across sectors and issues than government agencies.
3. A final group of stakeholders where greater engagement could prove fruitful is the **academic community**. Researchers have a potentially crucial role to play in enhancing policymakers' understanding, particularly with regards to the interrelationships between issue areas. The scientific community may provide technical advice to policymakers, validate scientific or evidence-based policies, and/or function as a mediator between science and policy domains (Kohler, Conliffe, Jungcurt, Gutierrez, and Yamineva 2012). This role is more likely to be carried out if academics are organised as part of an epistemic community: namely, groups of scientists who share a principled commitment to resolving a common set of problems (Haas 1992). Further, researchers can explore ways evidence-based tools and frameworks can potentially strengthen governance processes themselves (Niestroy 2016), whilst moving with relatively greater flexibility across agencies to bridge sectoral divides.



Following previous discussions on intergovernmental relationships, the degree to which governments engage with these stakeholders varies widely. Options range from vesting key actors with the authority to carry out decisions, widening membership in specific institutions (such as appointing influential advisory committees made up of one or more stakeholder groups) or promoting informal or voluntary participation in consultative processes on an *ad hoc* basis. Other options might include designing decision-making processes that require sharing information with different stakeholders on projects or larger initiatives.

As illustrated in the conceptual model, it is possible for different integrated solutions to require varying levels of coordination and engagement with diverse actors and stakeholders. This underscores that there are degrees of “integration ranging from slight adjustment in non-environmental sectoral policy to more substantial or reformist challenges” (Storbjörk and Isaksson 2014). However, because much of the literature emphasises the benefits of more integration and interaction, many of these studies advocate working with more actors and pursuing deeper levels of engagement to ensure that the environment is not overlooked or diluted by other concerns (Liberatore 1997). Taken to its fullest extension, this has invoked arguments for “each country to mobilise multisectoral, multiministerial, and multistakeholder approaches” for the SDGs (Bradford 2015).

## **3.2 The Costs of Coordination and Engagement**

The range of proposals outlined at the conclusion of the previous section appear to suggest that the optimal way of designing and implementing integrated approaches involves fostering engagement between different government levels and agencies, in addition to encouraging consultations with various stakeholders outside of government. However, as noted in the introduction, unqualified support for coordination and engagement may also result in undesirable side effects. In view of these challenges, some authors have suggested that EPI is “an extremely demanding standard for governance because it requires more interaction, accessibility, compatibility, and interdependence” (Meijers and Stead 2004). As such, two important qualifications warrant some consideration before subscribing to the promotion of “multisectoral, multiministerial, and multistakeholder approaches” without reservation.

First, it is useful to reflect on the notion of “good enough governance.” The main contention set out in this line of work is that it has become common practice in discourse on good governance to call for reforms promoting a wish list of “good things” (e.g. accountability, transparency, efficiency and effectiveness). However, especially in those countries that are resource-constrained, there may be a shortage in critical human and institutional capacities to adopt a long list of otherwise seemingly desirable reforms (Grindle 2010). Concisely stated, there may be insufficient initial levels of capacity, as well as a weak mandate to effectively manage such a wide-ranging agenda. A similar set of claims can be found in work that underlines the importance of institutional capacity to break down administrative siloes (Elder, Bengtsson, and Akenji 2016). If certain agencies lack the necessary capabilities to carry forward their own agendas, they may struggle to cooperate with others on a

shared set of issues regardless of potential synergies that may be observed. These notes of caution are particularly relevant given the growing use of evidence-based decision-making tools to demonstrate issues interlinkages. Many developing countries, for instance, may experience challenges attempting to negotiate between multiple sectors and stakeholders given that integration is not a “technical exercise but an art of constantly weighting comprehensiveness against the risk of over-burdening and delaying urgent decisions” (Underdal 2010). Without due consideration of these issues, insufficient capacities may serve to undermine the effectiveness of integration.

The second set of qualifications comes from institutional analysis and political economy literature. The work in question—which is more frequently found in research on how different actors can impede progress under different political systems (i.e. parliamentary versus presidential systems)—underlines that the more actors involved in a decision, the more difficult it may be to reach a consensus. By slowing the speed of policy change, it may be more difficult to arrive at more ambitious outcomes (Tsebelis 2002; Scharpf 1997). Surely, there are many important reasons to consider what some call veto points: for instance, legal procedures that delay decisions can protect citizens’ interests from hasty and risky interventions. At the same time, however, having more veto points that slow decisions can also afford traditionally well-placed interests the opportunity to maintain the status quo (Klijn and Koppenjan 2014). This outcome is more likely if such vested interests recognise that advantages from business-as-usual activities can be preserved when there is a need for more time-intensive deliberation and coordination. For these reasons, increasing the number of actors, and emphasising coordination and engagement may result in decision-making becoming less efficient, while insufficient levels of authority may also make integration less effective.

## 4. Governance for Integrated Solutions to Sustainable Development and Climate Change

While by no means guaranteed, the previous sections suggest that integration of multiple objectives *may* benefit from efforts to strengthen coordination within and between different government agencies, as well as through engagement with different non-state actors. Each of these areas for cooperation, namely, across agencies, collaboration between levels, and engagement with multiple stakeholders, may lead to more integrated outcomes. Yet—in view of concerns raised about initial capacities, as well as the possible delays that may result from excessive coordination—considering whether all dimensions of governance are necessary for integration ultimately represents less of an absolute certainty than an empirical question. That empirical question will often rest on the content of a specific integrated solution and the capacities at all levels where it is being implemented (Grindle 2007).

Exploring this question empirically is complicated by a few factors. Like the term governance, the concept of integration is used to connote different things in different contexts. Each of the chapters tries to draw attention to these differing perspectives, and some of the

alternative definitions are summarized in Box 1.1. To reduce possible confusion, the integrated solutions featured in the case studies are regarded as useful examples of integration because they consist of a single action or strategy that makes a connection between a core sustainability concern and climate change, thereby bringing social, economic and environmental benefits not only to the sector in question but to other sectors. Further, as emphasized in all chapters, making these links effectively requires at least a moderate amount of improved governance.

An equally important complicating factor is that previous attempts at wide-scale integration have not been very successful. The National Sustainable Development Strategies initiative set into motion by Agenda 21 has had limited success over more than two decades. A similar assessment drawn from much-studied attempts to integrate environmental priorities into policymaking agendas in 1990s Europe have been described as showing “limited evidence...of the achievements of environmental policy integration strategies

*Box 1.1. Varying interpretations of integration across sectors*

What needs to be “integrated” through integrated approaches varies across and within sectors.

In the **transport** sector, integration is often not clearly defined, but when it is, it can refer to combining different modes of transport (e.g. roads, railways, ports and aviation); different operational aspects of a public transport system (e.g. a fare system and service and information provision); conventional transport policies that focus on building roads with land use planning; different transport policy instruments (e.g. a road pricing scheme and fuel efficiency improvement); policies on transport and other areas relevant to transport (e.g. health and environment); and facilitating cooperation between different public agencies, levels of government and other organisations charged with designing and implementing transport policy.

In the **solid waste** sector, integration can mean combining different levels of waste in the hierarchy (combining waste prevention or reduction; reuse, recycling, composting and energy recovery; and disposal); consolidating contradicting or overlapping legislation and policies on solid waste; engaging local political units in regional solid waste management decision-making; aligning interests of decision-makers at various levels; applying life cycle assessment to solid waste management; looking at solid waste management as part of a larger resource management process in the context of a circular economy; analysing solid waste management options from environmental, social and economic perspectives; and integrating all of the above issues into an integrated approach to solid waste management, including both technical and governance aspects.

In the **water** sector, integration has at least 41 different interpretations, including helping to bring together water supply and water demand; surface water and groundwater; water quantity and quality; water and land-related issues; different uses of water; domestic, industrial, agricultural, navigational, recreational and environmental and hydropower generation; and water supply, waste water collection, treatment and disposal.

employed in practice” (Runhaar, Driessen, and Uittenbroek 2014). Similar observations can also be made about attempts to promote integration in the field of integrated water management (see Chapter 5). A notable lack of successful cases of integration makes it difficult to discern which of the previously reviewed coordination/engagement mechanisms (or additional factors) are instrumental to progress. Fortunately, there have been widely documented experiences and lessons learned in advancing solutions to climate change and other core development concerns.

There are arguably many factors associated with the modest success achieved by integrating climate change and other development issues. For instance, climate change is an inherently narrower and arguably less abstract issue than sustainable development. At the same time, climate issues are sufficiently broad to include interrelationships with many other development needs and objectives (Kainuma et al. 2017). Further, many countries have accrued multiple experiences working on climate change and other development needs. The most recent illustration of such experience involves efforts to incorporate SDGs into the nationally determined contributions (NDCs) that countries pledged to the The United Nations Framework Convention on Climate Change (UNFCCC) following the 2015 Paris Agreement (see Annex 1.1) (TERI 2017). These experiences, among others, make it possible to more precisely understand whether governance and other related factors contributed to the success and failure of integrated solutions.

The subsequent chapters in this report evaluate specific governance arrangements for working on co-benefits (Chapter 2); sustainable transport (Chapter 3), integrated solid waste management (Chapter 4); and the water-energy-food nexus (Chapter 5). In so doing, the chapters apply the three main coordination/engagement dimensions of the conceptual model presented in Figure 1.2. They then illustrate the relationship between integrated solutions to climate change and other sustainability concerns in line with specific case studies. In certain instances, the chapters also underline the importance that finance, technology, and capacity building can contribute to success as other MOI. Contextual factors are also brought into the analysis where appropriate.

*Annex 1.1. Integrating the SDGs into the NDCs*

Country	SDGs			
	Strength of Linkage			
	1 (Weak)	2	3	4 (Strong)
Bangladesh	4	3,13,15,	12,	2,7,9,11,17
China		2,6,9,11,12,14,15,17		7,13
India	1,8,16	2,3,4,6,9,11,12,17	15,	7,13,
Indonesia	2,5,16	1,3,6,9,11,12,13,14,15,17		7,
Japan	2,8,11,14,15,17	12,		7,9,
Malaysia	1,8,17	3,11,		2,6,13,
Maldives		1,3,9,11,		2,6,8,12,13,14,17
Singapore		2,13	3,	
Vietnam		1,2,7,8,9,12,		6,11,13,17

Following the Paris Agreement, many countries began to pledge NDCs to the UNFCCC as roadmaps outlining their approaches to climate change mitigation and adaptation from 2020 through to 2030. Notably, several countries also decided to emphasise linkages between climate goals and the SDGs. The table above provides an overview of the degree to which different SDG are integrated into NDCs in Asia, documenting the strength of linkages between SDGs and NDCs. Several countries have indicated how their NDCs corresponds with the SDGs, setting out objectives for realising co-benefits either through climate and development policies, whereas others indirectly describe how climate actions are related to the SDGs.

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# Chapter 2

## The Co-benefits of Integrated Solutions in Asia: An Analysis of Governance Challenges and Enablers

Authors: Bingyu Chiu, Eric Zusman and  
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## Chapter 2

# The Co-benefits of Integrated Solutions in Asia: An Analysis of Governance Challenges and Enablers<sup>1</sup>

Authors: Bingyu Chiu, Eric Zusman and So-Young Lee  
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### Main Messages

- Co-benefits are all the benefits of actions that mitigate climate change while meeting other development priorities;
- They provide a compelling near-term, local, and relatively certain rationale for mitigating climate change compared to the often long-term, global, and relatively uncertain climate benefits that would come from focusing only on climate change;
- Governance findings from 28 co-benefits case studies show that more inclusive institutions and processes are needed to reach out to affected communities; results also suggest technical solutions need to be tailored to local conditions;
- Perhaps surprisingly, the challenges involving inter-agency coordination were fewer than anticipated, while often it is important for government to reach out to external parties such as the private sector;
- Governance was not the only factor that prevented/mattered for the success of the cases: finance, technology, capacity building, or other means of implementation (MOI) are also needed; and
- The concept of social co-benefits and greater efforts to include assessments of jobs created, equity effects, and gender impacts arguably deserve more attention.

<sup>1</sup> This chapter draws upon some material from Chiu and Zusman 2018.

## 1. Introduction

In 2015, the international community welcomed the Sustainable Development Goals (SDGs) with much enthusiasm and fanfare. Some of this optimism grew from a sense that the 2030 Agenda for Sustainable Development would encourage governments, businesses and other stakeholders to take an integrated approach to development. Such an approach involves adopting actions that can capitalise on synergies and avoid trade-offs across multiple policy areas. It also entails aligning different interests behind solutions that cut across these areas. Past attempts at multi-sector integration have nonetheless often performed below expectations (Olsen and Zusman 2013; Runhaar, Driessen, and Uittenbroek 2014; Casado-Asensio and Steurer 2014). This was frequently due to the lack of capacity and limited mandate of responsible (usually environmental) agencies to align a wide range of varying interests behind integrated approaches. Chapter 1 argued that a possible way to overcome this challenge is to focus on more narrowly drawn solutions that integrate climate change and one or two additional sectoral concerns. A set of solutions that have exhibited modest success making connections between climate change and some development priorities (particularly controlling air pollution) involve co-benefits.

Co-benefits are all of the benefits of actions that mitigate climate change while meeting other development priorities; they can also be viewed as the additional climate benefits of actions focused chiefly on development needs (ACP 2014; ACP 2018). Co-benefits are important because they offer decision-makers a compelling near-term, local, and relatively certain rationale for mitigating climate change. That motivation stands in stark contrast to the often long-term, global, and relatively uncertain climate benefits that would come from focusing only on climate change (Krupnick, Burtraw, and Markandya 2000). Co-benefits have also been associated with helping to bring climate finance to interventions that reduce greenhouse gases (GHGs) while meeting other development priorities (Zusman, 2008). These two reasons—one focusing on mitigation costs and the other climate finance—have generated a fast-growing literature on co-benefits. Many of these studies concentrate on the quantification of reductions in GHGs and other benefits (chiefly local air quality and public health effects) (Pearce 2000; Markandya and Rübhelke 2004; Nemet, Holloway, and Meier 2010). Similar to the SDG linkages literature in Chapter 1, a possible limitation of focusing on quantification is the lack of attention to governance arrangements needed to align interests which support actions with co-benefits.

This chapter aims to complement the quantitative co-benefits work with insights into which kinds of governance arrangements affected attempts to align interests behind solutions with co-benefits. It also sheds some revealing light on this report's main questions involving the relative importance of vertical coordination; horizontal coordination; and engagement with multiple stakeholders. The chapter draws upon a collection of 28 co-benefits case studies in five sectors in Asia to identify whether, and to what extent, the three dimensions of governance were important to the achievement of co-benefits across multiple sectors and countries.

These cases reveal that the most common enablers involved governance arrangements that encourage participation from sets of stakeholders that are affected by and/or could contribute to a project or policy.<sup>2</sup> More inclusive institutions and processes are needed to reach out to affected communities that would benefit from co-benefits solutions. A second, related need was for greater interaction with the users of specific technologies; this would help ensure that technical solutions were in line with local conditions. The chapter also underlines the importance of governments engaging with the private sector to fill financing shortfalls. As these shortages frequently involve covering initial infrastructure costs, public and private partnerships (PPP) are likely to become increasingly important to yield co-benefits. A final notable finding was that horizontal and vertical coordination were less commonly cited as challenges or enablers. This finding may be because many of the cases were projects and not wider policies; it could also suggest that, because air pollution and climate mitigation are relatively closely related issues, they may require less coordination across agencies.

The remainder of this chapter is divided into three sections. The next section reviews literature on co-benefits, underlining the need to look more closely at the three dimensions of governance featured in this report. The third section presents the background and methods for analysing the case studies as well as the results of that analysis. The final section concludes with areas for further study.

## 2. Literature review on co-benefits

The term “co-benefits” originated in the early 1990s when environmental economists were researching the affordability of climate mitigation technologies and strategies (Ayres and Walter 1991; Nemet, Holloway, and Meier 2010). It was at this juncture that some observers recognised that, even with uncertainty surrounding the benefits of mitigating climate change, there were “no regrets” in investing in climate actions if they brought additional development benefits (Morgenstern 1991). From this realisation emerged an extensive literature that drew upon cost-benefit analyses and integrated assessment models to estimate the favourable impacts from hypothetical climate policies; the policies chosen for analysis often involving a carbon tax (Pearce 2000). This work has some parallels to the more recent issue of SDG linkages studies reviewed in Chapter 1. This early research frequently concluded that it was cost-effective to control GHGs even without the consideration of climate benefits in many contexts. This conclusion was laid out in Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) in 2001—the first IPCC report to include a section on co-benefits (IPCC 2001).

Over the past decade, research on co-benefits has moved in a few parallel directions that have aimed to convert increasingly robust science into equally strong action. Some of that work has taken an air pollution perspective on co-benefits; studies adopting this view feature types of air pollution that can warm the climate while degrading local air quality.<sup>3</sup>

<sup>2</sup> The absence of participatory institutions could be a challenge.

<sup>3</sup> There is an ongoing debate on the degree and certainty of the warming impacts of black carbon. This debate involves issues such as the ratio of the black to organic (white) carbon from a given emission source as well as the effects of different aerosols on cloud formation. Readers are invited to review the cited Bond et al. 2013 article for more information on this debate and some of the key variables influencing the warming and cooling of black carbon emissions.

These pollutants, collectively known as short-lived climate pollutants (SLCPs), have given rise to an expansive scientific literature on the different impacts of black carbon (Bond et al. 2013). They have also led to the creation of a partnership of more than 100 countries and non-state actors known as the Climate and Clean Air Coalition (CCAC) that is working to introduce technical measures that can curb SLCPs (UNEP/ WMO 2011). In many ways, the SLCP work has helped not only to better understand the impacts of different pollutants but also to drive action on the ground.

Studies on co-benefits from mitigating GHGs have also increasingly sought to spur action. This action-oriented perspective has involved, for example, studies that look at co-impact pathways, showing there may be an interrelationship between streams of different kinds of benefits that should be considered in policy and project decisions. Accompanying the suggestion to look at pathways has been a call for making data analysis tools and quantification methods more user friendly (streamlined) to facilitate the entry of estimates of co-benefits into policy decisions (Ürge-Vorsatz et al. 2014). This desire to make work on co-benefits more relevant to policy decisions can also be found in the Fifth IPCC Assessment Report that underlines a “growing political and analytical attention to co-benefits...that has resulted in an increased focus on policies designed to integrate multiple objectives” (IPCC 2014: 96). A similar sentiment is expressed in work that underlines the challenges to implementing recommendations for co-benefits based on modelling of those benefits (Aunan et al. 2004; Mayrhofer and Gupta 2016).

Finally, and perhaps most importantly, there has been some evidence that the work on co-benefits has left an imprint on policies and projects. China’s approach to climate change is closely linked to the development objectives of energy security and energy efficiency—with air pollution control and public health receiving more attention lately (Qi, Zhang, and Li 2008; Kostka and Hobbs 2012; Tsang and Kolk, 2010). A similar set of impacts is evident in India where decision-makers underlined climate co-benefits that could come from plans mitigating climate change, as well as reaching other development goals, in its national climate plan (Atteridge et al. 2012). Further, the Government of Japan has worked closely with partners in Indonesia, Mongolia, and China (see Box 2.1) to demonstrate the feasibility of pursuing multiple benefits in a few key projects (ACP 2016). There are also several less publicised cases across the region where other development objectives are pursued at the same time as mitigating climate change.

Over the nearly three decades since conceiving of the term co-benefits, research is increasingly aiming to prompt actions that can achieve multiple benefits. It has also become clearer over this period that some of the hurdles to taking actions consistent with co-benefits may have little to do with the models, data or analytical frameworks used to estimate the size of benefits. It may instead imply greater cooperation between government agencies and engagement with other stakeholders that can align interests in support of this work. This is partly because the concept of co-benefits suggests cooperation across actors who may or may not be aware of their shared interests (Pusztai and Suwa 2017). It may also be because as it becomes more common to quantify co-benefits, the governance or institutional challenges to making them relevant in policies become more evident

*Box 2.1. Delivering co-benefits to Xiamen, China*

The Ministry of the Environment, Japan (MOEJ) has been working on co-benefits projects in China for several years. One of the five largest economic zones in China, Xiamen, Fujian Province, has a generally solid record of managing pollution. However, fine particulate matter (PM<sub>2.5</sub>) remains a significant problem. Resolving that problem has required actions targeting the transport sector as it is responsible for 21.3 percent of the PM<sub>2.5</sub>. To reduce transport-related emissions, Xiamen has been encouraging the introduction of electric vehicles and vehicles that use natural gas for buses and taxis. However, pollution emissions from automobiles remained high.

In 2015, Xiamen installed a device to measure automobile exhaust gases using remote sensing at five points (four bridges and one tunnel). By measuring the exhaust gas concentration of passing vehicles, data from over 30,000 tailpipe samples was obtained daily; Xiamen nonetheless lacked the knowledge to analyse the data. To help support that analysis, the city requested Japanese counterparts to cooperate on a project entitled "Xiamen City automobile pollution prevention technology and policy research." Analysis of the data and other survey results conducted by Japanese experts showed that the significant proportion of nitrogen oxides (NO<sub>x</sub>) (a precursor to PM<sub>2.5</sub>) came from natural gas buses, while taxis discharged more NO<sub>x</sub> than diesel buses. Based on this research, Xiamen introduced a new strategy to control pollution by developing a full electric motorisation plan and financial subsidy policy. This would target buses using natural gas (including CNG, LNG, and gas electric hybrid buses) as well as dual-fuel taxis, reducing not only local pollution but also CO<sub>2</sub>. Many of these measures will help deliver co-benefits to Xiamen.

Source: Developed by Huang Jian based on her participation in a project on SLCPs funded by the MOEJ

(Mayrhofer and Gupta 2016). Three sets of governance considerations the same factors highlighted in the introductory chapter, may be relevant.

1. The first, horizontal coordination, could be critical because agencies working on climate change, air pollution, and other sectoral interests may have few opportunities to work together in decision-making processes and institutional structures. Supporting more coordination across agencies could lead to greater understanding of cross-issues synergies and conflicts, generate policies and measures consistent with that understanding, and lead to greater efficiencies that lower implementation costs.
2. The second, vertical coordination, involves working across different levels of government. This is particularly important since, while national governments are frequently responsible for shaping national responses to climate change, local governments are increasingly tasked with implementing those actions with links to local development priorities.
3. A third set of possible enablers involves engagement with different stakeholders, ranging from the private sector, businesses, academics to the general public. Mechanisms that can engage with stakeholders beyond the government could elicit varying perspectives as well as financial, technical or capacity building support needed

to align climate with other objectives. They may also help to provide resources and forms of support that could help implement an action with multiple benefits.

Whether, and to what extent, different governance challenges/enablers exist requires an examination of cases. Further, because the literature has focused on quantification, there have been few articles looking across multiple cases to identify broader patterns of challenges/enablers to achieve co-benefits. The studies that have looked at these cases have noted that the political and institutional aspects of co-benefits have been largely overlooked or understudied (Mayrhofer and Gupta 2016). To more systematically examine these challenges/enablers, it helps to examine multiple cases. The next section of this chapter looks at a series of case studies where co-benefits existed and the challenges/enablers to realising them.

### 3. Overview of the cases

To identify challenges/enablers to achieving co-benefits, 28 cases were selected from a Co-benefits Good Practice Map assembled by the Asian Co-benefits Partnership (ACP) (all of the cases can be downloaded for free from the ACP Good Practice Map at [https://www.cobenefit.org/good\\_practice/](https://www.cobenefit.org/good_practice/)). The ACP is an informal and interactive platform established in 2009 to promote information sharing and awareness raising on co-benefits in Asia. The Institute for Global Environmental Strategies (IGES) serves as the secretariat of the ACP; with funding mainly from the MOEJ. The ACP Good Practice Map includes a series of short case studies that follow a relatively standard format. The case studies include essential background such as location, sector and types of co-benefits; the sets of actions that were taken to achieve the co-benefits; and a discussion of barriers to achieving a full range of benefits. In some instances, though not formally part of the structure of the case studies, enabling factors that helped achieve multiple benefits are also mentioned.

The cases come from ten countries in Asia: Bangladesh (1), Cambodia (1), China (5), Indonesia (4), Japan (11), Republic of Korea (2), Lao PDR (1), Nepal (1), Thailand (1) and Viet Nam (1). The high proportion of cases in Japan stems from the fact that many of Japan's approaches to environmental management aim upstream in the production process to both reduce pollution and save energy (often with impacts on carbon dioxide (CO<sub>2</sub>)). The cases also come from a variety of sectors: transportation (7), waste management (4), biomass/fuel (5), livelihood (4) and energy/industry (8). The livelihood category refers to projects or policies that focused on both climate and social benefits such as new jobs or more equitable gender relations. Most of the other cases focused on mitigating climate change and other forms of pollution, particularly air pollution.



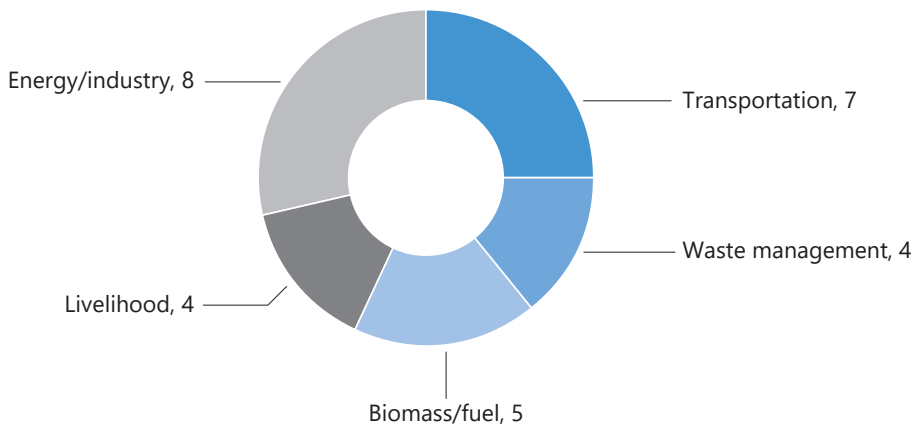


Figure 2.1. Sectoral breakdown of the case studies

Before summarising some of the major challenges and key enablers, a few important observations warrant highlighting. First, as for much of the co-benefits literature, the benefits in terms of reduced GHGs were quantified in many of the cases. In 17 out of the 28 cases, there was a measure of how much CO<sub>2</sub> or methane (CH<sub>4</sub>) was reduced: CO<sub>2</sub> was mentioned in twelve cases involving energy or transport and CH<sub>4</sub> was measured in five cases involving waste or wastewater. A smaller number of cases included measures of reductions in air pollution and SLCPs. The arguably lower number of cases where there is quantification of air pollution reduction may be attributable to the large concentration of cases in Japan where air pollution issues are not as serious. They are also likely related to the need to use emission factors for some local pollutants that may not exist or are difficult to calculate in developing countries. Beyond quantification, which is consistent with the mainstream literature on co-benefits, several interesting findings relating to the main questions in the introductory chapter can be seen by looking at the enablers and barriers in the cases below.

### 3.1 A review of challenges and enablers

The most frequently cited governance barriers involved different forms of stakeholder participation and engagement. For example, in Suwon, Korea, policymakers faced sharp public criticism due to what was perceived as an excessively top-down, insufficiently transparent and tourist-centric approach to a month-long, neighbourhood-wide car-free event; it nonetheless managed to win back support as it demonstrated the benefits of a larger urban renewal effort (in which the car ban was embedded) to the affected citizens. In the waste management sector, Hino, Japan adopted a plan to reduce GHG emissions but several of the measures went unimplemented due to limited engagement with citizens over design and implementation.

On a slightly smaller scale, a related set of challenges involved the government effectively engaging with sets of stakeholders who would use or repair specific technologies or infrastructure. In the transportation sector, three of the seven cases suffered from these kind of barriers. These include, for example, the inconvenience experienced by individuals who lacked information about the schedule and routing of lower carbon transport modes that could have been resolved by greater engagement with affected communities during the planning of the project. They also include the biomass/fuel and livelihood sectors in three of the eight cases—Lao PDR, Bangladesh and Viet Nam—where there was a need to build technical skills or technology users; one of the three (Lao PDR) was affected by a lack of consumer awareness or little appreciation of the long-term benefits of improved cookstoves. Another case, in Cambodia, involved a lack of knowledge of maintenance issues that could have been addressed with more engagement between technology users.

Some of the other challenges involving engagement suggested difficulties of working with the private sector and commercial interests. This was most evident in the transportation and waste management sectors. Four of the seven cases in the transportation sector were affected by a lack of initial finance that could have been managed through greater cooperation with banks and/or businesses. The shortage of these resources undermined the construction of new infrastructure. These cases involved light rail transit and transport sharing stations; new services such as intelligent transport systems; and securing sustained finance operations and maintenance.

As noted at the outset, the challenges involving agency coordination were fewer than anticipated, especially given that there would seem to be a need for cooperation across divisions working on air pollution and climate change. In the case of Tokyo, Japan, the Metropolitan Government needed to consider that most (80 percent) vehicles entering Tokyo came from neighbouring prefectures that were not subject to its authority. This required working with other cities and the national government to make sure the policy would not improve air quality and mitigate climate change in some parts of Japan while worsening the same problems elsewhere. In Indonesia, a lack of coordination and incentives between the local and national governments frustrated attempts to control GHG emissions as well as local pollution on slaughterhouse and waste management projects.

Table 2.1. Governance as a challenge

CASE	Governance Dimensions		
	Horizontal	Vertical	Non-state
Energy conservation, China			√
Compact city, Japan		√	√
Multi-modal transport sharing, Japan		√	√
Diesel emission control, Japan	√		
EcoMobility World Festival, ROK			√
Waste reduction, Indonesia	√		
Slaughterhouse waste management, Indonesia	√		
Increased biomass utilisation, Indonesia		√	√
Utilisation of improved cookstoves, Bangladesh			√
Conserving forest resources, Japan			√

While the enabling factors were not discussed as systematically across the case studies, some of the same findings as the section on challenges can be seen from looking at these factors. Here again, the most consistently cited sets of enabling factors were greater engagement with non-state actors. Three of these cases involved working with women on climate change projects. In each of these cases, efforts to bring women into the production, marketing, and sales of cookstoves and biodigesters could have helped to reduce GHGs and air pollution, while transmitting skills and promoting social equity. Engagement with local communities also helped to ensure that a series of energy initiatives were well aligned with needs of residents in Japan and Korea. In the Japanese case, this was achieved at a relatively small scale for a town that relied on decentralised energy. In Korea, an initiative known as One Less Nuclear Plant had more sizable impacts as it entailed reaching out to residents across Seoul to encourage support for energy saving technologies and behavioural changes that also mitigated climate change.

Table 2.2. Governance as an enabler

CASE	Governance Dimensions		
	Horizontal	Vertical	Non-state
Energy self-supporting communities, Japan			√
Compact city, Japan			√
Empowering women in biogas supply chain, Vietnam	√		√
Women in advanced cookstove supply chain, Cambodia	√	√	√
Disabled women in improved cookstove supply chain, Laos	√		√
Energy reduction through participatory governance, ROK			√

## 3.2 Overall Assessment

This chapter examines several cases to determine whether and to what extent governance challenges and enablers were needed for actions with co-benefits. Through comparing 28 case studies across various sectors in Asia, a few general observations emerge.

First, many of the most significant challenges involve greater engagement with multiple stakeholders. In some cases, the level of engagement is relatively limited in scope—where a company or even individuals could have helped to make a specific technology more useful. Many of the proposed responses to these user-level constraints are the easiest to implement because more engagement could lead to modest change in behaviour or a technology that would be good for the users, local environment, and global climate. At the same time, there are other instances where there is a need for greater levels of participation from not only affected residents but businesses and civil society. Creating institutional channels that support this engagement while simultaneously strengthening the capacities of government agencies could be a topic for future research on co-benefits.

Second, for several of the cases, it was important to enable participation with a more diverse mix of actors and interests. At one end of the spectrum were cases that involved working closely with women to provide them with the skills and knowledge need to mitigate climate change while achieving other socioeconomic benefits. In other instances, there were efforts to bring sizable populations of entire cities into solutions that delivered multiple benefits. Arguably the most successful case in this regard was Seoul, Korea's One Less Nuclear Power Plant. Importantly, this case worked with multiple not just single groups of stakeholders, including businesses and civil society. This also necessitated other intangibles such as having sufficient support from the political leadership.

Third, for some of the cases that involved infrastructure, it also makes sense for governments to become more adept at reaching out to commercial interests. Several of the solutions either involved or would have benefitted from the formation of PPP. In other cases, additional financial support from higher-level governments in form of subsidies and low-interest loans that support compliance with regulations helped to overcome challenges. This suggests that there are cases where more engagement beyond government and coordination within government would be helpful. In the previously mentioned cases, there was a need for engaging with multiple different kinds of stakeholders—though this was the exception.

Fourth, as demonstrated in the appendix that provides a more complete listing of all the cases, governance was not the only factor that prevented/mattered for the success of the cases. There was frequently a need for finance, technology, or capacity building—referred to elsewhere as means of implementation (MOI)—that played a contributing role. However, as also noted in this chapter, often engagement with actors beyond government could also help to fill some of the gaps related to MOI. In other words, the MOI interacted with some of the highlighted dimensions of governance.

## 4. Conclusion

This chapter began with an overview of the importance of co-benefits for mitigating climate change and pursuing other development needs. It noted that much of the co-benefits literature to date has concentrated on quantifying possible benefits as opposed to analysing the governance arrangements needed to align interests in support of actions based on that analysis. In many ways, the limited attention to governance parallels a similar gap in studies on linkages in the SDGs. The chapter aimed to fill this gap by assessing the governance challenges and enablers to the actions with co-benefits in five sectors in several countries in Asia.

The chapter found that the most frequently recurring challenges involved insufficient engagement with affected communities and technology users. At the same time, these challenges could be overcome with dedicated efforts to reach out to potential beneficiaries of co-benefits. A related finding is that some of the financial difficulties could also be overcome with greater engagement with the private sector in the form of PPP. Institutional coordination issues were less common in these mostly project-level cases. This suggests a possible correlation between the challenges and scale that is also relevant to Chapters 3 and 4. Those chapters underline that intergovernmental coordination becomes more important as efforts are made to scale up smaller integrated solutions.

An additional point involves the role of co-benefits as an integrated approach in helping to achieve the SDGs. A co-benefits approach offers useful experience that could inform other kinds of integrated approaches. These include the possible synergies between concretely measuring and monitoring multiple outcomes as well as promoting the kinds of participation needed to achieve the results of quantitative analysis. It may not be possible to achieve integrated outcomes without an inclusive decision-making process. Although the two are related, they are not the same. A key difference is that decision-making processes will need to be made more inclusive but there may be limits on how far these processes can be expanded to accommodate a wide range of interests. Research on the relationship between levels of institutional capacity and the effective inclusion of diverse interests could be useful for further work on the SDGs.

A related area for future research involves placing greater emphasis on the interrelationship between environmental and social goals. Too frequently, social-environmental interactions are not examined with the same rigour as those between different environmental issues, or those between environmental and economic issues. The concept of social co-benefits and greater efforts to include assessments of jobs created, equity effects, and gender impacts arguably deserve more attention. Similarly, improved methods for accounting for different approaches to public participation and stakeholder engagement are likely to be useful for both researchers and policymakers to consider. Decision-making tools and analytical frameworks that can help better understand how the achievement of multiple benefits rests on improved participation and engagement could also prove illuminating.

Annex 2.1. Overview of case studies

Location/ time	Policy/project goals	Co-benefits achieved	Co-benefits quantified?	Policy actions	Additional Challenges
Toyama, Japan, 2002 onwards	Compact city	Reduced GHGs, reduced dependence on automobiles, economic activities in the city centre, active elderly population	Yes, CO <sub>2</sub>	<ul style="list-style-type: none"> <li>- Revitalizing public transport: light rail transit</li> <li>- Encouraging relocation of residents and business to zones along public transport corridors</li> <li>- Re-energizing the city centre</li> </ul>	<b>Economic:</b> insufficient financing of construction and operations
Kashiwa, Japan, 2009-2016	Multi-modal transport sharing	Reduced congestion, reduced traffic accidents, reduced air pollution, reduced GHGs	No	<ul style="list-style-type: none"> <li>- Multi-modal sharing spots (bicycles, electric power-assisted bicycles, electric motorcycles, electric cars, gasoline cars)</li> <li>- Intelligent transport service spots</li> </ul>	<b>Economic:</b> securing sustainable finance to maintain operations, cost for securing and maintaining the sharing stations
Tokyo, Japan, 1999 onwards	Diesel emission control	Improved air quality	Yes, PM	<ul style="list-style-type: none"> <li>- Initiating the debate on vehicle pollution control policies</li> <li>- Call for behavioural change on vehicle use</li> <li>- Ban across Tokyo on the use of diesel vehicles non-compliant with PM emissions standards</li> </ul>	<p><b>Technological:</b> low-sulfur diesel fuels were not yet available in Japan</p> <p><b>Economic:</b> expensive installation of diesel particulate filters</p>
Toyota, Japan, 2004 onwards	Intelligent transport systems for transport demand management	Reduced CO <sub>2</sub> emissions	Yes, CO <sub>2</sub>	<ul style="list-style-type: none"> <li>- Provision of information through a comprehensive website and smartphone application</li> <li>- Information boards for park-and-ride and public transport services</li> <li>- Ultra-compact electric vehicle sharing system</li> </ul>	<b>Economic:</b> securing initial finance

Location/ time	Policy/project goals	Co-benefits achieved	Co-benefits quantified?	Policy actions	Additional Challenges
Thailand, 2007 onwards	Making domestic automobile companies globally competitive	Fuel saving, energy security, reduced CO <sub>2</sub> emissions	Yes, CO <sub>2</sub> , HC, CO, NOx	- Eco-car program: corporate tax exemption, import duties exemption or reduction	None
Kawasaki, Japan, 1995 onwards	Waste reduction	Extended life of landfill facilities, accrued experience in environmental policy and technology, creation of the Low CO <sub>2</sub> Kawasaki Brand	Yes, GHG	- Rail transport of regular waste, incineration ash and recyclables - Eco-Town plan to promote recycling - 3Rs: Reduce, Reuse and Recycle	<b>Economic:</b> national government subsidy was removed half-way in the Eco-Town project; added financial burden of waste collection due to illegal dumping <b>Legal:</b> illegal dumping
Hino, Japan, 2000 onwards	Waste reduction	Additional government revenue to fund cleaning service and low-income household subsidies; lower risks of fire; emergence of local networks; increased environmental public concern	No	- Required use of city's trash bags - Removal of garbage cans - Reduced frequency of waste collection - Volunteers to raise awareness	
Banjarmasin, Indonesia, 1991 onwards	Waste reduction	Conservation of space for landfills; decreased production of methane; prevention of odors; improved quality of surface and groundwater; lower risks of fire; recovered methane used as a power source; improvement of workplace health and atmosphere; community improvements	No	- Promotion of recycling and reuse at households - Mandate for local governments to shut down final disposal sites - National environmental standards on water and wastewater	<b>Economic:</b> high installation cost of new devices

Location/ time	Policy/project goals	Co-benefits achieved	Co-benefits quantified?	Policy actions	Additional Challenges
Palembang, Indonesia, 2006 onwards	Slaughterhouse waste management	Prevented wastewater leakage, reduced odors; reduced methane emissions; captured methane used as a power source	No	- National environmental standards on slaughterhouse wastewater	<b>Economic:</b> Market for compost is not strong enough for economically composting the waste; high initial costs of installation of methane- capturing devices; facility improvements are too costly for local governments to afford
Indonesia, 1997 onwards	Increased biomass utilization	Reduced GHGs attributable to energy production; strengthened domestic energy security and decreased reliance on fossil fuel imports; reduced organic waste, creation of job opportunities for low-income households and affiliated industries	No	none	None
Bangladesh, 1970s onwards	Increased utilization of improved cookstoves	Less time spent collecting biomass and cooking; reduced smoke in the kitchen; improved public health especially for women and children, fuel saving, time saving	No	- Research and development for efficient energy usage  - Disseminating improved cookstoves  - Promoting improved cookstoves	<b>Technical:</b> Limited durability of stoves
Vietnam	Empowering women in biogas supply chain	Reduced GHG emissions; reduced reliance on fossil fuels and chemical fertilizers; increased income of women changing from assistant to leadership roles; increased self- esteem of women, generation of economic benefits for households	Yes, CO <sub>2</sub> eq	- Training of female biogas masons  - Provision of loans for domestic biogas installations and relevant business capacity building for women	<b>Social:</b> Few role models for women masons, gender stereotypes in construction work  <b>Technical:</b> Women have limited masonry skills, women masons take longer to master the technical issues



Location/ time	Policy/project goals	Co-benefits achieved	Co-benefits quantified?	Policy actions	Additional Challenges
Cambodia	Empowering women to participate in advance cookstoves supply chain	Reduced GHG emissions; fuel saving; time saving; improved health	Yes, CO <sub>2</sub> eq	<ul style="list-style-type: none"> <li>- Integrating women as sales agents into the sales networks of advanced cookstoves; capacity building activities, agreements with the women's families, facilitating good relationships between women sales agents and local governments, organizing meetings among women sales agents</li> </ul>	<p><b>Economic:</b> expensive advance cookstoves compared with typical ones</p> <p><b>Technical:</b> potential hardship for users with even slight delay of maintenance</p>
Lao PDR, 2013 onwards	Empowering disabled women in improved cookstoves supply chain	Lowered GHG emissions, fuel saving, time saving, reduced indoor air pollution and improved health, promotion of understanding of gender equality	No	<ul style="list-style-type: none"> <li>- Testing of the financial viability of improved cookstoves productions</li> <li>- Achieving certification for an local NGO supporting disabled women as an accredited improved cookstoves production facility</li> <li>- Integrating women as sales agents into the sales networks of advance cookstoves: capacity building activities, agreements with the women's families, facilitating good relationships between women sales agents and local governments, organizing meetings among women sales agents</li> </ul>	<p><b>Technical:</b> lack of improved cookstoves production background, first batches of improved cookstoves did not pass inspection for quality of construction</p>
Nepal, 2015 onwards	Rebuilding earthquake-affected brick kilns	Decreased PM emission, reduced coal consumption, improved worker health, bricks'	Yes, PM	<ul style="list-style-type: none"> <li>- Design manual for new bricks manufactured in environmentally-friendly ways</li> <li>- Engineering support</li> </ul>	None

Location/ time	Policy/project goals	Co-benefits achieved	Co-benefits quantified?	Policy actions	Additional Challenges
Indonesia, 1995 onwards	Improving the palm oil production process	Capturing the methane generated and reusing it as an energy source; reduced GHG emissions; reduced air pollution; reduced water pollution; creation of jobs; improved work environment	Yes, N <sub>2</sub> O, CO <sub>2</sub> , CH <sub>4</sub> , SO <sub>2</sub> , NO <sub>x</sub>	- Regulations including environmental limits relating to chemicals	None
Panzhihua, China, 2006-2010	Energy conservation and emission reduction	Reduced air pollution	Yes, CO <sub>2</sub> , SO <sub>2</sub>	- Implementation program for total emission reduction of major pollutants  - Optimization and adjustment of industrial structure and the monitoring system	None
Chongqing, China, 2006-2015	Controlling air pollution and GHG emissions	Improved stability of power supply	Yes	- Waste heat recovery system in the cement industry for power generation used for cement production	<b>Economic:</b> Chances of not meeting standard internal return on revenue benchmark
Xiangtan, China, 2006-2010	Energy conservation and emission reduction	Increased percentage of days of good urban air quality	Yes, CO <sub>2</sub> , SO <sub>2</sub>	- Promoting the application of advanced technologies and energy saving and emission reduction devices  - Monitoring system to control pollution and smoke from a wide range of industries	None
Ningguo, China, 1998 onwards	Controlling emissions from cement industry	Power generation	Yes, CO <sub>2</sub> , SO <sub>2</sub> , NO <sub>x</sub> , PM <sub>2.5</sub>	- Waste heat recycling system as a result of Sino-Japan technology cooperation	<b>Technical:</b> information needed for estimating co-benefits
Anhui province, China, 2010 onwards	Energy conservation, reduction of impact on air pollution and GHG emissions	Prevented need for hazardous material treatment equipment	Yes, CO <sub>2</sub>	- Integrating a waste incinerator into existing cement operations as a result of Sino-Japan technology cooperation	<b>Economic:</b> unwillingness of local government to provide sufficient economic compensation for waste treatment

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# Chapter 3

## Governance for Integrated Transport Solutions in Asia: The Case of Eco-driving

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## Chapter 3

# Governance for Integrated Transport Solutions in Asia: The Case of Eco-driving

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### Main Messages

- Policymakers in Asia are adopting more integrated transport solutions to achieve multiple environmental, social, and economic objectives;
- A common cost-effective integrated transport solution is eco-driving, which typically involves changing driving behaviour, increasing a driver's control of the vehicle, and enhancing vehicle maintenance and repair to improve vehicle performance;
- This chapter addresses which agencies and actors and what forms of coordination and engagement are required for an effective eco-driving programme;
- The main challenges for eco-driving programmes are inadequate incentives for drivers to change entrenched behaviour;
- Potential solutions observed from Asia include increased eco-driving guidelines distributed by car companies, mandatory installation of in-vehicle intelligent transport systems, fuel efficiency indicator systems, driver training and integration of eco-driving into issuance of driving licences, awareness raising and rewards programmes;
- From a governance perspective, most programmes require a local government or company to initially equip drivers with the basic knowledge and skills for eco-driving. Once these fundamentals are in place, coalitions between businesses (especially car companies) and civil society organisations (CSOs) could strengthen eco-driving initiatives through awareness raising, capacity building, and dissemination of advanced information and communication technology (ICT); and
- In the overall framework for this report, stakeholder engagement mattered in most of the cases through the design and implementation of eco-driving programmes; vertical and horizontal coordination played a role as countries moved to scale up programmes.

## 1. Introduction

Asia is growing quickly with the region's rapidly expanding transport systems fuelling much of that growth. The expansion of transport systems not only stimulates development, but demands for transport also tend to grow with development. The dynamic interrelationship between economic development and transport demand has led to greater dependence on motor vehicles in Asia. The region's rapid motorisation has, in turn, threatened energy security, generated air pollution, and contributed to climate change. Growing awareness of this interrelated set of problems is leading policymakers in Asia to adopt more integrated transportation solutions (Zusman, Srinivasan, and Dhakal 2012; Huizenga and Bakker 2012; Schipper, Fabian, and Leather 2009). While the term "integration" is used many different ways in the transport sector (May, Kelly, and Shepherd 2006; Hull 2005), this chapter will focus on solutions that integrate environmental concerns (particularly mitigating climate change) and other socioeconomic priorities into a single set of transport actions. In line with the broader goals of this report, the chapter will also seek to determine how different agencies and non-state actors can work together to make a particular integrated solution effective. The specific solution examined in this chapter is eco-driving.

Eco-driving programmes typically involve changing driving behaviour, increasing a driver's control of the vehicle (through reducing vehicle weight and wind resistance), and enhancing vehicle maintenance and repair to improve vehicle performance (IEA 2010) (see Box 3.1 for a listing of desirable actions). Eco-driving is further aided by three sets of systems: 1) pre-trip systems that involve training before trips/driving; 2) in-trip systems that provide traffic information during the trip; and 3) post-trip systems that offer monitoring that can subsequently improve driving behaviour (Sciarretta, De Nunzio, and Ojeda 2015). By using these systems to alter behaviour and encourage sound vehicle maintenance and upkeep, eco-driving represents a cost-effective way to improve driving performance while cutting fuel consumption and reducing air pollution and greenhouse gas (GHG) emissions. Previous experience has shown that eco-driving could save up to 20 percent of the fuel used by some drivers and possibly 5-10 percent on average across all drivers over an extended period of time (Barkenbus 2010). As noted elsewhere in the chapter, eco-driving works best as part of a larger transport strategy that aims to also *avoid* unnecessary travel and encourage a *shift* to public transport—an approach known as **Avoid-Shift-Improve** or ASI (Dalkmann, H., C. Brannigan Lefevre, B. Enriquez 2014) .



*Box 3.1. Core components of an eco-driving programme*

1. Behavioural change
  - Optimise gear changing
    - Shift up as soon as possible
  - Avoid vehicle idling
    - Switch off engine at short stops
  - Avoid rapid acceleration and deceleration
    - Decelerate smoothly
  - Drive at efficient speeds. The most efficient speed for most cars is between 60 km/h and 90 km/h. Above 120 km/h, fuel efficiency falls significantly in most vehicles.
    - Maintain a steady speed
    - Anticipate traffic flow
2. Control of vehicle
  - Reduce weight by removing unnecessary items from the car
  - Reduce wind resistance by removing items attached to the exterior of the car
3. Regular and appropriate maintenance of vehicle
  - Keep tires properly inflated and purchase low-rolling resistance replacement tires
  - Use low viscosity motor oils.

Most drivers have some awareness of actions and skills required for eco-driving. Nonetheless it is easier to drive with little regard for inefficient habits. For most drivers, the main motivation for eco-driving is the cost-savings from reduced fuel consumption and potential reduction in maintenance expenses. This motivation should be taken into account as it can help to both raise awareness and create incentives for behavioural change. It is further important to understand that this motivation can wane without continual reinforcement. The need to continually raise awareness and create incentives to induce and then maintain behavioural changes explains why it may be important to integrate eco-driving into various policy fields such as energy, climate change, environment protection, and even driver license procedures. The same motivation and the related behaviour-altering incentives is also why eco-driving may require guidance and different forms of encouragement from government and non-state actors (Böhler-Baedeker and Hüging 2012). There is, however, a question over which agencies and actors and what forms of coordination and engagement are required for an effective eco-driving programme.

This chapter will aim to answer this question by employing the same analytical framework featured elsewhere in the report. That framework focuses on the following three elements: 1) horizontal cooperation; 2) vertical cooperation; and 3) stakeholder engagement (see Chapter 1). Using that framework, the chapter demonstrates that, at least initially, coalitions

between businesses (especially car companies) and civil society organisations (CSOs) could strengthen eco-driving initiatives through awareness raising, capacity building, and dissemination of advanced information and communication technologies (ICT). More ambitious eco-driving programmes—as were developed in Japan and Europe following efforts to reach Kyoto protocol targets—will likely necessitate enabling support from national transport, environmental, and energy agencies. That support could consist of incentives for the installation of in-vehicle intelligent transport systems, driver training programmes, and integration of eco-driving into the issuance of driving licences. These enabling reforms could be introduced in parallel with a broader integrated transport strategy that incorporates some of the A and S elements from the aforementioned ASI approach (Böhler-Baedeker and Hüging 2012).

This chapter is divided into four sections. The next section underlines the growing emphasis on integrated transport solutions and what is needed to govern those solutions in Asia. The third section reviews several programmes in Asia as well as a few programmes outside the region to highlight whether and to what extent horizontal coordination, vertical coordination, and stakeholder engagement influenced their performance. A final section reflects on the broader implications of eco-driving for sustainable transport and other integrated approaches to the SDGs.

## 2. Integrated transport solutions

As noted in the introduction, there are various uses of integration in the transport sector. It is helpful to briefly review how the term began to be used and the many different definitions of the term before demonstrating its particular application to this chapter.

### 2.1 Defining integration in the transport sector

In the 1990s, the notion of integration began to gain currency among transport planners. The growing appeal was initially to promote an alternative to transport policies focused chiefly on *supplying* more roads (Goodwin et al. 1991). Rather than supplying more transport infrastructure, there would be an emphasis on *integrating* concerns over fast-rising transport *demands* into transport planning. This was also done, in part, to reflect the impact that transport was having on the environment, particularly contributions to climate change.

In the early 2000s, the use of the term integration increased sharply following decisions from the United Kingdom and European Union to advance more integrated transport strategies in the UK 10-Year Transport Plan (DETR 2000) and the EU Common Transport Policy (European Commission 2001). Over the past two decades, there has not only been a proliferation of the term's use but more confusion over its meaning. To quote one of the

clearer presentations of work on integration in transport policy, integration is a principle that is “frequently advocated but rarely defined” (May, Kelly, and Shepherd 2006; Hull 2005).

Currently, integration in the transport community has been used to connote different things from different observers. Some of the varying uses and applications are as follows:

1. Integration between different operational aspects of a public transport system such as integration between the fare system, rider services and information provision;
2. Integration between different modes of transport such as the integration between infrastructure that supports walking, cycling, and public transport;
3. Integration between conventional transport measures that tend to focus on road building and land use planning;
4. Integration between different kinds of policy instruments as part of a strategic package of interventions such as the integration of a road pricing scheme into a programme that is helping to modernise the light rail system and assessing taxes on vehicles with low fuel efficiency;
5. Integration between transport and other policy areas such as health, environment, labour;
6. Integration between the different public agencies, levels of government, and other organisations charged with designing and implementing transport policy (May, Kelly, and Shepherd 2006; Hull 2005).

The remainder of the chapter will use integration chiefly in the sense of definition 5—that is, integration of environmental and other socioeconomic concerns into transport policies and plans. The chapter also seeks to understand how the interests of different agencies and actors can be aligned to support eco-driving, as in definition 6.

## 2.2 The need for integrated transport solutions in Asia

The focus on a solution that can integrate multiple environmental and socioeconomic objectives is consistent with the growing advocacy for sustainable low carbon transport (Sustainable Mobility for All 2017). Although sustainable transport does not have its own SDG, SDG target 11.2 “seeks to provide access to safe, affordable, accessible and sustainable transport systems for all...” Further, many of the headline goals—such as SDG 3 (health), SDG 7 (energy), SDG 8 (decent work and economic growth), SDG 9 (resilient infrastructure), SDG 12 (sustainable consumption and production, particularly regarding fossil fuel subsidies), and SDG (climate change)—call for greater integration with the transport sector (SLoCaT Partnership 2015). The links between eco-driving and several of the SDGs are presented in Figure 3.1.

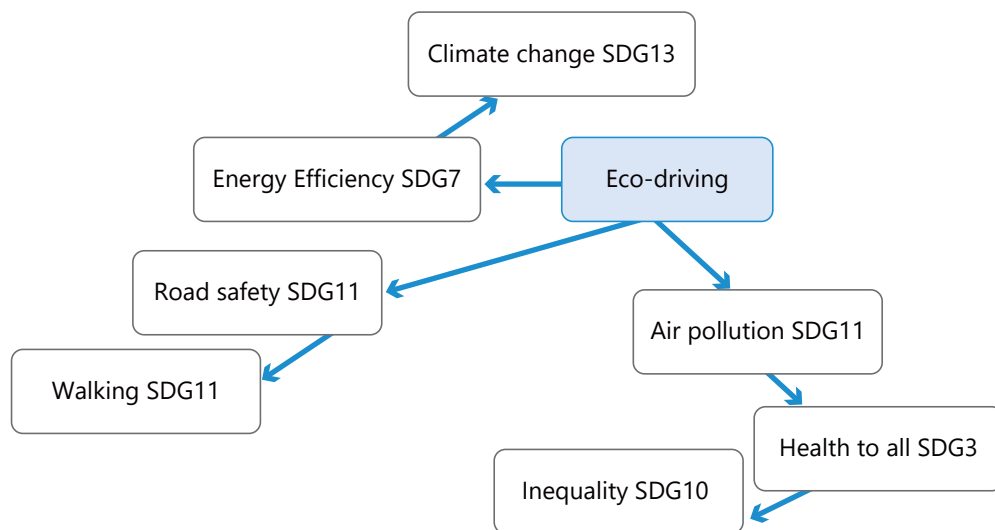


Figure 3.1. The multiple benefits of eco-driving

Source: Developed by the Authors

Much of the recent data demonstrates Asia could deliver on many of the SDGs featured in Figure 3.1. For example, in many parts of the region transport is one of the largest sources of nitrogen oxides (NO<sub>x</sub>)—a precursor of ground level ozone that can cause severe respiratory problems and harm ecosystems and vegetation. The most recent regional emissions inventory for Asia demonstrates that road transport in Southeast Asia made up nearly 45 percent of total NO<sub>x</sub> emissions, while it accounted for slightly more than 42 percent of NO<sub>x</sub> in India and nearly 13 percent of NO<sub>x</sub> in China as of 2008 (Kurokawa et al. 2013).<sup>1</sup> These contributions are partially responsible for results from cross-national studies that show the largest number of premature deaths from air pollution globally are in South and East Asia (Landrigan et al. 2017). Other signs of the transport sector’s unsustainable development can be found in research that suggests 700,000 of the world’s 1.18 million road casualties occur in Asia (ADB, 2010). Yet another source of concern is GHG emissions from the transport sector that have tended to grow quickly in Asia; transport contributes more than one quarter (Indonesia-29%) to more than half (Cambodia-53%) of energy-related carbon dioxide (CO<sub>2</sub>) in some countries in Asia (International Energy Agency 2017).

Policymakers are looking therefore to provide integrated transport solutions that enhance mobility without placing undue stress on the local and global environment. One way that they have done this is through the increased uptake and application of the ASI approach. The ASI approach categorises transport solutions into those that 1) avoid unnecessary travel, 2) shift to the most efficient modes, and 3) improve the performance of vehicles (Dalkmann, H., C. Brannigan Lefevre, B. Enriquez 2014). The ASI approach has been deservedly credited with placing a greater emphasis on “avoid” and “shift” options that were frequently discounted because they were more difficult to incorporate into transport models than the technology changes commonly found in the “improve” category. At the

1 Although road transport made up a smaller percentage of NO<sub>x</sub> emissions in China, the aggregate levels of NO<sub>x</sub> emissions were even greater than Southeast Asia.

same time, the approach has also helped highlight that some of the potentially most cost-effective options in all three categories involve changing behaviour and do not require significant investments in infrastructure (Böhler-Baedeker and Hüging 2012). As such, eco-driving offers a relatively low-cost set of potentially quick wins that could be critical to Asia.

Table 3.1. Options under the avoid, shift and improve approach

Avoid the number of trips requiring motorised transport	Shift to most environmentally efficient modes of transport	Improve the efficiency of vehicle technologies
<ul style="list-style-type: none"> <li>• Integrate land-use and transport planning</li> <li>• Design denser, more compact settlements</li> <li>• Promote telecommuting through teleconferencing</li> <li>• Congestion charging, parking management</li> <li>• Car sharing</li> </ul>	<ul style="list-style-type: none"> <li>• Frequent and reliable public transport (e.g. BRT)</li> <li>• Non-motorised transport (e.g. walking and cycling).</li> </ul>	<ul style="list-style-type: none"> <li>• Enhance fuel economy of conventional engines</li> <li>• Reduce the weight of vehicles</li> <li>• Promote electric and hybrid vehicles</li> <li>• Enable access to biofuels and hydrogen fuel</li> <li>• <b>Encourage environmentally-friendly driving habits (e.g. eco-driving).</b></li> </ul>

### 2.2.1. Governance and aligning stakeholder interests

As countries have taken forward ASI, policymakers have discovered the challenges of governing solutions based on this framework. To some extent, these struggles are attributable to issues that are familiar to policymaking literature that precedes work on sustainable low carbon transport or ASI. For example, sometimes there has been a lack of clear and consistent policy objectives; or inadequate attention to compliance in the transport policy’s target groups (Sabatier 1986). To illustrate, the Clean Air Act in the Philippines (also known as the Republic Act No. 8749) was modelled after the United States Clean Air Act and hence there was limited attention to some of the unique features of the country’s transport system—such as the provision of transport services by a large informal sector—that could complicate its application (Republic of the Philippines 1999).

While some of more general critiques from policymaking literature apply to transport, nearly a decade ago scholars began to draw upon the insights from multi-level governance to illuminate opportunities and constraints to sustainable low carbon transport. Initially, reflecting the regions that were most actively trying to reach climate mitigation targets, this application was seen mostly in developed countries in Europe. For example, in England and Scotland the devolution of authority spread the capacities of relevant transport agencies too thin and made it challenging to align diverse interests behind low carbon transport strategies (Marsden and Reardon 2017). Other observers have concentrated more on the dispersion of authority to find “a very piecemeal and often fragmented process” impeding the transition to more sustainable transports systems (Berger, G., Feindt, P., Holden, E., Rubik 2014).

In recent years, similar challenges of coordination in developing countries in Asia have been examined. In Indonesia, for instance, a study looking at central-local intergovernmental relations found that local governments struggled greatly to access sufficient resources to implement strategies consistent with national sustainable low carbon strategies (Jaeger et al. 2015). Others have similarly noted that a lack of horizontal and vertical integration “resulted in delays and ultimately rejection” of bus rapid transit (BRT) projects in Indonesia (Wijaya 2017). On a slightly more optimistic note, analysts have seen signs of progress stemming from the emergence of climate change and sustainable transport. These include the evidence that there is growing inter-ministerial cooperation and horizontal coordination owing to the need to address GHG emissions. This cooperation is partly a result of more regular interactions between policymakers in different sectors using some of the same thinking that underpins ASI (Bakker 2018). It has also resulted in the integration of transport measures in over 60 percent of a survey of 160 countries’ nationally determined contributions (NDCs) (Huizenga and Peet 2017).

The above literature suggests that many of the same elements of governance featured elsewhere in the report influenced transport strategies based on ASI. However, they offer limited insights into whether, and to what extent, horizontal coordination, vertical coordination, and/or stakeholder engagement could affect *eco-driving*. The following descriptions offer a brief summary of how the three sets of strategies might affect *eco-driving*.

- Horizontal cooperation involves creating or strengthening cooperation across different agencies at the same level. The *eco-driving* portfolio could fall either under the environmental, transport or energy agencies or some combination of the three; there is, however, a chance that it is not promoted by any of the three agencies and “falls through the cracks” as can occur with many inherently cross-sectoral approaches.
- Vertical cooperation involves the alignment of interests between levels of decision making. This could be important because, while local governments may be significant proponents of *eco-driving*, motor vehicles move easily across city boundaries. Without national government support, there is likely to be considerable leakage and disincentives for changing behaviour. A related potential area of support specific to *eco-driving* involves inclusion of training in driving license procedures. Only national governments are able to influence those rules. Also, national governments can provide financial and institutional support (particularly additional awareness raising) that could help local governments scale up successful pilots.
- Multi-stakeholder engagement is needed to raise awareness and offer other incentives in the private sector and civil society. For *eco-driving* techniques to reach the widest audience and be actively employed, a steady set of information flows is needed. The private sector and civil society can work through traditional outreach and programming to build and disseminate that knowledge. Advances in ICT can also help strengthen incentives for continued use of *eco-driving* techniques.

## 2.3 Eco-driving in Asia

The next question is whether the three different dimensions described at the end of the previous section have influenced eco-driving programmes. This section addresses that question by looking first at cases in Asia before moving to cases outside the region.

### 2.3.1 Japan

Japan—the most successful implementer of eco-driving in Asia—officially began promoting eco-driving in 2003 with an interagency effort that involved horizontal cooperation between the Ministry of Economy, Trade and Industry (METI), the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), and Ministry of the Environment (MOE), and National Police Agency (NPA). These four agencies joined together to form an Eco-driving Liaison Committee. This newly formed group was assembled to provide guidance to drivers that would help Japan make progress on national Kyoto Protocol targets. Three years after its creation, the Liaison Committee introduced and shared widely a set of 10 tips for eco-driving (later revised in 2012). This was supported by an Action Plan for Eco-Driving Promotion in 2006 that consisted of the following hardware and software components: “1) review of the definition of energy-saving driving, and determination of effective use; 2) dissemination and educational activities for energy-saving driving; 3) dissemination and promotion of an energy-saving driving support system; 4) establishment of an evaluation system for energy-saving driving; 5) interorganisational efforts involving municipalities and concerned organisations; 6) a survey required for dissemination and promotion of energy-saving driving” (Funazaki 2012). The action plan also outlined how different CSOs and industry associations (including federations of taxi drivers, freight operators, and bus companies) could contribute to eco-driving. This initial efforts served

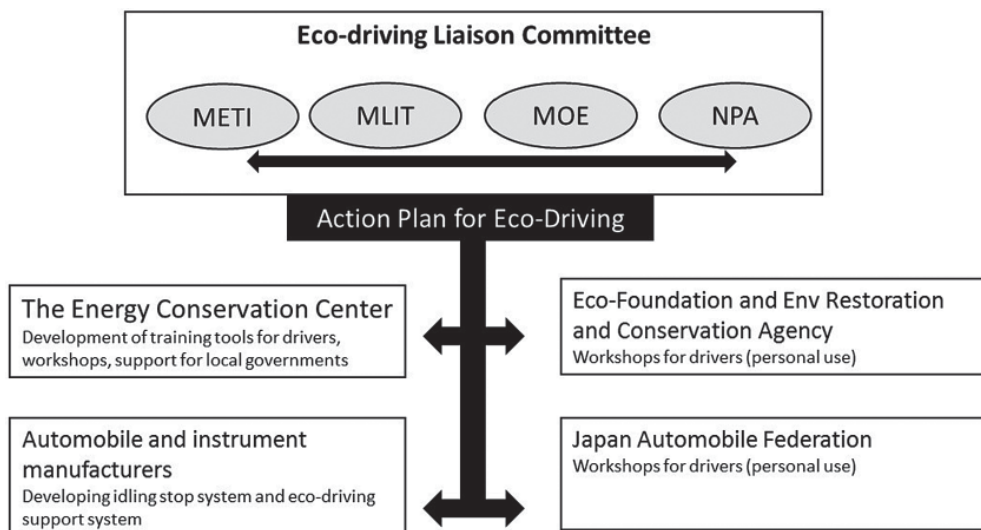


Figure 3.2. The organisational structure for eco-driving in Japan

Adapted from Funazaki 2012.

as a flexible platform that has helped to raise awareness and offer suggestions on how to eco-drive (Funazaki 2012; IEA 2016; Foundation for Promoting Personal Mobility and Ecological Transportation 2017).

In terms of stakeholder engagement, the same flexible platform has enabled multiple actors to exchange views and share experiences on their respective activities on eco-driving. For example, some companies have focused on developing and marketing an eco-driving management system to collect and analyse driving data on a real-time basis. Government subsidies then followed for expanding deployment of this system, especially for the freight sector. In other instances, the government agency responsible for energy decided to create a website [www.ecodrive.jp](http://www.ecodrive.jp) that not only allowed citizens to register, monitor mileage, and compare fuel economy but supports the efforts of companies working in the field. In other cases, companies have taken it largely on their own accord to promote eco-driving with limited government support. For instance, Toyota Motors has distributed eco-driving guidelines to all its subsidiaries and distributors not only in Japan but overseas.

As for vertical coordination, the previously mentioned flexible platform has also served as a source of information for local governments. However, local governments have also influenced the design and application of eco-driving programmes. This is evident in early efforts at the subnational level that involved Kyotango, a city of approximately 50,000 people located near Kyoto in Japan's Kansai region. In 2005, Kyotango piloted an eco-driving programme that required private and commercial vehicles to install in-vehicle intelligent transport system (ITS). The systems would then provide guidance on how to improve the cost-effectiveness of driving for six months (Shaheen and Martin 2012). More recently, Tokyo has promoted eco-driving as part of larger programme to reduce fuel consumption and address other environmental concerns from freight vehicles; the programme in question employs a one- to three-star rating system that gives priority in the selection for shipments to freight companies that can demonstrate progress in fuel efficiency. Due to the expense of replacing expensive trucks, a more efficient driving style has become the most viable approach for many companies to earn a solid rating. (Sustania 2017). In the case of Tokyo, the engagement is chiefly between the local governments and the private sector.

### **2.3.2 Indonesia**

An ongoing and still somewhat fragmented effort can be found in Indonesia. Eco-driving in Indonesia has proceeded in several stages. Early efforts to introduce eco-driving date back a decade ago to 2007 when the Clean Air Project (CAP) was launched in the Jakarta Metropolitan area by Swisscontact Indonesia Foundation (SIF). CAP provided eco-driving training for large bus fleet operators in Jakarta (HIBA Utama) that yielded an average reduction of 8 percent in fuel consumption or US\$12,000-US\$15,000 or reductions of 530-760 tons in CO<sub>2</sub> emissions.

In recent years, some of these more extensive efforts to promote eco-driving have come from the Ministry of Environment and Forestry (MoEF). MoEF has sponsored eco-driving



events during its annual Environment Week that are attended by car clubs, traffic police, companies, media and the general public. Participants have been provided with eco-driving “tips and tricks” that could result in significant CO<sub>2</sub> emissions and cost savings. There is nonetheless limited coordination and engagement between the different actors beyond the Environment Week.

The awareness of the potential need to further institutionalise cooperation led Clean Air Asia—a non-profit organisation based in Manila that works across the region to build capacity on air quality management—to support an approach to eco-driving that will strengthen collaboration between the national and local governments. The program in question has helped support cooperation with several government agencies and non-state actors to pilot an innovative eco-driving programme in Greater Jakarta. Using the knowledge from the Jakarta pilot, the main goal has been to integrate eco-driving into national policies through legislation requiring driving schools include training for a driver license. These efforts could also possibly result in a sustainable source of funding and further strengthen the cooperation between multiple agencies and stakeholders (Agatep 2017).

### **2.3.3 Other Cases in Asia**

Some relatively successful subnational efforts in Asia have also benefitted not from the support of the national government but engagement between the local government and private sector. In India, one of the more successful eco-driving experiences has involved Ahmedabad Municipal Corporation (AMC). The AMC oversees India’s seventh largest city, managing an area of more than 450 square kilometres with over 45 million people. Due to the size of the area and population, the AMC individually owns 1000 vehicles and contracts with operators of an additional estimated 700 vehicles. To reduce the environmental footprint of this vehicle fleet, AMC provides drivers and operators trainings on practical techniques and proper use of vehicles; the trainings were intended to address an array of themes ranging from reducing idling to avoiding unnecessary acceleration. The ultimate goal of these efforts was to bring down the daily consumption of about 10,000 litres of (mostly) diesel fuel; they also generated an estimated 13,000 tons of CO<sub>2</sub> emissions for the fleet (USEPA 2012).

In the Philippines, the private sector has taken the lead on eco-driving without engagement from the government. A notable example is the Meralco South Distribution Services (SDS) Green Fleet Program. SDS is a branch of the Meralco Corporation that distributes electricity in the Southern part of Luzon that aimed to make its approximately 300 vehicles more fuel-efficient when it shifted to an improved environment, safety, and health policy in 2009 (MERALCO 2009). Anticipating this change in policy, Meralco conducted a study on the possible effects of an eco-driving training course. Further, the company used the United Nations Environment Programme–Thomas Nationwide Transport (UNEP-TNT) Toolkit for Clean Fleet Strategy Development to formulate its own baseline of CO<sub>2</sub> emission and other pollutants (such as PM10) to monitor progress; this toolkit helped estimate that Meralco SDS 300 vehicles emitted 1.4 tons of PM10 every year. Based on the results of the analysis, the company identified vehicles it targeted for improvement (emergency pick-up trucks, utility pick-up trucks, vans and basket trucks) and introduced a series training, awareness

raising, and rewards programmes. After a year of implementation, Meralco SDS improved fleet-wide efficiency by 16 percent and reduced emissions of CO<sub>2</sub> and PM10 by 10 percent and 4 percent respectively. With the benefits of the programme clear, the company decided to integrate eco-driving training into driver training modules and make the eco-driving course mandatory for drivers every three years. Other Meralco Corporation branches are starting to implement similar initiatives (USEPA 2012)

While the case of the Philippines suggests government engagement may not always be necessary, other cases in Asia have enjoyed less success partially due to the lack of government involvement. In both Laos PDR and Viet Nam, for example, eco-driving has been attempted with freight and logistics companies. However, these efforts failed to make much headway due to the contracting structure between the truck drivers and the trucking company. That contracting structure is set up so that the companies pay the drivers a predetermined amount for the fuel. This is intended to limit the amount of bargaining that goes into the fuel costs and curb temptations for the drivers to steal fuel. At the same time, though, it also sharply limits the company's interest in saving fuel because fuel is a fixed cost. A similar sets of disincentives has also discouraged the purchase of low rolling resistance tires and aerodynamic devices that would also increase fuel efficiencies. Without support from the government to push for changes to the contracting or to create other incentives, it has been difficult to invest in the sustained awareness raising or other incentives that would make eco-driving effective in Laos PDR and Viet Nam (Grutter 2016).

Outside of the countries in Asia-Pacific covered in this section, other countries in the region that have some experience with eco-driving include New Zealand, Australia, Thailand, South Korea and China. The information on these programmes is rather limited, making it difficult to assess how governance did or did not influence their performance (VTL, Breithaupt, and Eberz 2012; Agatep 2017).

### 3. Eco-driving outside Asia

Outside of Asia, the success that European Union (EU) has enjoyed with eco-driving is partially attributable to more cooperation between more government agencies and stakeholders than in most of the cases in Asia. In the EU, governments, automobile companies and CSOs have all been cooperative players in efforts to promote eco-driving initially at the regional level. This regional cooperation, in turn, contributed to a set of three broader EU programmes: 1) Eco-Driving Europe that was launched in 2001 to create a transnational network for eco-driving schemes; 2) ECODRIVEN that helped raise awareness of best practices from 2006-2008; and 3) ECOWILL that supported the inclusion of eco-driving curriculum into driving license requirements from 2012-2013 (similar to the efforts underway in Indonesia) (Luther and Baas 2011).

Though some forms of eco-driving were introduced in Germany in 1999, these efforts did not gain significant momentum until the ECOWILL campaign supported the uptake of the

programme by the national government and then attracted attention from other partners. Through ECOWILL, the German Government worked with Deutscher Verkehrssicherheitsrat (DVR) or the German Road Safety Council and Ford Motor Company to deliver eco-driving education to more than 50,000 people. Having the involvement of Ford ensured there was sufficient technical knowledge and capacity to implement the programme. DVR also formulated a detailed national communication and implementation strategy to rollout short-term training that would eventually feed into a more sustainable long-term training structure. To help build this more durable structure, DVR reached out to various organisations and networks, including the German Driving School Association, DGUV, the German Social Accident Insurance, ministry officials, and fleet managers of external organisations and companies. An additional part of building this network was instituting “trainer certification” that helped to standardise training and boost the morale of trainers. Using a well-designed monitoring framework, it was estimated that a 25 percent reduction in fuel consumption could be achieved through the programme (Intelligent Energy Europe, n.d.).

The “Het Nieuwe Rijden” or “The New Driving” was also relatively successful initiative in the Netherlands that expanded for reasons related to collaboration between multiple governmental and non-state actors. Though Het Nieuwe Rijden was introduced to help meet the country’s national Kyoto Protocol targets, the programme grew chiefly due to the alignment of interests between a dense network of stakeholders (i.e. consumer organisations, environmental NGOs, car dealers, logistics companies, driving schools, oil companies, and car lease companies) (Luther and Baas 2011). It also gained support from SenterNovem—the Dutch Agency for Innovation, Energy and Environment—that helped to work with business and civil society in creating and incorporating well-structured eco-driving courses into driving school curricula. Many other supportive activities such as a national tax break on the purchase of in-car monitoring devices created financial incentives that led residents to purchase the devices and helped to inform the driving public of the potential benefits of the programme. Due to both its design and funding (40 million Euro budget), the initiative met or surpassed climate targets and generated other “benefits” such as increased road safety and allowing the end-users to recoup fuel cost savings of between 46-106 million Euros (US\$58-134 million).

## 4. Overall Assessment

Table 3.2 summarises the governance arrangements that facilitated collaboration within and beyond relevant agencies in different countries; other enabling factors contributing to implementation of the programmes are also listed. The table highlights that even successful smaller scale programmes required some involvement of a local government or motivated company to equip drivers with the basic knowledge and tools to eco-drive. Once these fundamentals were in place, coalitions between businesses (especially car companies) and CSOs could strengthen eco-driving initiatives. This frequently involved support for awareness raising, capacity building, and dissemination of ever more advanced ICT. At the same time, there is evidence to suggest that moving ahead too quickly without a good understanding of the existing institutional environment may be counterproductive. This is

particularly evident in the limited success cases of Viet Nam and Laos.

Table 3.2 also suggests that programmes that grew in scale and impacts have tended to involve greater engagement with larger companies and, to some extent, higher-level government agencies. In expanding their scope, as occurred in Europe and Japan, there was at significant coordination between levels of government and with a range of other stakeholders beyond government. In the EU, the development of the regional programmes such as ECOWILL that could transmit knowledge across countries proved particularly important.

A final set of points involves whether the three dimensions featured in this report mattered for eco-driving. The answer is that stakeholder engagement mattered in most of the cases through the design and implementation of eco-driving programmes. Vertical and horizontal coordination helped create a favourable enabling environment that could support the scaling of programmes. The timing and sequencing of when these different aspects of governance proved influential offers a slightly different view of the effects anticipated in the earlier discussion of the chapter. This will also be discussed more in the conclusion.

Table 3.2. Comparison of eco-driving programmes

		Netherlands	Germany	Japan	Philippines
Governance Dimensions	Horizontal coordination	Moderate	Moderate	Moderate	--
	Vertical coordination	Strong	Strong	Strong	--
	Stakeholder engagement	Strong	Strong	Strong	Strong
	Other Considerations	The national government oversees programme implementation	The national government oversees programme implementation	Several agencies formed a liaison committee to provide enabling support	Int'l NGOs provide support for the programme

		India	Lao	Viet Nam	Indonesia
Governance Dimensions	Horizontal coordination	--	--	---	--
	Vertical coordination	--	--	--	Limited
	Stakeholder engagement	Strong	Limited	Limited	Strong
	Other Considerations	Int'l NGOs provide support for the programme			Int'l NGOs provide support for ongoing programme

## 5. Conclusion

Asia has had some success with eco-driving. That success, at least initially, has been attributable to support from cities and companies. The converse has also been true with even small scale efforts lacking such support struggling to get off the ground. However, to achieve significant gains across more than one city will likely require support from national governments in cooperation with businesses and other stakeholders. The case in Japan shows that coordination between relevant ministries and agencies (in the form of a liaison group) can set in motion a virtuous cycle. That cycle has seen the creation of opportunities for more collaboration on eco-driving from a wide range of stakeholders: business associations, environmental NGOs as well as vehicle manufacturers. This can also have other positive second-order effects with cities and automobile companies formulating their own unique programs beyond the national initiative that encourage yet other businesses and citizens to adopt different kinds of sustainable behaviours beyond eco-driving.

The chapter also has some implications for how eco-driving can be taken forward as an integrated solution in line with the SDGs. In this connection, the chapter demonstrates that it may be best to ensure that the fundamentals of a programme are firmly in place before engaging in efforts to scale it up. Altering driver behaviour will not be easy since driving habits tend to be ingrained and incorporating new techniques or halting familiar practices (i.e. warming the car's engine before driving) tend to take time. That said, once those fundamentals are in place, support from the national government and willingness to work with networks, affected businesses, and subnational governments could play an important role. That role could involve the national government incorporating eco-driving training into driver education and licensing programmes, effectively mainstreaming eco-driving into policy. The stepwise approach that is being pursued in Indonesia currently appears to be moving in this direction.

This chapter also has some implications for broader integrated approaches to sustainable transport more generally. In Asia, eco-driving will need to be complemented by the avoid and shift options. Failure to emphasise these elements will result in streets that are too crowded to make eco-driving relevant; this is unfortunately the case in some cities in Asia. Avoid and shift options will be crucial to not only reducing emissions, but cutting down on commuting times and enhancing mobility. At the same time, it is worth noting that there are complementarities eco-driving and these other avoid and shift options. For example, eco-driving can be mainstreamed into the training and management of public transport operators, while eco-driving technologies could also raise awareness of when it is more cost-effective to telecommute rather than drive to the office. Further, since the avoid and shift options are likely to require additional coordination and engagement, successful but smaller scale eco-driving programmes could be incorporated within a larger strategy focusing on avoid and shift options to facilitate its dissemination and scaling.

In the mid to longer term, there may also be other opportunities for eco-driving that require less government support. These could include the potential use of eco-driving as part of larger citywide efforts to improve the movement of goods and services. These

efforts could be enabled by self-driving vehicle fleets where there will be strong incentives for companies to save energy. Advances such as this will not only be good for the environment but also bring other tangible social and economic benefits for Asia and beyond.

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# Chapter 4

## Governing Integrated Solid Waste Management: The Case of San Carlos, Philippines

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## Chapter 4

# Governing Integrated Solid Waste Management: The Case of San Carlos, Philippines

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### Main Messages

- Policymakers are increasingly looking for waste management solutions that can help achieve multiple development objectives, such as climate change mitigation, ecosystem conservation, improved human health, and the transition to a circular or zero waste economy;
- This requires integrated approaches as called for by the Sustainable Development Goals (SDGs). There are many ways to advance an integrated approach in the waste sector, as illustrated by the numerous definitions of integrated solid waste management (ISWM);
- The implementation of ISWM in developing countries faces greater challenges than in developed countries due to 1) a lack of existing solid waste management infrastructure, systems and industries; 2) limited resources and capacities; and 3) a lack of political will, strategic directions, appropriate policies, and governance;
- This chapter analyses what kinds of governance arrangements—horizontal coordination, vertical coordination, and multi-stakeholder engagement—were needed to make ISWM effective in San Carlos, Philippines and elsewhere in the Asia-Pacific region;
- The analysis found that well-functioning horizontal coordination and engagement mechanisms at the city level are important, partly reflecting the need to align and promote interactions between multiple stakeholders at the local level, operating across different stages of waste management;
- Strong vertical coordination with national environmental agencies is also needed to meet financing shortfalls, and provide enabling legislation.
- Other means of implementation (MOI) (particularly appropriate funding, and institutional capacities), political commitment and leadership are also key;
- Elsewhere in the Asia-Pacific region, similar vertical and horizontal coordination issues influenced the performance of ISWM.

## 1. Introduction

Municipal Solid Waste Management (MSWM) is a growing priority in the Asia-Pacific region. Particularly in the region's developing countries, many governments are struggling to provide sufficient waste management service. Current estimates suggest that more than two billion people globally still lack access to waste collection services (UNEP-IETC and ISWA 2015). Due to expanding urban populations and high urban population densities, these problems tend to be particularly acute in cities in the Asia-Pacific region. The impacts of the under-provision of MSWM can be sobering and striking. Uncollected waste is often scattered on streets, vacant lands, waterways or burned. Even in cities where waste is collected, unwanted refuse may end up being dumped or disposed in an unprotected manner outside the city. Inadequate waste disposal and open burning leads to increased public health and environmental risks (UN-Habitat 2010; UNEP-IETC and ISWA 2015). In short, the absence of effective MSWM poses a significant constraint on sustainable urban development in the Asia-Pacific region.

This threat to sustainable urban development also has an important global and regional dimension. Recent data shows that total resource consumption in the Asia-Pacific region is rising while material productivity has not improved (UNEP 2016). In part due to these increases in consumption, greenhouse gas (GHG) emissions from MSWM have become a major policy concern in recent years. This is largely because methane from landfills represents the third largest source of methane and about 12 percent of total global methane emissions (Global Methane Initiative 2011 and USEPA 2013). Estimations also suggest that 40 percent of black carbon (BC)—a short-lived climate pollutant (SLCP) that can warm the climate over relatively short lifetimes in the atmosphere (see Chapter 2)—comes from open burning of both urban and agricultural waste (UNEP-IETC and ISWA 2015). Therefore, the problem of methane from landfills and BC from open burning needs to be urgently addressed.

MSWM also has important economic and social implications, partly because reducing waste levels can be achieved through social and behavioural changes that alter consumption and production patterns. Waste prevention and reducing the quantities of waste at the source and effective management of collected waste have become a focal point of sustainable waste management (Cox et al. 2010; Wilson et al. 2010; Premakumara 2013; Premakumara et al. 2015). Also, active recycling, reuse and repair is carried out by the informal sector and micro-enterprises in many cities driven by the market value of materials, often resulting in recycling rates of 20–30 percent (Wilson et al. 2012, Wilson et al. 2009) as well as savings of more than 20 percent in municipal budgets for waste management (Scheinberg et al. 2010a and 2011). Therefore, MSWM solutions also need to consider the broader impacts on society and the economy.

Policymakers are increasingly looking for waste management solutions that can help achieve multiple development objectives (see Table 4.1 for the links between SDGs and sustainable waste management). These solutions may require working across different

agencies at different levels of government, while bringing in a variety of stakeholders into decision-making processes. This chapter examines how cities in developing countries can work on Integrated Solid Waste Management (ISWM) in ways that are economically affordable, environmentally effective and socially acceptable. The focus is on horizontal coordination, vertical coordination, and multi-stakeholder engagement in San Carlos, Philippines. The chapter demonstrates that it is helpful to have well-functioning horizontal coordination/engagement mechanisms at the city level; this is due, in part, to the need to align and promote interactions between multiple stakeholders at the local level, operating across different stages of waste management. The chapter also underlines the importance of strong vertical coordination with national environmental agencies to meet financing shortfalls and provide enabling legislation. The chapter further stresses the importance of other means of implementation (MOI), particularly appropriate funding and institutional capacity building. Political commitment and leadership are also cited as playing an important role as the glue that holds ISWM together.

Table 4.1. Linkages between sustainable waste management and SDGs

Sustainable Development Goals (SDG)	Specific Target
<i>(1) Extending waste collection services</i>	
SDG 11: Make cities and human settlements inclusive, safe, resilient and sustainable	11.1 Ensure access for all to adequate, safe, and affordable basic services; upgrading slums 11.6 Reduce the adverse environmental impact of cities; special attention to air quality and municipal and other waste management 11.b. Increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters
SDG 3: Ensure healthy lives and promote well-being for all at all ages	3.2 End preventable deaths of children under 5 years 3.3 End malaria and combat water-borne diseases 3.9 Reduce illnesses from hazardous chemicals and air, water and soil pollution, and contamination
SDG 12: Responsible consumption and production	12.4 Environmentally sound management of chemicals and all wastes in order to minimize their adverse impacts on human health and the environment
SDG 8: Decent work and economic growth	8.3. Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services
SDG 14: Conserve and sustainably use the oceans, seas and marine resources	14.1 Prevent marine pollution of all kinds, in particular from land-based activities, including marine debris

<i>(2) Eliminate uncontrolled dumping and open burning</i>	
SDG 11: Sustainable Cities	11.6 Reduce the adverse environmental impact of cities; special attention to waste management
SDG 3: Good health and well-being	3.2 End preventable deaths of children under 5 years 3.3 End malaria and combat water-borne diseases 3.9 Reduce illnesses from hazardous chemicals and air, water and soil pollution, and contamination
SDG 12: Responsible consumption and production	12.4 Environmentally sound management of chemicals and all wastes in order to minimize their adverse impacts on human health and the environment
SDG 14: Life below water	14.1 Prevent marine pollution of all kinds, in particular from land-based activities, including marine debris
SDG 6: Clean water and sanitation	6.3 Improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous materials
SDG 15: Life on land	15.1 Ensure the conservation of terrestrial and inland freshwater ecosystems and their services
SDG 13: Climate action	SDG 13: Take urgent action to combat climate change and its impacts
<i>(3) Reduce waste generation through prevention and the 3Rs integrating informal and micro enterprises</i>	
SDG 12: Responsible consumption and production	12.5 Reduce waste through prevention, reduction, recycling, and reuse 12.2 achieve the sustainable management and efficient use of natural resources 12.3 Halve global food waste and reduce food losses along production and supply chains
SDG 1: No poverty	1.4 Ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources and financial services, including microfinance
SDG 8: Decent work and economic growth	SDG 8: Promote inclusive and sustainable economic growth, employment and decent work for all

Sources: Extracted from SDGs and UNEP and ISWA 2015

## 2. Moving towards ISWM

The multiple components of the waste management system are clearly interconnected (McDougall et al. 2001). Due to these interconnections, the term “integrated” has been associated with solid waste management since the 1970s. Table 4.2 summarises the use of ISWM in a wide variety of contexts. In the initial stage of its development, ISWM was mainly defined in technical language, focusing on mostly solutions that could help strengthen integration between different parts of the waste stream, such as waste

collection, treatment and disposal methods. For example, the integrated waste management system is defined as a system that “combine[s] waste streams, waste collection, treatment and disposal methods, with the objective of achieving environmental benefits, economic optimisation and social acceptability” (McDougall et al. 2001). This approach could lead to improvements in waste management systems, especially in cities in developed countries.

Table 4.2. Different use of the term ISWM

Thematic use	Description-system components	References
Waste and wastewater processing integration	Integrating solid waste management with wastewater treatment, and sometimes also with energy generation and food production	Murray et al. 1971; Ingelfinger and Murray 1975; Diaz et al. 1996
Solid waste processing integration	Integrating various technical elements into a single waste treatment process (e.g. as in modern mechanical biological treatment plants)	Crocker 1983; Diaz and Golueke 1989; Smith 1990
Facility integration	Integrating different types of solid waste treatment and disposal facilities in close proximity, often with various treatment processes and a landfill site co-located	McQuaid-Cook and Simpson 1986; Diaz et al. 1996
Integrated solid waste management in industrial parks	Exploring industrial symbiosis and economies of scale in managing solid wastes of industries located in the same park, as a part of the industrial ecology approach to resource management	Geng et al. 2007
Integrated planning for a region/metropolitan area	Integrating a number of neighbouring political units into a region for the purposes of analysis/planning/siting and permitting common facilities to serve the whole region. Often the term implies the use of a systems approach or mathematical modelling	Tobin and Myers 1974; Barlaz et al. 1995; Huang et al. 1997; Zotos et al. 2009; Xi et al. 2010
Integration (consolidation) of disparate legislation and policies	Consolidating disparate, disconnected or partly overlapping/contradicting legislation and policies into strategies or overarching initiatives, for example as emerging from EU regulations and directives (e.g. Race against Waste programme (see <a href="http://www.raceagainstwaste.ie">www.raceagainstwaste.ie</a> ) in Ireland)	Rudden 2007
Integration of decision makers	Consolidating contradictory suggestions from multiple institutional statutory bodies involved in solid waste management decision making	Clarke et al. 1999
Integrated (solid) waste management (using the waste hierarchy)	Integrating SWM according to principles of the waste hierarchy, combining waste prevention or reduction, reuse, recycling/composting, energy recovery and disposal, or discussing the role of particular technological solutions	Smith 1990; Johnke 1992; USEPA 2002; Heimlich et al. 2005; Memon 2010; Consonni et al. 2011
Integrated analysis of solid waste management options with other (environmental, economic) aspects	For example, integrating analysis of solid waste management options with air pollution in a city, energy consumption, cost–benefit analysis, etc.	Karagiannidis and Moussiopoulos 1995; Daskalopoulos et al. 1998; Thorpe 2001

<b>Life Cycle Assessment</b>	'Integrated waste management' and 'integrated solid waste management' are terms that have been used to describe life-cycle assessment (LCA) approaches to waste management	Constant and Thibodeaux 1993; Huang et al. 1997; McDougal et al. 2001; Thomas and McDougall 2005; Bjorklund et al. 2011; Giugliano et al. 2011
<b>Integrated resource management</b>	Integration of waste with resources management, often in the context of a 'closed-loop' recycling, eco-design/ recyclability of new products or general 'circular economy'	Pontin 1980; Nilsson 1991; Lisney et al. 2004; Amos 2005; Deutz et al. 2010; Carter 2012
<b>Integrated sustainable waste management (ISWM)</b>	Integrated sustainable waste management (ISWM) Integrating across three dimensions – all the elements of the waste hierarchy, all the stakeholders involved and all the 'aspects' of the 'enabling environment' (political, institutional, social, financial, economic and technical). Used particularly in developing countries	Schübeler et al. 1996; Van de Klundert and Anschütz 2001; Anschütz et al. 2004; Scheinberg et al. 2010b

Source: Extracted from Wilson et al. 2012

Thinking on ISWM was further developed as the concept of sustainable development gained traction with the Brundtland Report, *Our Common Future* (WCED, 1987). It also drew momentum from the introduction of the concept of *More with Less* – the need to produce more goods and services from less resources while generating less waste-further influenced the concept of ISWM. This has resulted in growing support for the waste management hierarchy based on 3Rs (reduce, reuse and recycling) as a critical part of ISWM (see Figure 4.1).

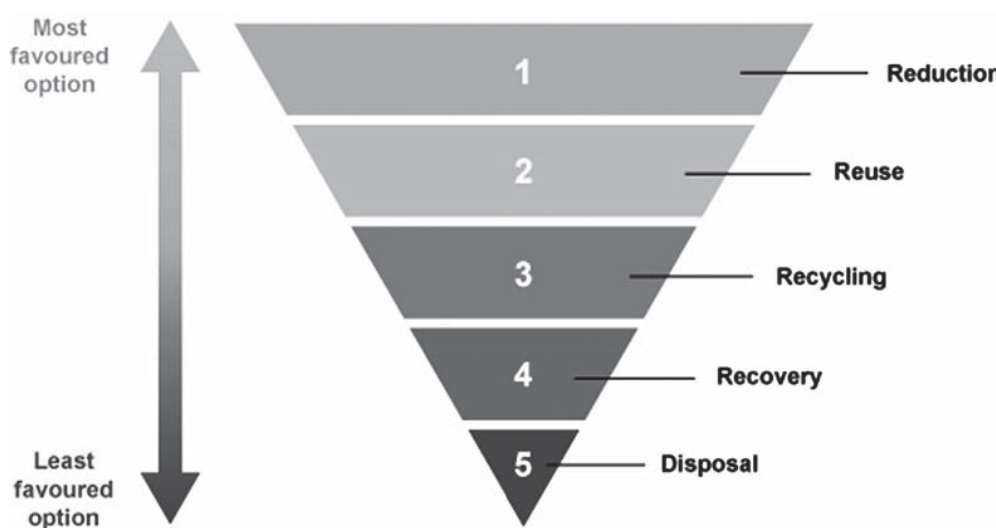


Figure 4.1. Waste hierarchy



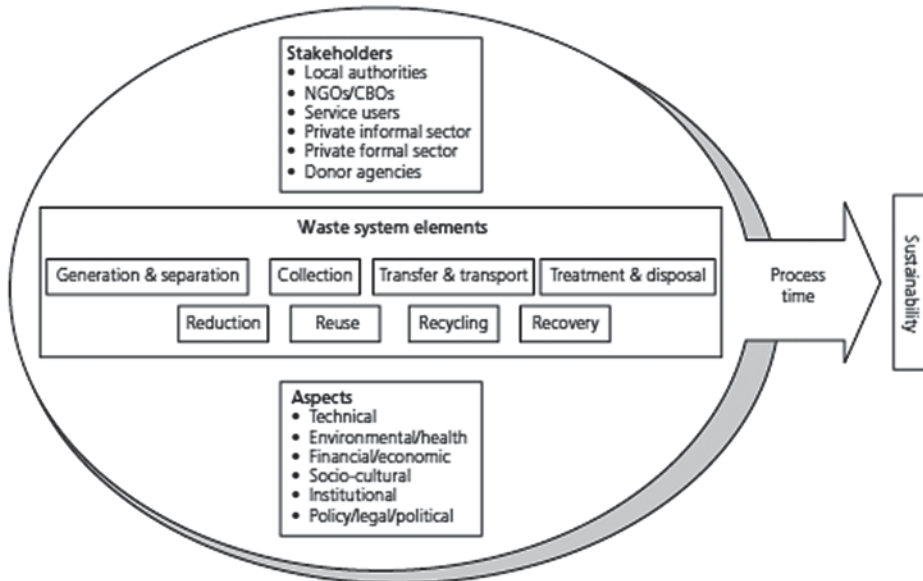
However, in the early 1990s, many international agencies and non-governmental organisations (NGOs) working in developing countries encountered challenges in applying ISWM because it was chiefly a 'technical fix' (Wilson 2007). Many of the challenges were a result of a lack of the following: 1) existing solid waste management policies and regulations; 2) financial capacity to introduce new technology/ infrastructure; 3) appropriate institutions and capacities; 4) the development of private sector and recycling industries; 5) finance and cost recovery systems; 6) strategic planning/ directions, looking at waste management as an end-of-pipe issue; 7) political will; and 8) stakeholder participation and partnership (Marshall and Farahbakhsh 2013; McDougall et al. 2001; Premakumara and Maeda 2014). This suggests that ISWM can become an acceptable paradigm in practice in developing countries too, if these countries could address "both the physical and the governance aspects (such as inclusivity of both users and service providers) [while] achieving some form of financial sustainability and strengthening institutions to perform their public tasks" (Hardoy, Mitlin, and Satterthwaite 2001; Wilson et al. 2012; Premakumara et al. 2011).

Against this background, the concept of ISWM was further developed especially for the use of developing countries. Arnold van de Klundert of the Dutch institute WASTE, contributed some thinking that carried forward the conceptual framework of ISWM. As in Figure 4.2 (a), the model consists of "three dimensions for analysis of solid waste management and recycling systems: the physical system and its technological components, sustainability aspects (social, institutional, political, financial, economic, environmental and technical) and the various groups of stakeholders involved" (Wilson et al. 2012).

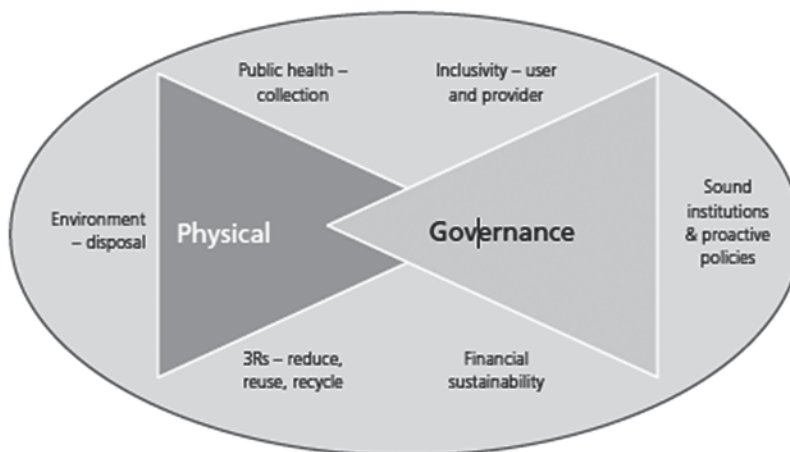
Following this new formulation of ISWM, the Urban Waste Expertise Programme prepared a global report on solid waste management (UN-Habitat 2010). This report adapted the same ISWM framework to compare cities along two overlapping triangles (see Figure 4.2 (b)). The first triangle "focuses on three key drivers for development of waste management" (Wilson 2007); these correspond to the three physical (hardware) components, including public health, environment and resource management. The second triangle corresponds to 'software' or the governance strategies required for an effective ISWM system. The system as a whole needs to be 1) "inclusive (allowing stakeholders to contribute as users, providers and enablers)"; 2) "financially sustainable (cost-effective and affordable)"; and 3) "rest on a base of sound institutions and proactive policies" (Wilson et al. 2012).

In summary, it can be argued that, though the term ISWM has been frequently applied in both developed and developing country contexts, it has rarely been defined and agreed upon. However, the literature identifies the importance of appropriate governance arrangements for the successful application of ISWM in developing country cities. While the meaning and application of the term governance varies (Bulkeley et al. 2005; Gunningham 2009; Zehavi 2012; Ljiljana et al. 2017), the same three components of governance used elsewhere in this report will be stressed in this chapter:

- Horizontal coordination involves creating or strengthening institutional structures that support cooperation across different agencies at the same level. While much of the waste management portfolio is under environmental agencies, working with



(a)



(b)

Figure 4.2. ISWM System.

Source: Adopted from Wilson et al. 2012

financing, planning, agricultural, and other sectoral agencies could enable a more holistic approach to waste management. This is particularly important given the wide range of actors that generate and manage waste across the waste stream (from residents to farmers to state-owned businesses).

- Vertical coordination involves creating or strengthening structures that support the gradual alignment of interests at different levels of decision-making. This is potentially important since local governments will frequently possess the knowledge to manage waste but lack the resources to implement their solutions. National governments can help fill financing gaps and also facilitate the sharing and dissemination of context-appropriate ISWM solutions. These could include national level awareness raising campaigns on the virtues of curbing excessive consumption or sorting waste at the sources.
- Multi-stakeholder engagement is relevant for ISWM on several counts. As mentioned above, segments of the population often depend on the collection and management of waste for their livelihoods. Failure to account for these views often poses a fundamental hurdle to an effective solution. Also, business can help government collection, management and disposal of waste through different financing strategies.

### **3. The Case of San Carlos, Philippines**

In this section, an application of ISWM, which included the integration of governance dimensions and improvement of technical elements in the city's waste management system based on the waste hierarchy (3Rs), is outlined for San Carlos, Philippines. San Carlos was selected based on the author's past experience in working with the city, easy access to relevant information, and the reputation of the city within the Philippines and internationally as a model case of waste management. The relevant information was gathered from field work, interviews and focus group discussions with key stakeholders. This section also summarises other cases of MSWM from developing Asia, supporting many of the findings from the case of San Carlos (Annex 4.1).

#### **3.1 Background**

San Carlos is one of the fast-growing cities in the province of Negros Occidental, Philippines (Figure 4.3), with a population of 133,000 (Census, 2010). It was granted the status of city on July 1, 1960 under the Republic Act No. 2643. San Carlos is a second-class city with 45,150 ha of total land area, 17,000 ha of protected forests and a 40 km coastline, partly covered with mangroves.

San Carlos is the third largest urban centre after Bacolod and Dumaguete in the Negoras Island and has a deep natural harbour protected from inclement weather by the island of Refugio, also known as Sipaway. The city has potential for various types of development given its abundant natural resources, available land, strategic location at the core of several economic growth centres in the Visayas, transportation links, and strong political support and private sector presence. The current city council aims to develop San Carlos into a modern agro-industrial zone with a 5,000 ha of new-town built along 37 km of coastline.



Figure 4.3. Location of San Carlos City Source: City of San Carlos, 2018

Like many other cities in the Philippines, rapid urbanisation and economic progress have brought changes to lifestyles and increased the generation of municipal waste, making it one of the key environmental, social and political issues faced by the city council 2005. A regular waste collection service was not available for all citizens in the city and most of the generated waste was either disposed or burnt by citizens near residential areas. Even though the city provided waste collection services to limited parts of the city, especially the city centre, the collected waste was disposed at an open dumpsite. However, this situation has improved gradually in a step-by-step manner with the introduction of a new waste management system as summarised in the following sections.

### 3.2 Application of an integrated approach to waste management

Before 2005, the waste management system in the city was based on the end-of-pipe method that focused on waste collection and disposal. Similar practices are common during the early stages of waste management in many developing country cities. As Eng. (Mr.) Arthur Batomalaque, Division Head of Integrated Waste Management and Pollution Control Division of San Carlos pointed out during an interview in 2017, “within the old system, the city made all efforts to collect whatever waste was put on the roadsides and tried hard to dispose of it quickly to a location that nobody can see.”

However, with rapid urbanisation, population growth and increased volume of waste generated, the rising cost of waste collection and difficulties in identifying new land for waste disposal forced the city to find an alternative approach to waste management. This change was further accelerated due to the establishment of National Waste Management Policy of the Republic Act (RA) 9003 (2001) at the national level in the Philippines that mandated cities to improve their local waste management systems. The new San Carlos Mayor, who was then recently elected to the city, was also more positive and used his leadership skills to engineer this change because the issue of waste management was high on his political agenda during his election campaign. All the above factors pushed the city to introducing ISWM practices, focusing more on the waste hierarchy. In practice, this meant the city would adopt a clear set of preferences that would prioritise actions that reduced and managed waste more sustainably in line with the principles of the 3Rs (reduce, reuse and recycle)(see Figure 4.4). A summary of key initiatives adopted for this transformation in San Carlos is presented below.

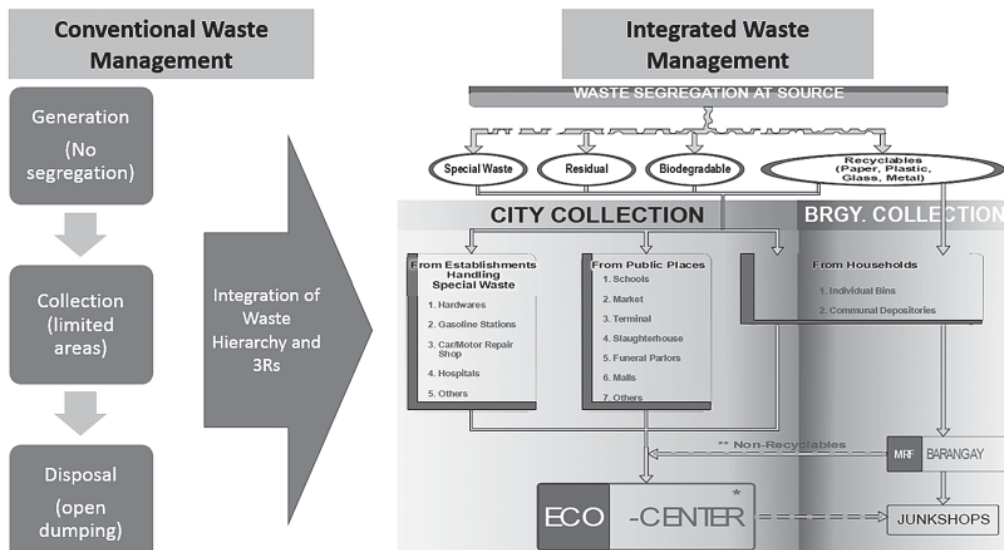


Figure 4.4. Moving towards integrated solid waste management

### **Extending waste collection service by integrating barangay waste management model**

According to the average estimated waste generation rate of 0.44 kg/day/resident (as stated in the MSWM plan of San Carlos, 2006), a total of 58 tonnes of solid waste were generated daily. Although this is not a large volume, small cities like San Carlos only have a limited annual budget for operation, and the city found many difficulties in providing waste collection services to all its citizens, especially those living in upland and island *barangays* (village or neighbourhood), due to lack of vehicles, equipment, labour and budget. In view of these limitations, San Carlos introduced a new waste collection and

transport system based on local circumstances that introduced the barangay waste management model (Figure 4.5). In this new system, the city provided regular waste collection service for the city centre (about 30 percent) where the establishment of a Material Recovery Facility (MRF) for waste recycling and composting is difficult due to the lack of space. The City Environment Management Office (CEMO) collects separated solid waste at defined collection points along the roads, at central public locations such



Figure 4.5. Waste collection vehicles with a banner of No Segregation No Collection.

as the public market, city plaza, bus terminal, harbour, schools, hospitals, institutions and from commercial establishments based on set schedules. However, in other parts of the city, including upland and island sections, the *barangay* waste management model was introduced. Here, *barangays* are responsible for segregation and collection of recyclable and biodegradable waste, which is then processed and stored in respective MRFs. The residual waste is then temporarily contained in a residual containment area (RCA), and collected later by CEMO and transported to the sanitary landfill (SLF).

### ***Integrating environmental pollution control measures in improving the final disposal site***

Until 2005, all mixed waste, including hazardous waste, collected from households was disposed at an open disposal site that was located close to agriculture land. This uncontrolled disposal practice has resulted in polluting ground- and surface-water and soil, as well as generating GHGs. As a result, the city has integrated some pollution control measures (water, air and soil) in planning, implementation and monitoring of the new landfill site. After officially closing the former dumpsite, San Carlos established a new Eco-Centre in 2007 with the technical assistance of the German Corporation for International Cooperation GmbH (GIZ) to introduce proper waste treatment and final disposal. In the years that followed, the city would transport all collected waste to the Eco-Centre, which is located on land leased from a private-owner around 7 kilometers south of the city centre. The Eco-Centre, which includes a training and information centre, a sorting plant, a composting site, a SLF and a leachate treatment pond, is operated by the CEMO. Appropriate, low-cost technologies were applied to set up these components. For example, the sorting facility took advantage of the sloping terrain to help further segregate incoming waste along several slides. Although waste was separated at the source, all incoming non-organic waste at the Eco-Centre was further segregated, processed and recorded daily (Figure 4.6).

The SLF was constructed utilising clay liner on site in lieu of expensive imported high-density polyethylene liner, and an innovative biological wastewater treatment facility was



designed utilising the natural slopes to minimise the use of pumps and other power-driven equipment. Planted trees and other vegetation along the perimeter of the facility serve as a natural buffer and improve the landscape, aesthetics and efficiency of the SLF. The designed cell was constructed and filled according to the projected volumes from a waste assessment and characterisation study. The design and construction of the earth bund is carefully considered and contributes to the stability of the landfill facility. A landfill cell development plan is being designed to accommodate anticipated increases in the volume of residual waste; the plan will allow for the scheduling of residual waste dumping per cell and proper benching during operation to further enhance stability. A separate storage area for special forms of waste (toxic and hazardous waste) from health care facilities, hospitals and other generators has also been created and made operational.

San Carlos was able to limit the total investment cost of the Eco-Centre to about USD 160,000 due to the application of appropriate, local-based and low-cost technologies. According to the head of CEMO, the operation costs of the Eco-Centre were made even more affordable with some cost recovery mechanisms, including a tipping fee from five neighbouring cities that use the site to dispose of their residual waste. This is regulated through City Ordinance No. 15-01 "An Ordinance Establishing the Solid Waste Management Cost Recovery Mechanism of the City Government of San Carlos through Charging of Tipping Fee for its SLF Services in the City's Eco-Centre Waste Processing Facility".



Figure 4.6. The operation of Eco-Centre in San Carlos City Source: San Carlos, 2018

In addition, an information database was set up to regularly update the quality and quantity of waste stored and diverted. Hence, record keeping of the Eco-Centre's receipt, dispatch and disposal of waste was regularly monitored. Training is also organised to strengthen staff capacity to operate the SLF. Training on occupational health and safety for SLF personnel was also conducted, which was subsequently followed by the creation of a manual on occupational health and safety highlighting specific guidelines and protocols to be observed and followed for the safety of the workers. Prior to the operation of the Eco-Centre, waste pickers at the dumpsite who recovered waste for their livelihoods mainly conducted material recovery. Most of them were later recruited by the local government unit (LGU) to conduct waste segregation at the new sorting plant. The main objective of their recruitment was to formalise their employment status, enhance their working conditions, and utilise their skills for the newly established waste segregation process. Table 4.3 summarises the key achievements of this shift from conventional waste management practices into the ISWM practices.

*Table 4.3. Comparison of waste management system in San Carlos (before/after 2005)*

Description	Before 2005 (conventional approach based on end-of-pipe system)	After 2005 (integrated approach based on waste hierarchy)	Key achievements
(1) Waste collection	<ul style="list-style-type: none"> <li>• City provided waste collection</li> <li>• Limited service coverage (only for city business area) due to lack of budget and vehicles</li> <li>• Citizens used to dispose mixed waste into open lands, water bodies and the ocean or burned it near their residence</li> </ul>	<ul style="list-style-type: none"> <li>• City localised waste collection system by integrating barangay (lowest administrative system) waste management model and private sector operation</li> </ul>	<ul style="list-style-type: none"> <li>• Increased waste collection coverage from 30% (2005) to 100% (2017)</li> <li>• Reduced illegal disposal and burning of waste as a result of increasing the access to waste collection service</li> </ul>
(2) Waste separation and citizen participation for 3R activities	<ul style="list-style-type: none"> <li>• No waste separation at the source</li> <li>• Citizens used to dispose mixed waste</li> </ul> <p>Environmental education and information was provided by local NGOs, but not systematic or continuous</p>	<ul style="list-style-type: none"> <li>• The waste separation policy was integrated into the new waste collection system.</li> <li>• New local policies such as "No Segregation No Collection" was introduced</li> <li>• Comprehensive education and awareness campaigns were implemented integrating other stakeholders</li> <li>• Single-use plastic was banned integrating waste reduction policies</li> </ul>	<ul style="list-style-type: none"> <li>• The majority of citizens (about 8 percent) are now separating waste into three types (organic, recycle and residual) at the source</li> <li>• Citizens are more aware of the city's waste collection system and contribute for 3R activities</li> <li>• The city was successful in maintaining the per capita waste generation at a similar rate (0.44 kg/day) over nearly 10 years due to waste reduction practices</li> </ul>



<p><b>(3) Treatment and disposal</b></p>	<ul style="list-style-type: none"> <li>• Collected waste just disposed at an open landfill</li> <li>• Informal sector involved in collecting some recyclable materials from the landfill</li> </ul>	<ul style="list-style-type: none"> <li>• Intermediate treatment methods were integrated into the waste management system before waste bringing to final disposal.</li> <li>• All <i>barangays</i> were mandated to integrate a material recovery facility (MRF) into their local operation for collection of recyclables and composting of organic waste</li> <li>• Integrate informal recycling and private sector involvement in waste recycling and material recovery</li> <li>• Eco Centre (a central treatment facility) was also newly established including waste separation and composting integrating resource efficiency policies into the waste management system.</li> <li>• New sanitary landfill was constructed integrating environmental pollution control measures, such leachate management</li> </ul>	<ul style="list-style-type: none"> <li>• Increased the volume of material recovery that results to reduce waste to be landfilled by over 60%.</li> <li>• The involvement of the informal and private sector in recycling increased</li> <li>• Increased the number of closed open dumpsites and changed the land into green space</li> </ul>
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Source: Compiled by the Authors, 2018

### 3.3 The Role of Governance in San Carlos MSWM

Many of the described changes to the San Carlos led to significant reductions in waste and emissions that could harm the environment. However, the above innovations based on waste hierarchy and 3Rs were not solely due to a sound technical approach. San Carlos also successfully incorporated some governance aspects as summarised below.

#### 3.3.1 Horizontal and Vertical Coordination

Cross-sectoral (horizontal) coordination within the city administration was instrumental to ISWM as managing waste not only involves the environmental department but also other relevant departments, divisions and sections (Figure 4.7). In San Carlos, the CEMO had to coordinate with various other offices, specifically the City Engineering Department (planning and construction of equipment and facilities), the City Treasurer's Office (budget planning and management), Livelihood Management Office (informal sector, recycling,

and livelihood business promotion), and the City Health Office (public health). Then this coordination was done to jointly implement procedures for solid waste management, operation of solid waste management facilities as well as inspection and compliance in accordance with the National Building Code and Sanitation Code of the Philippines (P.D. 856) and other related local ordinances. The coordination among these city departments took place as needed or requested through the City Waste Management Board, which is headed by the mayor and functions as a policy and decision-making body. The City Waste Management Board includes representatives from city government (mayor, city administrator, chairman of the city committee on the environment, and city environment management officer) and other selected private and citizen groups. For example, when there is a need to construct a new MRF in *barangays*, the head of the city engineering department is called to join the meeting to provide possible design ideas.

In addition, the Integrated Waste Management and Pollution Control Division was newly established under the CEMO to handle all waste management activities, including waste collection, processing and landfill operation, city street sweepers and information, education and communication (IEC) programme and other initiatives. The CEMO has to coordinate with other divisions, such as administrative support service, climate change, regulatory, coastal resource, and parks. It is also a member of the Law Enforcement Team (LET) and the Joint Inspection Team (JIT) of the city's Business Permit and Licensing Office. The primary responsibility of a member of the LET is to enforce the existing laws and ordinances of the city. The JIT is tasked with checking and monitoring the compliance of City Ordinance No. 12-08, Section 4E.14 – Prohibited and Punishable Acts # 4 “Non-provision of segregated and labelled waste bins in commercial, institutional and industrial establishments, including motorised and non-motorized passenger vehicles and marine

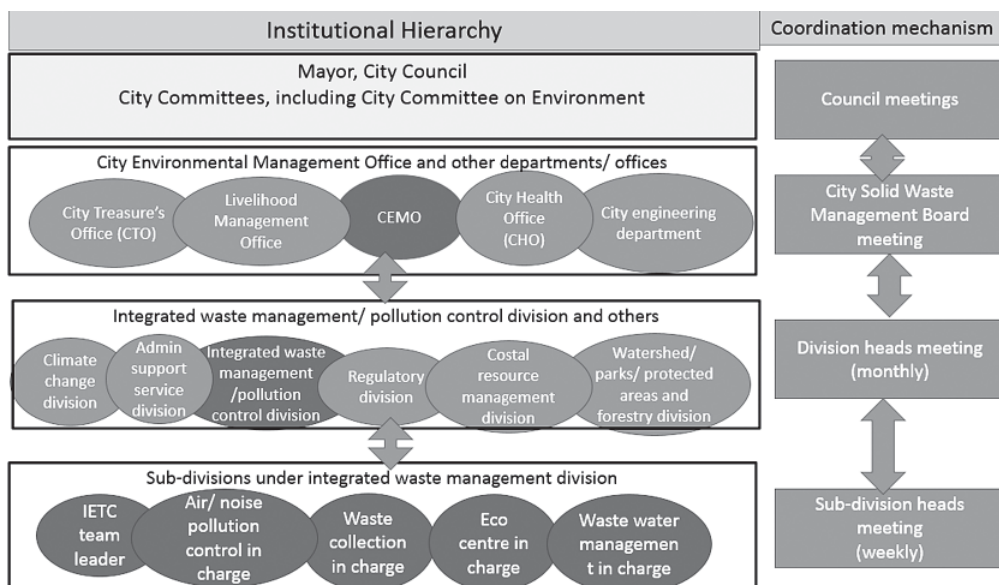


Figure 4.7. Institutional hierarchy within the city

vessels (boats, bancas, ferries, etc.), traversing through the territorial jurisdiction of the City of San Carlos". The coordination among these divisions took place on a regular basis through a monthly division leaders' meeting. In addition, the integrated waste management and pollution control division was also divided into sub-units (such as a team in charge of air/noise pollution, waste collection, eco-centre management and waste water management) for the effective operation of the functions of integrated waste management system. The coordination among these sub-units took place through weekly review meetings by request.

Further, San Carlos was one of the first cities in the Philippines to formulate a 10-year Solid Waste Management Plan in 2004 (updated in 2015) in accordance with the provisions of the national government's Republic Act (RA) 9003 (otherwise known as the Ecological Solid Waste Management Act of 2000). The waste management plan of San Carlos includes the city's vision, directions and political commitment to achieving ecologically sustainable and economically viable zero waste management, and is aligned with the ISWM system based on the aforementioned waste hierarchy (3Rs). It sets waste reduction targets and introduces practical actions to implement in coordination with other departments and key stakeholders. The City Waste Management Board coordinates the implementation of the plan and reviews progress under the leadership of the Mayor (Figure 4.8).



Figure 4.8. The mayor led the stakeholder meeting  
Source: San Carlos City, 2018

As shown in Table 4.4, the Department of Environment and Natural Resources (DENR) is responsible for formulating, implementing and coordinating national policies. For effective cooperation among other executive departments, especially agriculture, budget and management, education, energy, health, interior and local government, public works, labour and employment, and social welfare and development, the National Solid Waste Management Commission (NSWMC) was established, including 14 invited representatives from other relevant ministries and three from the private sector. The National Ecological Center (NEC) was also created under the NSWMC to provide technical assistance to cities through its regional officials. As a guiding framework, RA 9003 mandates all LGUs to " 1) create a Solid Waste Management Board (SWMB) at city and *barangay* levels (Section 12); 2) prepare and submit a 10-year Solid Waste Management Plan (SWMP) (Section 17); 3) establish mandatory solid waste diversion (Section 20); 4) establish MRF in each *barangay* to increase resource recovery and composting (Section 32); and 5) close the open dumpsites and establish sanitary landfills by 2006 (SLFs) (Section 37)" (DENR 2015). More than 10 years have passed since the enactment of RA9003. Although there have been an increase in the number of cities like San Carlos implementing the national requirements in the past

few years, progress is still very limited. The author's early work (Premakumara et. al. 2016) suggested that these national policies were effective when local governments had a strong political commitment and established a supportive institutional framework and coordination mechanisms.

Table 4.4. The legal mandate and responsibilities under each level of government in implementing RA 9003 in the Philippines

Administration	Key responsibility	Legal measures for promoting inclusivity
National	The national government sets the policy, financial and administrative framework within which the city needs to work and national ministries and departments are influenced by an increasingly globalised vision of sustainability.	<ul style="list-style-type: none"> <li>• National Solid Waste Management Commission (NSWMC)                             <ul style="list-style-type: none"> <li>- Established under the Office of the President and composed of 14 members from government ministries and three members from the private sector</li> <li>- The DENR secretary and a representative from the private sector jointly chair the NSWMC</li> <li>- Prepares the national solid waste management framework; approves local solid waste management plans in accordance with its rules and regulations; and reviews and monitors the implementation of local solid waste management plans etc</li> </ul> </li> <li>• The National Ecology Centre (NEC)                             <ul style="list-style-type: none"> <li>- Section 7 of RA 9003 requires the establishment of a NEC under the Commission, headed by the Director of the Environment Management Bureau (EMB), which provides consulting, information, training, and networking services for implementation of the provisions of the Act</li> </ul> </li> </ul>
Regional	Support, coordination, monitoring and review of progress of implementing the national solid waste management act at regional/provincial levels.	<ul style="list-style-type: none"> <li>• Provincial Solid Waste Management Board                             <ul style="list-style-type: none"> <li>- Section 11 of RA 9003 requires the establishment of Provincial Solid Waste Management Boards (SWMBs) to develop a Provincial SWM Plan from the submitted SWM Plans of the city/municipal SWMBs and ensure that these complement each other; oversees the implementation of the Provincial SWM plans and provided necessary logistical and operational support to LGUs; and allows for the clustering of LGUs to solve common solid waste management problems</li> </ul> </li> <li>• The Regional Ecology Centre (REC)                             <ul style="list-style-type: none"> <li>- Rule V, Section 1 of DENR Administrative Order 2001-34 mandates the establishment of RECs, which shall be headed by the EMB Regional Directors in their <i>ex officio</i> capacities.</li> <li>- The RECs shall maintain a multi-sectoral, multi-disciplinary pool of experts, including those from academia, business and industry; inventors, practicing professionals, youth, women; and other concerned sectors, who shall be screened according to qualifications set by the Commission. RECs provide consulting, information, training, and networking services for implementation of the provisions of the Act.</li> </ul> </li> </ul>

<p><b>Local</b></p>	<p>The LGUs are responsible for solid waste management in a city, such as establishing the legal, regulatory and financial boundary conditions that make it possible to provide the service.</p> <ul style="list-style-type: none"> <li>- RA 7160 stipulates that basic services and facilities shall be provided by the LGUs. The services include the provision of a solid waste disposal system or environmental management system and services or facilities related to general hygiene and sanitation.</li> <li>- Section 10 of RA 9003 reiterates these RA 7160 provisions that the LGUs shall be primarily responsible for the implementation and enforcement of the provisions of this Act within their respective jurisdictions. Segregation and collection of solid waste shall be conducted at the <i>barangay</i> level, specifically for biodegradable and recyclable wastes, provided that the collection of non-recyclable materials and special wastes shall be the responsibility of the municipality or city</li> </ul>	<ul style="list-style-type: none"> <li>• City and Municipal Solid Waste Management Board             <ul style="list-style-type: none"> <li>- Each city or municipality shall form a City or Municipal Waste Management Board that shall prepare, submit and implement a plan for the safe and sanitary management of solid waste generated in areas under its geographic and political coverage.</li> <li>- The City or Municipal Solid Waste Management Board shall be composed of the city or municipal mayor as head with the following as members: 1) one representative of Sangguniang Panlungsod or the Sangguniang Bayan, preferably chairpersons of either the Committees on Environment or Health, who will be designated as the presiding officer; 2) President of the Association of Barangay Councils in the municipality or city; 3) Chairperson of the Sangguniang Kabataan Federation; 4) a representative from NGOs whose principal purpose is to promote recycling and the protection of air and water quality; 5) a representative from the recycling industry; 6) a representative from the manufacturing or packaging industry; and 7) a representative of each concerned government agency possessing relevant technical and marketing expertise as may be determined by the Board.</li> <li>- The City and Municipal Solid Waste Management Boards shall have the following duties and responsibilities: 1) develop the City or Municipal Solid Waste Management Plan to ensure the long-term management of solid waste, as well as integrate the various solid waste management plans and strategies of the <i>barangays</i> in its area of jurisdiction. In the development of the Solid Waste Management Plan, it shall 1) conduct consultations with the various sectors of the community; 2) adopt measures to promote and ensure the viability and effective implementation of solid waste management programmes in its component <i>barangays</i>; 3) monitor the implementation of the City or Municipal Solid Waste Management Plan through its various political subdivisions and in cooperation with the private sector and the NGOs; 4) adopt specific revenue-generating measures to promote the viability of its Solid Waste Management Plan; and 5) convene regular meetings for purposes of planning and coordinating the implementation of the solid waste management plans of the respective component <i>barangays</i>;</li> </ul> </li> </ul>
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Source: Compiled by the Authors adapted from DENR 2015

### **3.3.2 Integration of key stakeholders into waste management planning and operation**

Some of the other reasons for success in San Carlos is that the city not only relied on technical solutions for collecting and disposing of waste or the government's efforts in establishing new policies and regulations, but also encourages involvement and participation from many stakeholders. All key stakeholders in the community have been targeted to become agents of change in planning, operation and monitoring of the ISWM system that complies with source reduction and attains greater waste diversion. For example, stakeholder participation in the decision-making process was crucial to attaining higher levels of compliance with the solid waste management law and the 10-year waste management plan. The stakeholders engaged included, *interalia*, the private/industrial/agricultural sector, schools, 18 *barangays*, and all households. Although the city council led the development of the plan, the community participatory approach has been employed and all key stakeholders provided their individual ideas and inputs to harmonise the elements of the updated plan. As part of the consultative process, a series of *pulong-pulong* or public consultations were organised with barangay officials to raise awareness, elicit stakeholders' views and demarcate specific roles and responsibilities. In addition, NGOs, the private sector, and academia provided technical support to finalise the waste management plan, which served as a guide to public and private stakeholders to comply with RA 9003.

Stakeholder participation was also institutionalised, for example, in San Carlos' Solid Waste Management Board (CSWMB), established under the chair of the mayor as a policymaking body in compliance with the requirements of RA 9003. CSWMB provides a firm basis for the overall solid waste management programme in accordance with the city's 10-Year Solid Waste Management Plan and plays an important role in coordinating with relevant stakeholders and ensuring sustainability of solid waste management operations.<sup>1</sup> The members of the CSWMB include the Mayor and representatives from different stakeholder groups, including the city administrator, private sector (Managing Director of SCDBI), civil society (Executive Director of GENESYS Foundation), chairman of the committee on environment, city environment management officer, CLGOO - DILG, San Carlos City, ABC President, and the San Carlos City Junkers' Association President. The Junkshop Association of San Carlos, Negros Occidental was formally organised and duly accredited by San Carlos in September 2013. It was basically organised to address the required composition of the SWM Board to include the recycling industry as junkshop operators play an important role in the diversion of waste.

The partnership between the city and stakeholders has had positive impacts on raising awareness on behavioural changes. San Carlos has partnered with the Global Environment and Nature Ecosystems Society (GENESYS) Foundation since 2003 to implement a four-year citywide IEC campaign under the theme of "No Segregation No Collection" that covers the 18 *barangays* (Figure 4.9). The target participants in the IEC were the Sangguniang *Barangays*, households, business establishments, institutions, religious institutions and other areas identified during the campaign implementation. The comprehensive IEC

1 On February 14, 2002, the Local Chief Executive passed Executive Order No. 9, Series of 2002 for the creation of the CSWMB and it was further amended regarding membership of its composition by Executive Order No. 13, Series of 2006; 76, Series of 2010; 31, Series of 2011 and 21, Series of 2011.



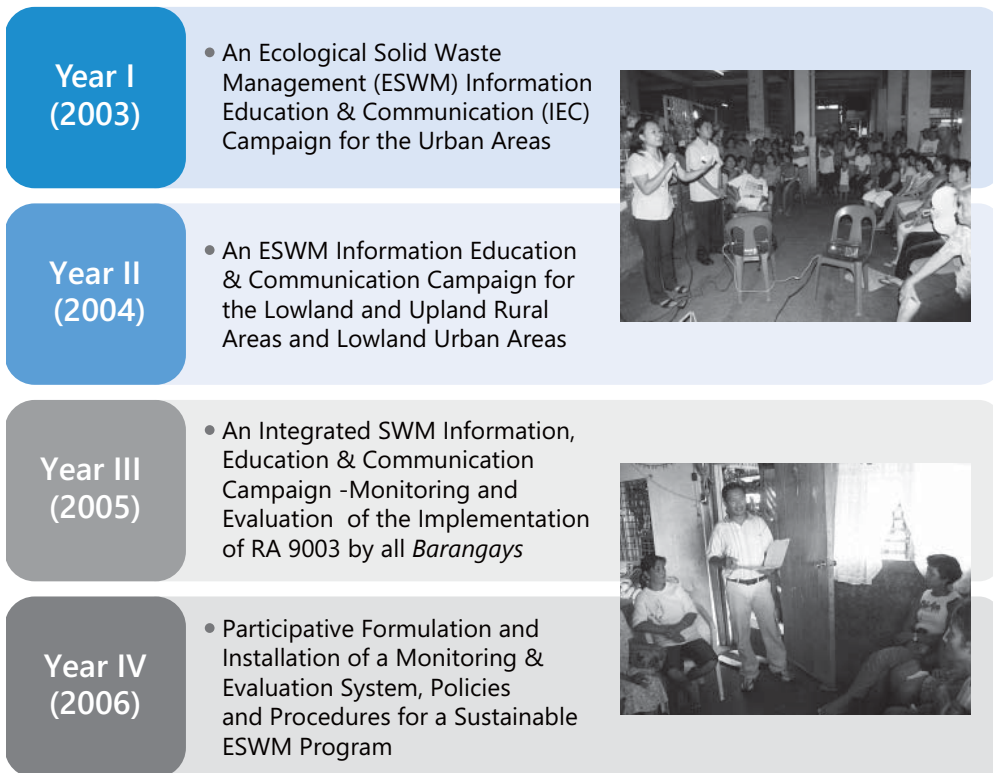


Figure 4.9. Implementation of long-term IEC programme for lifestyle change

Source: San Carlos City, 2018

campaign was implemented in accordance with the Implementing Rules and Regulations in RA 9003 and it was designed to reach as many citizens as possible. The campaign stressed the need for a serious and sincere “lifestyle change”<sup>2</sup> that will alter personal habits and social practices, contributing to behaviour changes towards an environmentally-responsible lifestyle and waste management practices among households, businesses and institutional establishments. In addition, the city also initiated the “Search for the Most Environmentally-Friendly Market Vendor” in line with the advocacy programme related to the Plastic Ordinance. School and *barangay* contests were also conducted annually to promote waste reduction. At present, the trained staff from the GENESYS Foundation, Inc., have joined the CEMO to ensure sustainability through the institutionalisation of the IEC programme in the city’s daily operation.

San Carlos also partners with the private sector in advocating environmental-friendly energy use. For example, San Carlos Biopower, Inc. is one of the leading industries in the city, and supplies 18 MW baseload electric power to the local grid. The major biomass feedstock requirement of the plant is sugarcane thrash (commonly known as “*bagasse*”), waste residue (from the sugar cane harvest) and energy crops.

2 San Carlos has encouraged innovative lifestyle changes through the implementation of City Ordinance No.14-53, which regulates the use of plastic bags as packaging materials and utilisation of polystyrene (commonly known as styrofoam) for food and beverages containers.

In engaging stakeholders, arguably the most important groups are “users” and “providers”. The main users are those who produce waste, including residents, households and commercial and institutional entities. They are responsible for waste separation at the source, placing waste in designated locations, paying necessary fees for waste collection, and participating in community activities such as cleaning and recycling activities. San Carlos established several mechanisms to strengthen user inclusivity. For example, users are engaged in decision-making on waste management planning and system design. They are also informed and consulted to improve waste prevention, waste separation, and home composting. Inclusivity is also institutionalised through established feedback mechanisms, client surveys, and solid waste forums and platforms.

On the other hand, service providers are public/ private, informal/ formal, large/ small entities providing waste collection, transport, treatment and disposal services. Service providers also include those who trade recycled materials, and those who process and sell compost and other agricultural materials. For successful operation of its waste management system and recycling activities, the different kinds of providers are equally important and San Carlos successfully integrated several groups into planning, including the informal groups and micro-enterprises for the operation of MRFs and the Eco-Centre. In addition, San Carlos is supported by NGOs and community-based organisations that represent the user community, in organising members, raising awareness and implementing activities at community level. Similarly, the business sector is represented by trade and professional associations and chambers of commerce.

### ***3.3.3 Other Enabling Factors as Means of Implementation***

While vertical and horizontal coordination within the government and stakeholder engagement were critical to the success of ISWM in the city, additional factors that enabled these elements to function smoothly require attention, including the city’s financial capacity. One of the common constraints in implementing MSWM programmes is securing a regular budget for implementation. In this regard, San Carlos has adopted some innovative economic instruments such as the polluter pay principle and cost recovery. As a first step, a solid waste management trust fund was created in 2007, intending to finance solid waste management projects utilising income from waste operation activities such as income from selling of recyclables, compost and other potential materials from the Eco-Centre; tipping fees generated from landfilling, collection charges from the business and institutions; and cash award incentives from various local, national and international agencies. However, new guidelines by the Commission on Audits in 2011 stipulated that income generated from these additional sources should be treated as general income for the city and should be deposited directly into the City’s General Fund. As a consequence, the solid waste management fund was closed. However, it was reported that the city still generated an average of PHP 1.8 million or 11 percent of total waste management budget annually from the sales of recyclables (PHP 0.5 million), compost (PHP 0.5 million) and other income (PHP 0.8 million).

This shows that the budget (89 percent) for MSWM in San Carlos still relies on 20 percent of the national and local development fund (20 percent of the Internal Revenue Allotment



or IRA) as a main source of income. The yearly budget (usually in the third quarter of the year) is discussed under the auspices of the Local Finance Committee. The total budget allocation for MSWM was PHP 15.4 million in 2017, including 1) sanitation and environmental protection programme (PHP 5.5 million); 2) ecological centre project operation (PHP 3.5 million); 3) Citywide Barangay and Schools Education for Solid Waste Management (ESWM) Capacity Building Programme (PHP 1.3 million); 4) Sanitation and Environmental Protection Programme-Maintenance of City Lanes related activities (PHP 3.9 million); and 5) Sanitation and Environmental Protection Programme-Maintenance of City Government's facilities and other solid waste related structures (PHP 1.2 million).

### 3.4 Other cases of MSWM from developing Asia

Other cases of MSWM from developing Asia with varying degrees of success are presented in Table 1 in Annex 4.1. That table includes a brief background on the cases and a description of how horizontal coordination, vertical coordination, and stakeholder engagement played a role in the city's approach to MSWM; information on other MOI is included where relevant.

The table indicates that relatively successful cases consistently demonstrate stakeholder engagement. Vertical and horizontal coordination played a role in many but not all cases. For example, Cebu (Philippines), Surabaya (Indonesia), and Battambang, (Cambodia) enjoyed some level of success with their MSWM efforts. Strong community engagement was common among these cases—they all engaged with affected residents and other stakeholders not only in awareness campaigns for behavioural changes but also in the planning stage of MSWM. In the case of Battambang, stakeholders helped to monitor waste management rules as part of penalty scheme that raised additional funding for MSWM. Regarding vertical coordination, the three cities aligned their visions and plans with the national laws and regulations. Within the cities, the Mayor or Governor provided strong leadership to ensure different agencies were on the same page when it came to MSWM. Coordination between the main body in charge of MSWM and other related bodies such as planning and finance offices contributed to the generally successful performance.

On the other hand, Phnom Penh (Cambodia) and Virac (Philippines) are struggling with their MSWM. In these cases, many of the above-mentioned elements are missing or limited. For example, awareness-raising campaigns have been conducted but on an irregular basis and on a limited scale. As a result, residents and other stakeholders have not significantly changed their behaviour in collecting and reducing solid waste. Vertical coordination for these cities is also very weak. In Phnom Penh, the city assumed the responsibility of MSWM in 2015; however, its capacity to fulfil its MSWM responsibility is limited, due partly to lack of support from national or provincial level governments. In Virac, the city has not been able to develop a city plan for MSWM. It also has difficulty in translating laws into actions in the local context and clarifying responsibilities of the city and its *barangays* in MSWM. Horizontal coordination is also weak or not present in these cities, due partly to the lack of clarity in each actor's responsibility. These observations mostly support the findings from the case of San Carlos.

## 4. Summary and Conclusions

The experience of San Carlos demonstrates that moving from the end-of-pipe approach with a focus on waste collection and disposal to an ISWM system based on waste hierarchy (3Rs) can bring multiple benefits to cities. It can further contribute to the achievement of some of environmental, social and economic goals found in the SDGs and the Paris Agreement. For example, San Carlos was able to achieve about 65 percent waste reduction within 2007– 2017; this is well over the nationally set target (25 percent) for all cities and contributes to resource efficiency (SDG 12). In addition, the operation of the composting and sanitary landfill site resulted in reducing 7,600 tonnes CO<sub>2</sub>-eq/year of GHG emissions when compared with the baseline situation in 2005 (SDG 13) (Paul et al., 2012). Due to the extension of waste collection coverage for all citizens (from 30 percent-100 percent) and successful IEC campaigns and policies that encouraged responsible consumption and production (SDG 12), illegal waste disposal and open burning activities became zero or minimal, reducing environmental stresses (SDG 11 and 15). This substantially contributed to a better quality of life and better health for the citizens (SDG 3) as well as prevented marine waste, including plastic, from entering the sea (SDG 14). In addition, the operation of composting for organic waste, closure of the open disposal site and effective operation of the sanitary landfill site significantly contributed to reducing GHG emissions (SDG 13) and helped restore local ecosystems (SDG 15). The integration of the informal sector into the city's waste management programme also created good working conditions (SDG 8) and sustainable livelihoods for poor families, helping them to escape poverty (SDG 1).

Because of these achievements, San Carlos is now widely known in the Philippines and internationally for its best environmental practices, particularly on solid waste management and wastewater treatment. It was among the recipients of the Association of Southeast Asian Nations (ASEAN) Clean Tourist City award in 2018. ASEAN also awarded the city an Environmentally Sustainable City (ESC) in 2017. Further, San Carlos emerged as the fourth Most Lovable City in the World after its stint as one of the three finalists to the Earth Hour City Challenge (EHCC) and the We Love Cities campaign for Most Lovable City in The World conducted by the World Wildlife Fund for Nature (WWF) in 2016 (San Carlos City, 2018).

As this chapter suggests, governance played a significant role in the planning and implementation of the ISWM system in developing country cities due to the complexity and involvement of different departments and key stakeholders at both the national and local levels. The case of San Carlos and other cases from the author's previous work and some analysis in Annex 4.1 indicate that both vertical and horizontal coordination are necessary among different departments and units at both national and local levels. In the case of San Carlos, NSWMC of the DENR sets an enabling policy and legal environment at the national level. While the NSWMC is responsible for waste management, considering interlinkages with other sectors, such as climate change, health, economic, social development etc. In addition, key executive departments needed to participate in policy planning and implementation. In addition, the regional/provincial governments of DENR need to be strengthened with information, scientific knowledge, human and financial

capacity to coordinate and monitor the efforts of cities in implementing waste management systems according to national policies. Cities and their *barangays* are ultimately responsible for the execution of solid waste management, including establishing legal, regulatory and financial rules in line with national and provincial frameworks, as well as enabling provision of the service.

However, the presence of vertical coordination alone is unlikely to make the case successful. The case study suggested that these national policies were effective when an appropriate institutional framework is put in place at the local level, supported by strong political will, and when interests favouring better MSWM are aligned, they enjoy success. Beyond intangibles such as leadership and political commitment, other factors are also critical for success, such as human resources, financial resources and technical and science-policy interface, information management and strategic/ holistic planning.

Another important factor is engagement of relevant stakeholders. The best-functioning solid waste management systems, as is evident in San Carlos, adopt an inclusive approach involving multiple stakeholders in planning, implementing and monitoring the changes to the system. However, this can be a difficult and time-consuming process. For example, San Carlos institutionalised and continuously implemented the IEC programme for over four years to raise awareness and alter stakeholders' behaviours. Such continuous efforts again require strong commitment, leadership as well as capacity and resources from the city and collaborators. Another important challenge for stakeholder engagement is to maintain active inclusivity after the system is in place. Institutionalising systems and practices for free communication among all stakeholders, particularly municipal authorities, service users and providers, and the wider community, is critical to success. For this purpose, San Carlos established its CSWMB under the leadership of the mayor and representing all key stakeholders (users and providers) as a platform for dialogue, consensus building and shared decision-making. Developing and getting council approval for the city's 10-year solid waste management plan in a participatory manner provided a strong foundation and long-term vision for the city.

Last but not least, there are other global and regional factors that are not discussed much in this chapter that could potentially play a role in MSWM moving forward. Following China's decision to ban the import of 24 streams of recyclable materials at the close of 2017, many developed countries are now looking for import markets in Asia to handle large shipments of recycled waste that used to go to China. For example, Australia has begun to increase exports of scraps of plastics, paper and paperboard to Indonesia, Thailand, Malaysia, India, Viet Nam, Republic of Korea and Taiwan (Australia Packaging Covenant Organisation 2018). The growing recognition of these regional and global connections has led to a renewed urgency on finding integrated solutions to MSWM that can be directly linked to achieving development and climate change goals. It will be important that not only cities but countries adopt a view on MSWM similar to San Carlos to avoid cancelling out its impressive ISWM efforts, as well as those efforts from other cities.

Annex 4.1. Cases of municipal solid waste management

	Horizontal integration	Vertical integration	Stakeholder engagement	Other key success/failure factors	Additional Remarks
<p>Cebu City, Philippines (2010-)</p> <p><a href="https://www.ccet.jp/publication/casestudy-cebu_ISWM">https://www.ccet.jp/publication/casestudy-cebu_ISWM</a></p>	<ul style="list-style-type: none"> <li>• Cebu City Solid Waste Management Board (CCSWMB), headed by the mayor, is mandated to develop, implement and monitor a 10-year solid waste management plan</li> <li>• CCSWMB includes members from relevant city departments (public service, Cebu City Environmental and Natural Resource Office (CCENRO), environmental committee, city planning, and budget), private sector, NGOs, <i>barangay</i> councils, and representatives from the DENR–regional office</li> </ul>	<ul style="list-style-type: none"> <li>• National and subnational planning and strategies were aligned based on RA 9003</li> <li>• National policies were accompanied by strong political leadership at local level and the monitoring by regional officials from the Environmental Management Board (EMB)</li> <li>• City closely worked with <i>barangay</i> (community) councils and <i>Barangay</i> Solid Waste Management Boards (BSWMB) on waste management and provided necessary budget and training etc.</li> <li>• CCENRO coordinates with <i>barangay</i> councils, Cebu’s Environmental and Sanitation Team (CESET) and <i>Barangay</i> Environmental Officers (BEOs) in implementing the waste management policies, plans and activities</li> </ul>	<ul style="list-style-type: none"> <li>• The city conducted intensive public awareness campaigns and engaged the community (NGO, homeowner’s association, waste pickers, media, residents, academic institutions, private sector etc.) in enforcing garbage separation rules</li> <li>• Private companies the work with the city government to treat plastic and organic waste</li> </ul>	<ul style="list-style-type: none"> <li>• Strong commitment of local authorities with a long term vision (especially the mayor and the chair of the environmental committee)</li> <li>• Enabling policy and regulatory framework</li> <li>• Sufficient human and financial resources</li> <li>• Effective monitoring and enforcement</li> <li>• Technical and financial support from international partners</li> </ul>	<ul style="list-style-type: none"> <li>• The city mainstreamed ISWM planning locally and reduced the amount of municipal solid waste sent to local landfills through a decentralized approach</li> <li>• Sustainable economic, environmental and social benefits were achieved locally</li> <li>• Remaining challenges include public compliance, constrained human and financial resources and policy consistency and coherence</li> </ul>

	Horizontal integration	Vertical integration	Stakeholder engagement	Other key success/failure factors	Additional Remarks
<p>Surabaya City, Indonesia (2004-)</p> <p><a href="https://www.ccet.jp/publication/casestudy-surabaya_ISWM">https://www.ccet.jp/publication/casestudy-surabaya_ISWM</a></p>	<ul style="list-style-type: none"> <li>MSWM is handled by the Cleanliness and Landscaping Department of the city government under the leadership of the Mayor</li> </ul>	<ul style="list-style-type: none"> <li>National laws, regulations, policies guidelines and initiatives on waste management are in place to strengthen and assist city's efforts.</li> <li>The national government created a system to award good solid waste management cities and collect solid waste management-related information from the local level (Adipura program)</li> <li>Districts/ sub-districts, and neighbourhood associations are involved in providing waste collection service, public awareness campaign and education, and 3R activities at the local level</li> <li>City recruited approximately 420 facilitators and 28,000 environmental cadres to coordinate the community-based SWM programs</li> </ul>	<ul style="list-style-type: none"> <li>The city government promoted a community solid waste management program and facilitated voluntary work by stakeholders</li> <li>All stakeholders built necessary capacity through training</li> <li>The 3R strategy was implemented through public, private and non-profit sector collaboration engaging both local and foreign actors</li> <li>Women's groups/ neighbourhood associations were engaged</li> </ul>	<ul style="list-style-type: none"> <li>Infrastructure development (composting centres, waste-sorting facilities etc.)</li> <li>Technical support from international partners</li> </ul>	<ul style="list-style-type: none"> <li>The city was successful in waste reduction and separation through community-based composting activities and other low-tech cost-effective solutions</li> </ul>

	Horizontal integration	Vertical integration	Stakeholder engagement	Other key success/failure factors	Additional Remarks
<p>Battambang City, Cambodia (2011-)</p> <p><a href="https://www.ccet.jp/publication/battambang_case_study_participatory_waste_management_initiative">https://www.ccet.jp/publication/battambang_case_study_participatory_waste_management_initiative</a></p>	<ul style="list-style-type: none"> <li>At the municipal level, the Office of Beautification is in charge of MSWM under the leadership of governor and deputy governor through the municipal administration</li> <li>The Office of Beautification works with Planning and the Sangkat Support Office to make a long-term development plan, which include solid waste management</li> <li>The Office of Beautification also works with Administration and Finance office to secure a budget for solid waste management</li> </ul>	<ul style="list-style-type: none"> <li>Under a national legal framework and policies on waste management, municipal/district administrations provide a localized plan and waste management services.</li> <li>The city secured a budget and put in place a penalty scheme to raise financial resources</li> <li>Sangkat (community) offices coordinate solid waste management at the community level</li> </ul>	<ul style="list-style-type: none"> <li>Trust among stakeholders was restored through third-party facilitation</li> <li>Participatory waste management for climate change mitigation engaged key stakeholders (NGOs, private companies, and community members etc.) from an early stage of planning and generated a sense of ownership, leadership and commitment</li> <li>Separation of organic waste created new business opportunities and necessitated awareness raising campaigns</li> <li>Regular on-site monitoring and evaluation based on a participatory approach to support implementation</li> </ul>	<ul style="list-style-type: none"> <li>A lack of budget and human resources</li> <li>Political commitment</li> <li>Leadership of the Municipal Governor</li> <li>Appropriate technical support and facilitation by international partners</li> <li>Incentives and measures promoting stakeholder participation</li> <li>Regular on-site monitoring and evaluation through a participatory approach</li> </ul>	<ul style="list-style-type: none"> <li>Gradually improved its waste management system from a poorly functioning private sector-driven services to a system generating environmental, social and economic co-benefits, winning the award for the cleanest city in the country and Certificate of Recognition for Clean Air</li> </ul>

	Horizontal integration	Vertical integration	Stakeholder engagement	Other key success/failure factors	Additional Remarks
<p>Phnom Penh, Cambodia (2015-)  <a href="https://pub.iges.org/pub/report-strategy-formulation-workshop">https://pub.iges.org/pub/report-strategy-formulation-workshop</a>  <a href="https://asiafoundation.org/wp-content/uploads/2016/06/Working-Politically-and-Flexibly-to-Reform-Solid-Waste-Management-in-Phnom-Penh.pdf">https://asiafoundation.org/wp-content/uploads/2016/06/Working-Politically-and-Flexibly-to-Reform-Solid-Waste-Management-in-Phnom-Penh.pdf</a>  <a href="https://cdri.org.kh/wp-content/uploads/wp110e.pdf">https://cdri.org.kh/wp-content/uploads/wp110e.pdf</a></p>	<ul style="list-style-type: none"> <li>The Ministry of the Environment is responsible for waste management in general; however, the waste management responsibilities are fragmented and dispersed across various ministries based on the type and source of waste generated, which often result in confusion during implementation</li> </ul>	<ul style="list-style-type: none"> <li>The Ministry of the Environment provides laws on waste management. The role of providing solid waste services was transferred from the provincial level to municipal administrations in 2015 with responsibility, rights and ministry-granted fiscal resources, but without a personnel reassignment</li> <li>Challenges exist in interactions between provincial departments and municipal administrations, including veto exercised by a provincial department over a municipal proposal on solid waste management activities to be funded by the Ministry of the Environment</li> </ul>	<ul style="list-style-type: none"> <li>Limited awareness raising activities on waste disposal and collection were conducted by a waste collection company</li> <li>Many residents are unwilling to pay for unreliable collection services</li> </ul>	<ul style="list-style-type: none"> <li>Limited political will at the national level to address solid waste</li> <li>Sense of ownership with limited capacity of municipal administrations</li> <li>Monopoly of waste collection service by a limited number of companies based on a long-term contract.</li> <li>Limited public land for landfills</li> <li>Insufficient fiscal resources from the national government</li> <li>City Hall's lack of interest in monitoring the performance of the contractor</li> <li>Absence of reliable waste collection service for residents and deteriorating</li> </ul>	<ul style="list-style-type: none"> <li>Residents pay a fee for waste collection as part of the electricity bill but many households do not receive waste collection services due to the underperformance of the waste collection company</li> </ul>

	Horizontal integration	Vertical integration	Stakeholder engagement	Other key success/failure factors	Additional Remarks
<p>Virac, Philippines (2018) <a href="https://www.ccet.jp/node/47">https://www.ccet.jp/node/47</a></p>	<ul style="list-style-type: none"> <li>The solid Waste Management Board is established under the Mayor's office based on the national law</li> <li>The solid Waste Management Section of Municipal Environmental and Natural Resource Office is responsible for daily operations, but it is difficult to find horizontal linkages with other offices</li> </ul>	<ul style="list-style-type: none"> <li>The national government has given the mandate to cities under RA 9003</li> <li>The city has not developed a 10-year solid waste management plan yet</li> <li>The city works with <i>barangays'</i> public utility team for waste management; however, their relationship is not strong</li> <li>The allocation of responsibilities shared between city and <i>barangays</i> are not clear, and this hampers capacity building of <i>barangays</i></li> </ul>	<ul style="list-style-type: none"> <li>The city supports IEC campaigns in schools and for youth on a limited scale on an irregular basis</li> <li>The city's collaborative activities with other partners, including local NGOs and private sector are limited</li> <li>There is no coordination between the informal recycling activities including by waste pickers and service provided by city</li> </ul>	<ul style="list-style-type: none"> <li>A lack of resources and capacity in the city</li> <li>The absence of long-term plan for waste reduction and an effective recycling programme</li> <li>The budget for waste management comes from the city's budget</li> <li>A lack of information sharing and monitoring</li> <li>Commitment from the city but the lack of enabling policy and regulatory framework</li> <li>A lack of effective monitoring and enforcement</li> <li>No support from international partners</li> </ul>	<ul style="list-style-type: none"> <li>The waste collection ratio is low (60%). The rest is dumped or burned.</li> <li>The city is working to develop a 10-year plan based on an integrated approach with support from the DENR</li> <li>The city's "No Segregation or No Collection" policy seems unsuccessful due to lack of information sharing and monitoring</li> <li>The city tried to introduce composting but this is still in the experimental stages</li> </ul>

Sources: Compiled by the Authors, 2018



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# Chapter 5

## Governing a Water-Energy- Food Nexus Approach: Creating Synergies and Managing Trade-offs

Authors: Bijon Kumer Mitra and Ngoc-Bao Pham  
Contributors: Nobue Amanuma, Tetsuro Yoshida  
and Eric Zusman



## Chapter 5

# Governing a Water-Energy-Food Nexus Approach: Creating Synergies and Managing Trade-offs

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### Main Messages

- The importance of food, water and energy for sustainable development is clearly highlighted in SDG 2, SDG 6 and SDG 7, respectively, and these resources are facing intensified challenges in the coming decades;
- Water, energy and food securities are interconnected. Thus, addressing these challenges requires an integrated approach to resource planning and management;
- Until now, there have been several versions of an integrated approach (including Integrated Water Resource Management (IWRM)) that have been proposed and implemented. However, these approaches have prioritised a particular sector and have failed to elicit significant interest from stakeholders in other key sectors;
- This chapter examines how a water-energy-food nexus (WEFN) approach is different and complements other integrated approaches to natural resource management such as Integrated Water Resource Management (IWRM), analyses a case of WEFN in India, and constructs an enabling framework to strengthen governance of WEFN;
- One key difference between IWRM and WEFN emerges: IWRM starts with water whereas the nexus looks at water, food and energy as three equally important parts of an integrated system, but both acknowledge the importance of greater horizontal and vertical coordination;
- In India, shifting USD 5 billion for subsidised pumping of irrigation water to water use efficiency would save 102 billion m<sup>3</sup> of water and 82,000 GWh of energy, as well as reducing CO<sub>2</sub> emissions by 72 million tonnes, thus generating multiple socioeconomic and environmental benefits, while contributing to SDG 2, SDG 6, SDG 7 and other SDGs;
- Given the shared nature of these three resources and the interdependence among those who rely on them, collective decision-making through horizontal and vertical integration of policies, development plans and actions plans is crucial; and
- The key policy measures that will allow such collective decision making to gain traction include 1) identification of a key coordination agency; 2) create a common vision and break away for sectoral perspectives; 3) strengthen science-policy interactions; and 4) build capacity of the key policymakers.

## 1. Introduction

Throughout the world, a significant portion of the global population still lacks access to adequate water, energy and food. It is estimated that 2.1 billion people lack access to safely managed drinking water (UNICEF and WHO 2017), 1.06 billion people lack access to electricity (World Bank 2017), and about 815 million are undernourished as of 2016 (FAO, IFAD, UNICEF 2017). A combination of rapid population growth, urbanisation, industrialisation and lifestyle changes has meant that water, energy and food have become exhaustible resources over time. This will pose a challenge to the implementation of the Sustainable Development Goals (SDGs), because access to these resources is the basis for sustainable development and life itself.

The importance of food, water and energy for sustainable development is clearly highlighted in SDG 2, SDG 6 and SDG 7, respectively. These three resources form the basic elements for human survival, economic growth and development. In addition, water, energy and food security are inherently interlinked and interdependent. For example, about 4 percent of the world's total energy consumption is accounted for by water delivery (International Energy Agency 2016). The energy sector needs water for fuel extraction, cooling, and hydropower generation. Based on estimates in Bhattacharya and Mitra (2013), India's energy sector water demand will reach 90 billion cubic meters (BCM) if thermal power plants are cooled down with conventional cooling systems, which is about 8 percent of total utilizable water. Food security also relies on supply of water and energy. India's agriculture sector consumes about 83 percent of total water withdrawals and 18 percent of total electricity consumption (Dhawan 2017). It is important, therefore, to bring together water, energy and food goals and targets, and address them in tandem. Until recently, there has been a notable absence of nexus thinking in planning and policymaking for water, energy and food resources. This has resulted in incoherent policymaking, contradictory strategies and the inefficient use of natural resources (Foran 2015). Insecurities within each sector are also aggravated when they are not considered together.

In the coming years, the world will face intensified challenges to secure these three interdependent resources—40 percent water shortfall by 2030, 50 percent food demand increase by 2050, and annual electricity demand increase by 5 percent (International Energy Agency 2016). Addressing these challenges requires an integrated approach to resource planning and management that has already been recognised through different concepts and models, but approaches up to now have tended to prioritise a particular sector. For instance, integrated water resources management (IWRM) is centred on water resources. For understandable reasons, such approaches have failed to elicit significant interest from stakeholders in other key sectors (such as food and water). This may have contributed to the limited effectiveness of past efforts to advance IWRM.

To overcome weaknesses in previous integrated approaches, the water-energy-food nexus (WEFN) has been proposed as a useful concept that aims to systematise the interconnections and provide tools to assess the use of water, energy and food resources (Hermann et al. 2012). The United Nations University (UNU) initiated the first nexus programme to acknowledge the interdependent nature of food and energy. The WEFN concept subsequently gathered momentum at various national, international, regional and global forums (Figure 5.1). It was the Bonn 2011 Nexus Conference that then contributed to better understanding of the WEFN concept, garnering increased attention from policymakers, academia, the private sector and financial institutions. Following this, many key policy forums gave explicit attention to the WEFN. These included the World Water Forum’s Ministerial Roundtable on Water, Energy and Food Security, in 2012, Stockholm World Water Week in 2012, Mekong2Rio International Conference on Transboundary River Basin Management in 2012, the Water Summit 2013: Bringing WEF Nexus to Life in 2013, and the 14th Delhi Sustainable Development Forum in 2014.

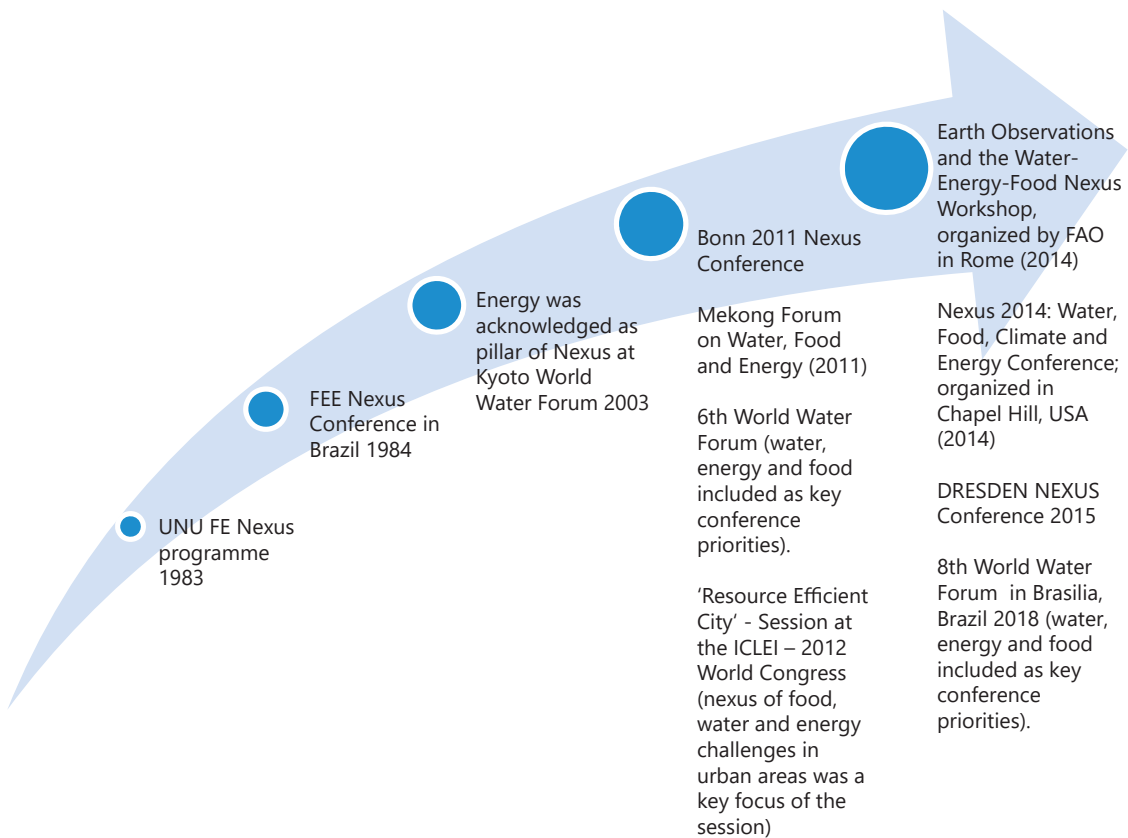


Figure 5.1. Chronology of major WEFN-related events

Source: Prepared by authors

After the adoption of the SDGs by the United Nations General Assembly in 2015, the nexus concept has been increasingly featured on the agendas of policymakers (Weitz et al. 2014). For example, the WEFN approach has received attention in a wide range of international initiatives (e.g. Sustainable Energy for All (SE4All) and World Economic Forum) as well as support from the research/academic sector (e.g. International Food Policy Research Institute (IFPRI), German Development Institute (DIE), Stockholm Environment Institute (SEI), governments (e.g. in Germany, Colombia), the private sector (e.g. World Business Council for Sustainable Development (WBCSD), Anheuser-Busch InBev, Royal Dutch Shell, Coca Cola), and international and development partners (e.g. World Wildlife Fund, International Union for Conservation of Nature (IUCN), Opec Fund for International Development, International Renewable Energy Agency (IRENA), United Nations Economic and Social Commission for Western Asia, Food and Agriculture Organization (FAO), United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP).

The cross-sectoral nature of the WEFN approach and its focus on key resources for people's livelihoods would seemingly make governance crucial to its application and implementation. Until very recently, however, governance did not receive as much attention as more technical applications of WEFN. Fortunately, this is beginning to change with some experts highlighting the important role that the governance and institutional coordination (both horizontal and vertical) issues featured in this report play in the performance of a nexus approach (Scott 2017).

This chapter aims to initiate a discussion on actionable measures to realise, promote and operationalise WEFN in practice. Specific objectives are: 1) to examine how a nexus approach is different and complements other integrated approaches to natural resource management with a particular focus on IWRM; 2) to analyse a case of WEFN in India to demonstrate trade-offs and draw some practical measures to realise synergies; and 3) to construct an enabling framework that will continually strengthen governance for the WEFN approach.

## **2. From Integrated Water Resource Management (IWRM) to Water-Energy-Food Nexus Approach**

Formalisation of a policy framework for IWRM at the global level began with adoption of the Mar del Plata Action Plan at the United Nations Water Conference in 1977. The concept of IWRM would then gain even more attention from a wider audience during the Agenda 21 process of the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992. In 2002, at the World Summit on Sustainable Development in Johannesburg, governments agreed to develop national IWRM and water efficiency plans.



Most recently, the importance of IWRM was demonstrated in the SDG target 6.5, which calls for implementation “by 2030 of IWRM at all levels, including through transboundary cooperation as appropriate.”

The Global Water Partnership defines IWRM as “a process which promotes the coordinated development and the management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems” (Hassing et al. 2009). It is considered a holistic approach to water resource management, bringing actors from different sectors into water decision-making processes, thereby balancing the interests of different user groups and avoiding potential conflicts.

The broader objective of IWRM is to overcome sector-based policy fragmentation and siloed institutions, thus making water management more ecologically and economically efficient. However, the actual objectives of IWRM vary in practice, depending on national and local circumstances, and interpretations of the concerned organisations. An analysis of existing literature by Biswas (2008) indicated that there is unfortunately no agreement on the definition of IWRM. Rather different experts and institutions use “integration” to connote different things. To bring greater clarity to the discussion of IWRM, Biswas (2008) constructed a long list of examples, including 41 issues that different sources considered should be “integrated” under the aegis of IWRM; either within or across sectors (horizontal dimension); or at the local, national, regional level or international level (vertical dimension) (e.g. water quality and quantity; water and health; national and international water policies, etc.). Therefore, it is important that the definitional problem be resolved before a universal approach to IWRM is translated into practical actions.

Arguably even more problematic than the definitional issues for IWRM is the limited evidence that the approach has been effective. Unfortunately, neither research nor applications of IWRM have made significant improvements in the way water resources are managed, rehabilitated, conserved and re-allocated. Rather some studies have pointed out that the key challenges occur in the implementation stage (Schreier, Kurian, and Ardakanian 2014), while others underline a broader range of impediments (United Nations Environment Programme 2012; Butterworth et al. 2010). Table 5.1 summarises a number of common problems and possible solutions with IWRM.

Although IWRM has a long history, WEFN only gained significant attention in the 2000s as interest grew in moving from working on individual cases to more holistic forms of natural resource management (Bizikova et al. 2013). To date, there is a no consensus about whether the nexus is distinct from past cross-sectoral approaches to natural resource management. At least on the surface, the nexus concept shares some of the same core features of other holistic approaches to environmental decision-making, including IWRM (Rees 2013; Lee and Maheswaran 2011).

*Table 5.1. Common problems of IWRM and possible solutions based on the ideas of nexus approach*

Challenges	Possible solutions based on the ideas of Nexus approach
No agreement on which issues are to be integrated, how, by whom, or if integration is feasible	<ul style="list-style-type: none"> <li>• Build IWRM principles into specific projects and programmes.</li> </ul>
Lack of consideration to local context	<ul style="list-style-type: none"> <li>• Use local laws and existing institutions as an entry point for IWRM.</li> <li>• Train policymakers to be flexible in their work.</li> <li>• Build IWRM from the bottom-up and ensure it is integrated into local government planning processes.</li> </ul>
Lack of administrative capacity and institutional arrangements	<ul style="list-style-type: none"> <li>• Ensure there is enough institutional capacity to support multi-sector integration.</li> <li>• Establish an institutional framework and strengthen capacity building programmes to support local government staff.</li> <li>• Provide appropriate financial support.</li> </ul>
Conflict of interests and views	<ul style="list-style-type: none"> <li>• Establish appropriate mechanisms to develop and share policy goals, common visions and strategies among all relevant sectors, aimed at minimising potential conflicts and maximising synergies while achieving the goals and visions in each sector.</li> <li>• Give adequate attention to the different interests and institutions early in the planning process to minimise conflicts in water management (both horizontal and vertical integration are necessary).</li> </ul>
Coordinating mechanism	<ul style="list-style-type: none"> <li>• Set practical guidelines and create a central committee or coordinating agency to harmonise diverse interests and encourage participation in decision making.</li> <li>• Establish a mechanism for coordinated actions between water and other relevant agencies.</li> <li>• Promote voluntary and cooperative actions.</li> </ul>

Source: Modified from United Nations Environment Programme 2012

### ***Similarities and differences between IWRM and WEFN***

But looking a little more closely, one key difference between IWRM and WEFN emerges: notably IWRM starts with water whereas the nexus looks at water, food and energy as three equally important parts of a system. In practice, of course, there needs to be a starting point; however, a key distinction for nexus thinking is that the point of departure could just as easily be energy or food security as water. For energy and food researchers, the WEFN offers a more balanced and feasible way forward than IWRM (Leck et al. 2015).

Box 5.1. Key principles of the nexus approach

1. Understand the interdependence of subsystems within a system across space and time and focus on system efficiency rather than the productivity of individual sectors to provide integrated solutions that contribute to water, energy and food policy objectives.
2. Recognise the interdependence between water, energy and food and promote economically rational decision making and efficient use of these resources in an environmentally responsible manner
3. Identify integrated policy solutions to minimise trade-offs and maximise synergies across sectors and encourage mutually beneficial responses that enhance the potential for cooperation between and among all sectors, and public-private partnership at multiple scales.
4. Ensure policy coherence and coordination across sectors and stakeholders to build synergies and generate co-benefits to produce more with less and contribute to long-term sustainability with limited environmental impact.
5. Value the natural capital of land, water, energy, and ecosystems and encourage business to support the transition to sustainability.

Source: Extracted from Leck et al. 2015

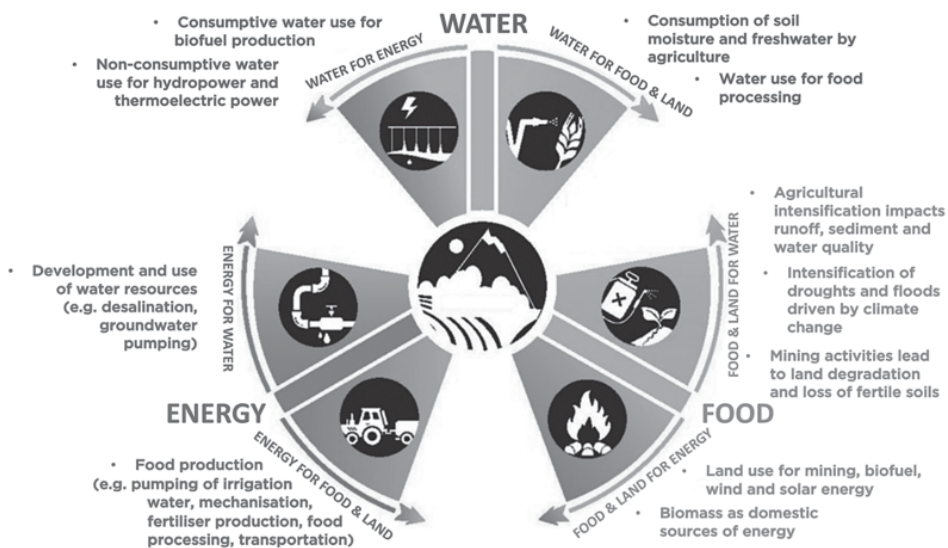


Figure 5.2. Interlinkages between water, energy and food systems

Source: Adapted from United Nations Economic Commission for Europe 2015; Future Earth 2018

Benson, et al. (2015) summarised some similarities as well as differences between IWRM and the nexus concept (e.g. WEFN), focusing on their normative assumptions on policy integration, optimal governance, scales, stakeholder participation, resource use and sustainable development (Table 5.2).

Table 5.2. Key features of IWRM and the WEFN

Features	IWRM	WEFN
Integration	<ul style="list-style-type: none"> <li>Integrating water with other policy objectives</li> </ul>	<ul style="list-style-type: none"> <li>Integrating water, energy and food policy objectives</li> </ul>
Optimal governance	<ul style="list-style-type: none"> <li>'Good governance' principles</li> </ul>	<ul style="list-style-type: none"> <li>Integrated policy solutions</li> <li>Multi-tiered institutions</li> </ul>
Scale	<ul style="list-style-type: none"> <li>River-basin or sub-basin scale (most commonly)</li> </ul>	<ul style="list-style-type: none"> <li>Multiple scales (all levels of governance from local to international)</li> </ul>
Participation	<ul style="list-style-type: none"> <li>Stakeholder involvement in decision-making</li> <li>Multiple actors, including women</li> </ul>	<ul style="list-style-type: none"> <li>Public-private partnerships – multi-stakeholder platforms for increasing stakeholder collaboration</li> </ul>
Resource use	<ul style="list-style-type: none"> <li>Efficient allocations</li> <li>Cost recovery</li> <li>Equitable access</li> </ul>	<ul style="list-style-type: none"> <li>Economically rational decision-making</li> <li>Cost recovery</li> <li>Securitisation of resources</li> </ul>
Sustainable development	<ul style="list-style-type: none"> <li>Demand management</li> </ul>	<ul style="list-style-type: none"> <li>Securitisation of resources</li> </ul>

Source: Benson, et al. 2015

The comparison between IWRM and WEFN approach indicates that neither can be replaced by the other. Although the nexus terminology may be relatively new, the fundamental idea behind it is not. The ultimate purpose is to promote better resource use in an environmentally, socially and economically sustainable manner. Both IWRM and WEFN share a view that uni-sectorial planning and decision-making is unlikely to result in desirable outcomes. Therefore, both concepts emphasise greater coordination between interdependent resources so as "to improve human welfare and social equity, allow sustainable growth and protect essential environmental resources" (GIZ 2014).

### 3. Case Study: Water-Energy-Food Nexus in India<sup>1</sup>

India is one of the global hot spots of economic development but increasing water shortages pose serious threats to this development (WWAP 2012; Rodriguez et al. 2013). Per capita water availability in India has already dropped to water stress levels. Per capita water availability in India is 1,604 m<sup>3</sup>, which is far below the global average of 24,776 m<sup>3</sup> (FAO n.d.). It is projected that this availability will drop further to 1,140 m<sup>3</sup> by 2050, which is close to a water scarce situation (1,000 m<sup>3</sup>) as per the Falkenmark indicator and greater

<sup>1</sup> This section extracts from and draws heavily on the authors' previous publication Mitra et al, 2017.

competition over water is likely (ADB 2011). As a result, increasing pressure on the water supply will threaten all development activities in India.

Overuse of water is one of the main causes of water scarcity. This overuse results from low irrigation water use efficiency (WUE) associated with water intensive cropping systems, use of suboptimal irrigation supply systems, uneven water distribution in crop fields, and subsidised electricity for pumping irrigation water, as well as high dependency on water-intensive thermal electricity generation systems.

### 3.1 Water-food nexus

Agriculture is one of the main economic activities in South Asia, and its share of gross domestic product (GDP) is relatively large—16 percent in Bangladesh, 19 percent in India, 32 percent in Nepal, 12 percent in Pakistan and 21 percent in Sri Lanka (Taheripour et al. 2016). Irrigation has played a pivotal role in enabling an expansion of crop production in many parts of the region. Irrigated agriculture accounts for 60–80 percent of the food production in the region (World Bank n.d.). The irrigated area has expanded rapidly over the last few decades at an average annual growth rate of 1.7 percent in South Asia (FAO 2011). Due to this rapid growth, the agriculture sector has become the largest consumer of water, accounting for almost 95 percent of the withdrawn water in South Asia, which is well above the global average of 70 percent (Babel and Wahid 2008). Nevertheless, water productivity in this region is one sixth that of the world's top food producers in terms of GDP generated per cubic meter of water (World Bank n.d.). The main reasons for low water productivity include the fact that two-thirds of the irrigated area are devoted to low value but high water-using cereal grain production, reliance on traditional flood irrigation systems for watering crops despite poor efficiency, while the most important driver is the subsidised electricity for pumping of irrigation water.

Since the colonial era, irrigation development has been dominated by a supply-driven approach. In recent years, a number of river diversion mega projects have been planned to supply water to water-stressed areas. From the supply side, inter-basin water transfer is one of the main solutions to water scarcity, but this usually comes with high investment costs, as well as significant social and environmental costs (Pittock et al. 2009). In contrast, demand side management measures through WUE improvement offer environmentally-friendly, low-cost solutions for reducing water scarcity.

Many studies argue that WUE improvement in agriculture could significantly contribute to meeting future water demand because the agriculture sector is the largest water user (World Bank 2014; 2030 Water Resources Group 2009). The importance of WUE improvement is also clearly acknowledged in SDG 6 on water and sanitation.

The average irrigation WUE in South Asia is 40 percent (Hasanain et al. 2012), which is relatively low compared to some other Asian countries such as Japan and Taiwan (60 percent), China (49 percent) and Malaysia (45 percent) (Postel, S; Vickers 2004). There is,

therefore, great potential to improve irrigation WUE in South Asia, and any positive change in irrigation WUE would help to reduce water scarcity, which is essential to economic prosperity.

### 3.2 Technological options to maximise synergies in the water-food nexus

There are several available options to improve WUE in the field including no tillage farming, adjusting the water supply depending on the crop's growth stage, uniform distribution of water in the field and promoting micro irrigation to minimise water loss in the system. Some of these options can improve WUE at no or low-cost such as no tillage, but the extent of reduction in overall water consumption is negligible. Therefore, other options of WUE improvement, including micro irrigation and levelling the field surface for uniform water distribution, would play a key role to improve WUE to a satisfactory level. These are, however, relatively more costly options.

Figure 5.3 shows the total potential of irrigation WUE improvement for three water saving technologies in India. In India, wheat, which is suitable for water efficient sprinkler irrigation, is cultivated in a large portion of the irrigated area. Therefore, sprinkler irrigation has a greater potential to increase irrigation WUE from current levels (below 40 percent) to a satisfactory level (more than 60 percent) compared to other methods. Utilisation of the full potential of micro irrigation and laser levelling in rice cultivation irrigation would improve WUE by above 30 percent in India.

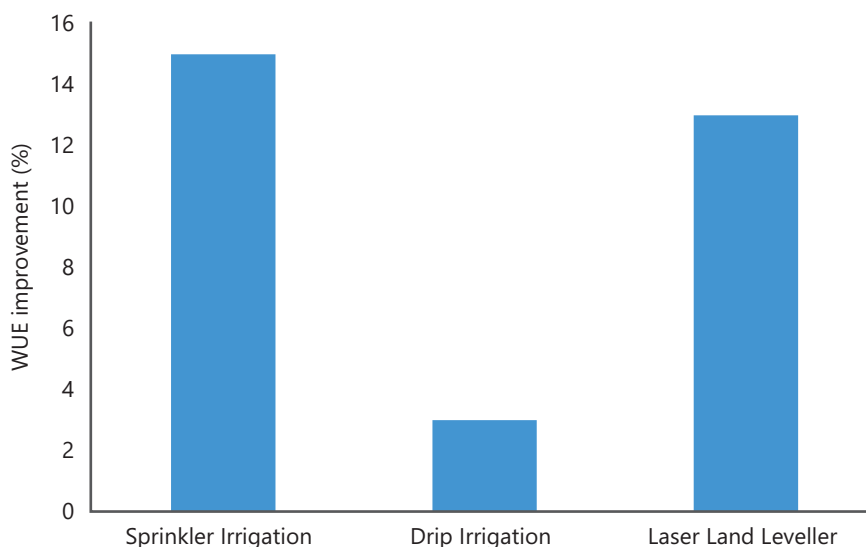


Figure 5.3. Potential of irrigation WUE improvement using water saving technologies in India  
Source: Adapted from Mitra et al. 2017

### 3.3 Water-energy nexus

Though India is the fifth largest producer of electricity in the world, its per capita electricity consumption is far below the world average of 2,700 KWh (IEA 2011). Moreover, power generation and supply are primarily oriented towards demand centres and industrial activities in the urban regions; hence the majority of the rural population face severe power shortages. There are more than 240 million people in the country without adequate access to electricity (IEA 2015), although the Indian Government has reached a milestone of connecting 100 percent villages to electricity (announced by the Prime Minister Narendra Modi). There is thus significant potential for a great expansion of the electricity sector in India in the coming decades.

Currently, India's electricity generation capacity is dominated by coal and gas based thermal power, which accounts for 70 percent of total installed capacity (CEA 2015). Thermal power facilities need large volumes of water to produce electricity. The water is primarily for washing coal, for cooling systems and ash handling. Reports published by various government and non-government sources indicate that thermal power plants in India use about 88 percent of the total industrial water use in the country (Center for Science and Environment 2012). This high proportion is partly due to the use of open loop systems, which have an average water use intensity 80 m<sup>3</sup>/ MWh (Center for Science and Environment 2012), which is around 60 times higher than the current world average of 1.2 to 1.5 m<sup>3</sup>/ MWh (mainly closed loop systems). India's newer power plants with closed loop cooling systems are performing better with 2.8 to 3.4 m<sup>3</sup>/MWh water use intensity (Bhattacharya and Mitra 2013), but this is still high compared to the world average.

Given the availability of indigenous coal resources in India and following the national projected energy supply portfolio, it is envisaged that future power generation will rely heavily on thermal sources. Nonetheless, national power planning appears to be ignoring the issue of long-term water availability in the country for power generation. The findings of several studies on long-term water availability and demand, especially at various basin levels, share the view that there is increasing competition over water between various uses, and agree that this poses a potential operational risk for power plants. In India, there is a clear need to align long-term power planning with water resource planning and management to avoid a future crisis.

Table 5.3. Water requirement of different types of power plants

Fuel type	Cooling Type	Water coefficient of thermal power generation (m <sup>3</sup> /MWh)
Coal	Wet Cooling - Open loop	40.0-130 <sup>a</sup>
	Wet Cooling - Closed loop	2.8 -5.0 <sup>b</sup>
	Dry cooling	0.45 – 0.65 <sup>c</sup>
Natural gas	Wet Cooling- Closed loop	3.0 <sup>d</sup>

Source: a) Based on IGES survey on Indian power plants conducted in 2015 and data collected and compiled by Centre for Science and Environment (2004) and by MoEF, Govt. of India (2011).

b) Based on IGES survey on Indian power plants conducted in 2012 and 2015.

c) Based on IGES survey on Indian power plants conducted in 2012.

d) Based on IGES survey on Indian power plants conducted in 2015 and estimates done by National Environmental Engineering Research Institute (NEERI) in 2006.

### 3.4 Possible future of water constraint mitigation scenarios for power plants

Water is critical for thermal power plants because water is required at every important stage of power plant operations, including cooling systems, demineralisation water make-up, potable and service water, and ash handling in coal-based power plants. Unsurprisingly, the biggest use of water (80 percent of total water use) is for the cooling system, where water is routinely used as a coolant. Therefore, a water-efficient cooling system as a means of reducing water demand in power plants can play a significant role. Four different water demands in power plants based on the adoption of different cooling systems have been estimated below.

The Ministry of Environment, Forest and Climate Change (MOEFCC) of the Government of India put a ban on using open loop wet cooling systems in any inland power plants using fresh water starting 1 June 1999. As a result, about 75 percent of thermal power generation capacities in India have now adopted a closed loop cooling system. This means 180 GW of installed thermal power capacity is using a closed loop cooling system and 60 GW thermal power capacities is still using water at a rate of 80 m<sup>3</sup>/MWh (average). For the S1 Scenario (business as usual (BAU)) the authors assumed that 25 percent of the thermal power capacity will continue with open loop cooling systems. The estimation shows that water demand for thermal power generation will jump from 12 BCM in 2010 to 27 BCM in 2050. However, existing open loop power plants are very old and are ideally expected to retire within a couple of decades. Hence, for the S2 Scenario water demand was estimated assuming that all open loop system will be phased out by 2030. Replacing open loop cooling systems with closed loop systems can reduce water demand for thermal power plants by 48 percent in 2030 compared with water demand under the S1 scenario in the same period.

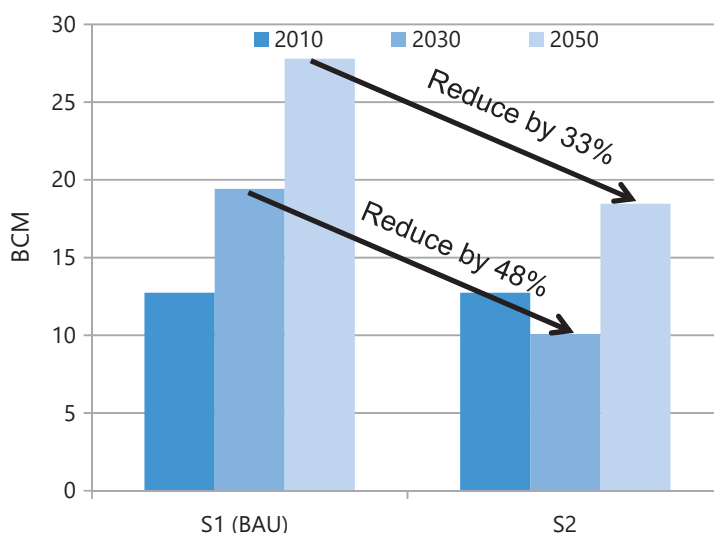


Figure 5.4. Comparison of long-term water demand for thermal under S1 and S2 Scenarios  
Source: Authors' estimation



Considering the increasing competition among water users and continuous national priority of water security for drinking and agriculture, thermal power plants may require further strengthening of efforts to improve water use efficiency in the plant operation. Dry cooling systems can significantly minimise water consumption in thermal power plants and reduce water demand for power generation. In this system, power cycle waste heat transmission from condenser to atmosphere takes place by sensible cooling in finned tubes by ambient air, and make-up water is not required for cooling. Hence, in S3 (moderate effort) and S4 (high effort) dry cooling systems are introduced as a further way to mitigate the water constraint situation in the future. In the S3 scenario, it is assumed that open loop cooling systems will be replaced by dry cooling systems by 2030. In this scenario, water demand will be reduced from 19 BCM in 2030 and 27 BCM in 2050 to 9 BCM in 2030 and 17 BCM in 2050, respectively, compared with the S1 scenario.

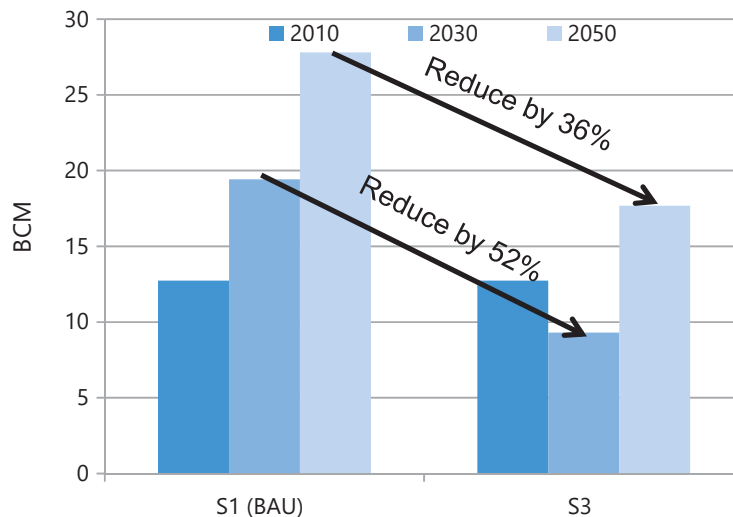


Figure 5.5. Comparison of long-term water demand for thermal under S1 and S3 Scenarios  
Sources: Authors' estimations

The high effort scenario (S4) shows that if 25 percent of total thermal power capacities use the dry cooling system, water demand for thermal power generation will drop to 14 BCM in 2050, which is 48 percent of water demand for thermal power plants under the S1 scenario in the same time period.

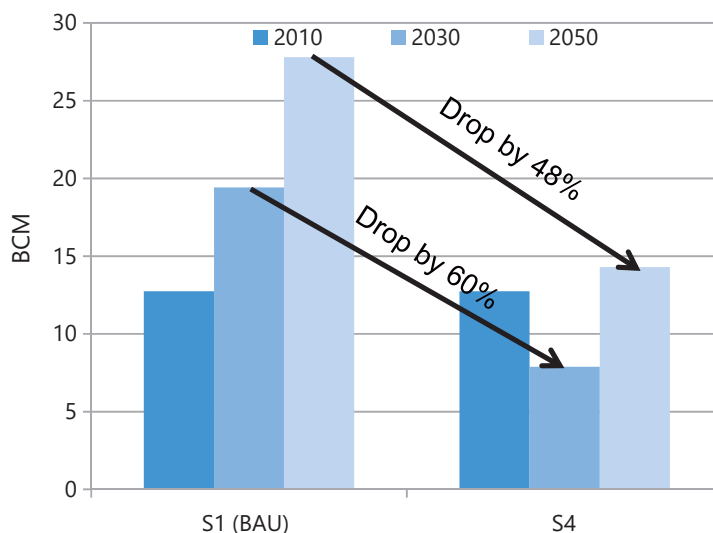


Figure 5.6. Long-term water demand scenarios for thermal power plants with different cooling systems Source: Authors' estimations

The MOEFCC gave notification of the Environmental (Protection) Amendment Rules, 2015, which aim to reduce the use limit from 3.6 m<sup>3</sup>/MWh to 2.5 m<sup>3</sup>/MWh for thermal power plants (MOEFCC 2015). In order to meet the new limit, USD 3 billion may be needed for retrofitting old power plants as well as for new power plants operated by the country's largest power company, National Thermal Power Corporation Limited (NTPC) (Dharmadhikary 2016).

### 3.5 Sectoral integration in the budget process for capturing multiple benefits across the water-energy-food nexus

The assessment indicated that India would need USD 4.7 billion to improve WUE by 20 percent (Taheripour et al. 2016). To improve WUE by 30 percent, the required capital investment would increase to USD 10.6 billion. These estimations also showed that WUE improvement would increase GDP (Figure 5.7) for some levels of investment, after allowing for the opportunity cost of the resources allocated. The analysis shows that GDP would show an increase greater than the investment costs for investments of up to a 20 percent improvement in WUE. However, the cost of further investment increasing WUE from 20 percent to 30 percent would be greater than the increase in GDP. Additional investment is always a major challenge for developing countries, given limited financial resources. It is also unlikely that private investment for irrigation in these countries would increase substantially because of various constraints, including a low water price, market distortions

and country-specific risks, especially political risks that are not easily mitigated. Therefore, it would be a major challenge for the national budget to secure finance to improve WUE in irrigated agriculture.

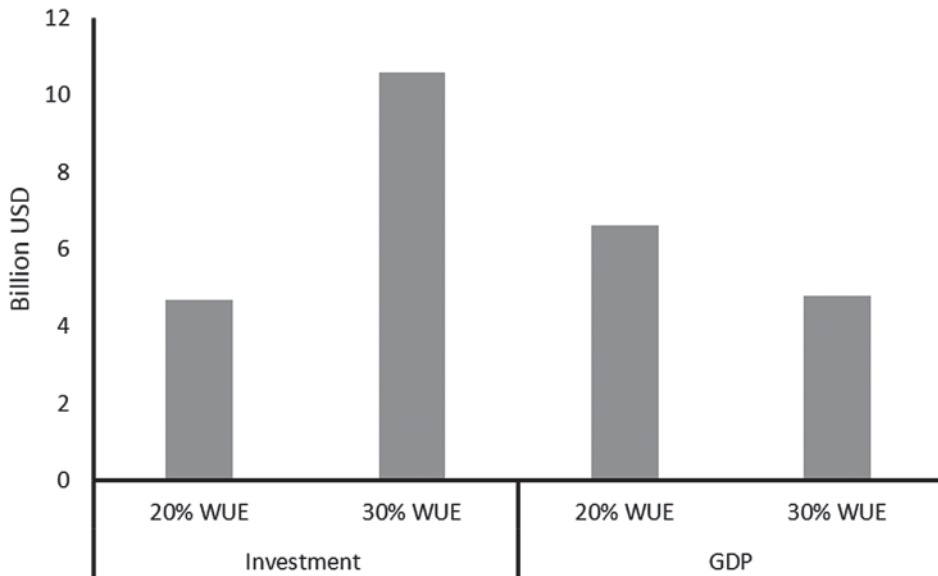


Figure 5.7. Economic implications of irrigation water use efficiency improvement in India  
Source: Prepared by authors based on Taheripour et al. 2016

The solution lies in recognising that governments in many countries provide significant subsidies for the electricity used to pump irrigation water. The artificially lowered pricing leads to inefficient and unsustainable energy and water use, which jeopardises water and energy security. In developing countries, removing this subsidy from agriculture is politically sensitive, because it is directly linked with farmers' livelihoods and national food security. A policy that shifts the subsidy amount from power supply to WUE could become a win-win solution for both governments and farmers (Table 5.4). To illustrate, Indian farmers currently receive USD 5 billion in subsidies that translate into low electricity tariffs for pumping irrigation water. Estimates have shown that a 20 percent efficiency rate for WUE in India would save 102 billion m<sup>3</sup> of water and 82,000 GWh of energy, as well as reducing CO<sub>2</sub> emissions by 72 million tonnes. Shifting this amount to target WUE improvement could potentially lead to a 20 percent increase in WUE. Such a financial re-allocation could therefore generate multiple socioeconomic and environmental benefits, contributing to SDG 2, SDG 6, SDG 7 and other SDGs by saving energy and water, increasing crop yields and farmer incomes, and mitigating greenhouse gases (GHGs) and other environmental harms.

*Table 5.4. Impact of WUE improvements resulting from shifting subsidies from electric power supply to directly supporting WUE improvement in agriculture*

Beneficiaries	Variable	Indicative impact
Farmers	Crop yield	+
	Water cost	-
	Electricity cost	+
	Income	+
Government	Financial cost of subsidies	-
	Food security	+
	Energy security	+
	GDP	+
Environmental	Balance between water availability and demand	+
	GHG emissions reduction	+

Source: Mitra et al. 2017

## 4. Making governance integrative for WEFN

Most literature and case studies conducted on the WEFN suggest that it is imperative for policymakers to have a nexus-based way of thinking and perspective but at the same time nexus-based policymaking should not be overly complicated. Critics of the nexus or integrated approach argue that aiming for the ideal of comprehensiveness and integrated approaches for all decisions affecting the use of natural resources may be too difficult and too costly. But it is also quite evident that silo-based policymaking is not effective and, in fact, creates its own set of risks, whereby intense competition for resource access can easily lead to conflicts. The WEFN approach can minimise conflicts, generate multiple benefits and maximise net economic return by ensuring resources are used more efficiently. However, there is little movement on the ground to show WEFN implementation due to the lack of strategic and practical guidance on how to translate abstract concepts into practical action—i.e. how to identify the multiple and sometimes conflicting issues that should be integrated and how integration should happen in practice. Therefore, a key challenge for the nexus is governance—i.e. who decides what issues are addressed, when and how (Stein et al. 2014).

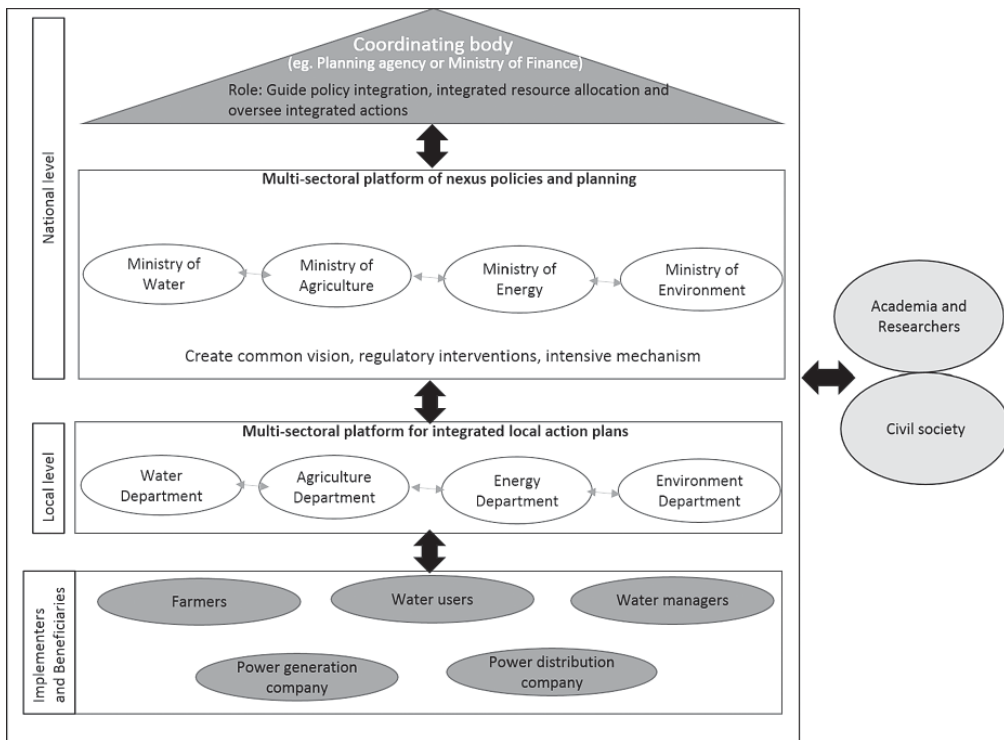
According to Beisheim 2013, the main barriers to reduce the correlated security risks between water, energy and food include lack of clear strategic guidance, mismatch, slowness to adopt of nexus approach and related assessment tools in the policymaking

processes. To overcome these barriers, policymaking, and designing development plans and action plans should be included at all levels of nexus governance.

Given the shared nature of these three resources and the interdependence among those who rely on them, collective decision-making through horizontal and vertical integration of policies, development plans and actions plans is crucial. A report by the World Economic Forum (2014) points out the need for multi-stakeholder cooperation to manage the WEFN is beyond the scope of individual governments, companies and non-governmental organisations (NGOs). The report also points to low awareness on the nexus as a particular challenge. A nexus-based policymaking process requires coordination across different departments/ministries and a broader range of stakeholders from different sectors. This process must be coordinated both horizontally and vertically. Implementation of a nexus approach also requires communication on scientific evidence-based knowledge generation, strategic guideline preparation, outlining the MOI and practical actions (Figure 5.8).

As discussed in the earlier section, the WEFN approach has been driven by policy discussion at various international forums including Rio+20, Bonn Conference 2011, and World Economic Forum etc. Therefore, policymakers are very likely to be aware of the concept of WEFN. The main challenge is how to provide policymakers with tools that are easy to use and communicate for decision-making. Recognising the importance of water security, scientists have stepped up efforts to generate evidence-based knowledge on water resource management. However, these efforts only have value when the policymakers can easily act upon the new knowledge. Some reviews have nonetheless shown there is a possible disconnect between WEFN assessment methods and core nexus concepts. The lack of a clear connection may limit progress with applications of WEFN (Albrecht et al. 2018). This underlines the need for the scientific community to work closely with policy communities. This will help to define key practical questions as well as select the methods and tools that support decision-making. It is vital that these are easy-to-use and communicate.

WEFN should be the basis for strategic plans on natural resource sustainability. The process for formulating policies does not necessarily conform to one typical pathway; it can follow a top-down or a bottom-up approach. What is most important is to identify stronger agencies that have the authority to approve sectoral plans and budgets. Such agencies include the Ministry of Finance and Planning Commission or equivalent agencies. These typically stronger agencies could play key roles in formulating strategies and guidelines for better cross-sectoral planning. This will help in improving a country's development by reducing unnecessary costs and preserving resources. Formulation of strategies and guidelines must be supported by the scientific evidence-based knowledge. These WEFN strategies and guidelines will facilitate the process of cross-sectoral collaboration by developing a common vision, coordination of sectoral strategies, as well as enabling policies.



Note: Proxy names are used for government agencies in this figure. These may differ country to country

Figure 5.8. Enabling framework for strengthening WEFN governance structure

Source: Prepared by the authors

## 5. Conclusion

It is most likely that the world will face intensified challenges to secure basic needs including water, energy and food, and these resource securities are interdependent. To mitigate these challenges, the need for an integrated approach to resource planning and management has already been recognised through different concepts and models but these approaches tends to prioritise a particular sector. For instance, IWRM is centred on water resources. Therefore, these approaches failed to target the implementation of integrated sectoral planning. In recent years, WEFN has been discussed and proposed as a useful concept to promote cross-sectoral integration for sustainable management of interconnected resource systems. WEFN emphasises interdependencies and the need to address water, energy and food systems not in an isolated manner, but rather through an integrated policy making process. WEFN approach can help minimise conflicts, and assist

in improving a country's development by reducing unnecessary costs and preserving a country's resources to be used more efficiently. However, governing WEFN is one of the key challenges of sustainable development, due to the lack of strategic and practical guidance on how to move from the abstract concepts to practical actions. This chapter proposed an enabling framework to operationalise and strengthen nexus governance in practice. This framework emphasised the importance of initiating a virtuous cycle of communication based upon scientific evidence-based knowledge generation, strategic guideline preparation, outlining the means of implementation (MOI) and practical actions. Below are the key reforms that can help enable the framework to address the interconnected challenges of water, energy and food security:

1. **Identify a key coordinating agency within the current intuitional framework:** It is critical to identify stronger agencies that have the authority to approve sectoral action plans and budgets (e.g. Ministry of Finance and planning agencies). These agencies should take the lead in developing strategic plans and guidance for operationalisation of WEFN, which will be an umbrella document for integrated resource planning.
2. **Break away from sectoral visions:** There is a need to create a common vision and integrated action plans for water, energy and food securities. Umbrella documents such as a WEFN strategic plan and science-based decision support tools would help sectors to realise the critical role of a common vision towards win-win solutions.
3. **Strengthening science-policy interactions:** Strategic plans and action plans should be formulated based on scientific-based decision support tools, which should be easy for policymakers to use and communicate. The scientific community should work closely with policymakers and other stakeholders to understand real issues and needs.
4. **Capacity building of policymakers:** Policymakers lack the knowledge and capacity to understand the scientific relationship between water, energy and food systems. A capacity building programme is needed to provide better understanding of the linkage between the three sectors and strengthen the interface between science and policy. This will create a foundation for integrated development plans for sustainable development.

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# Chapter 6

## Conclusions and the Way Forward

Nobue Amanuma and Eric Zusman



## Chapter 6

# Conclusions and the Way Forward

Nobue Amanuma and Eric Zusman

Many policymakers are responding to the SDGs by integrating multiple economic, social and environmental concerns into their development plans. Much of the recent research on SDGs has sought to help policymakers with this cross-sectoral integration by developing evidence-based models and analytical frameworks that can identify linkages across a wide range of issues (Nilsson et al. 2017; Nilsson, Griggs, and Visback 2016; IGES 2017; Millennium Institute 2017). Fewer studies have examined the governance arrangements needed to align agency and other stakeholder interests behind integrated solutions. This is a significant gap because policymakers will need to understand both issue linkages and governance arrangements that can help align interests to make integrated solutions effective. This report has aimed to fill that gap by determining whether and to what extent three different dimensions of governance—horizontal coordination, vertical coordination, and multi-stakeholder engagement—affected narrowly drawn efforts to mitigate climate change and achieve other development objectives in the Asia-Pacific region.

Following an introductory chapter that brought insights from governance research into research on issues linkages, the report has sought to draw lessons from a series of case studies focusing on the governance arrangements that supported co-benefits (Chapter 2); sustainable transport (Chapter 3); integrated solid waste management (Chapter 4); and the water-energy-food nexus (Chapter 5) in the Asia-Pacific region. Overall the chapters suggest that the greater the number and diversity of issues in an integrated solution, the more countries will need to strengthen institutional structures and enhance decision-making processes to advance that solution. In certain instances, the chapters also underline the important role played by finance, technology, and capacity building as means of implementation (MOI). Contextual factors are also brought into the analysis where appropriate.

The next section summarises the main results of the case study chapters. In so doing, it uses the conceptual model developed in Chapter 1 to illustrate which actors need to be involved and the strength of coordination and engagement (the darker the shades, the stronger the required coordination). A discussion of areas for future research and the limitations of the report conclude this chapter.

## 1. Summarizing Results

Chapter 2 focuses on governance for an integrated approach to climate change mitigation and air quality management often known as a co-benefits approach. The chapter describes how the literature on co-benefits focuses on quantifying reductions in greenhouse gases (GHGs) and air pollution (paralleling trends in the work on evidence-based decision-making), noting that fewer studies examine the governance enablers and challenges associated with integrated solutions that deliver co-benefits. The chapter analyses these enablers and barriers from 28 examples drawn from several countries in Asia. The chapter concludes that stakeholder engagement (particularly between local governments, affected communities and business) is a frequently recurring enabling factors and/or barriers. At the same time, the range of horizontal and vertical institutional coordination issues that are presumed to be important for integrating climate and air pollution issues were less commonly mentioned (see Figure 6.1) The chapter concludes that this moderately surprising result is due in part to the project-level scale of actions examined in the 28 project-level case studies. This suggests a potentially generalisable correlation between the scale of activities employing the integrated approach and the scale and the level of inter/ intragovernmental coordination required.

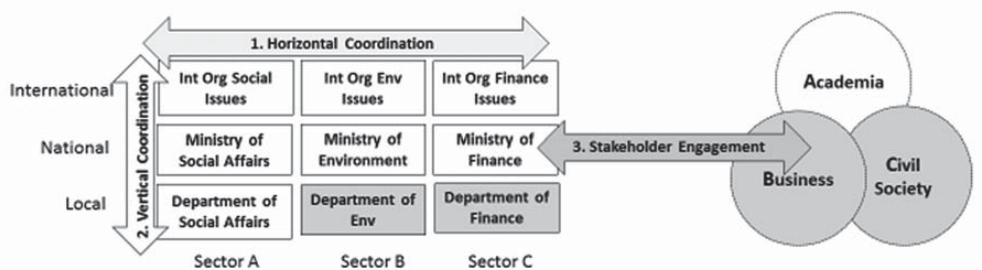


Figure 6.1. Governance for co-benefits

Chapter 3 examines the governance needs for an integrated approach to sustainable transport, focusing on eco-driving. The chapter shows that eco-driving presents a cost-efficient, integrated solution that can minimise GHG emissions, reduce air pollution, and conserve fuel. The chapter proposes that eco-driving can be made more effective by engaging with regional networks, relevant businesses, and subnational governments. The chapter further demonstrates that some of the success attributed to eco-driving programmes involved the cooperation of national transport and environmental agencies in scaling up good practices. The chapter concludes by underlining that capacity building delivered from regional networks and businesses was key in realising continued improvement to the programme's design. Such improvements can be further supported in several ways, including by mainstreaming eco-driving into driver license programmes and

sharing information on programme benefits with drivers, governments, and engaged businesses (see Figure 6.2).

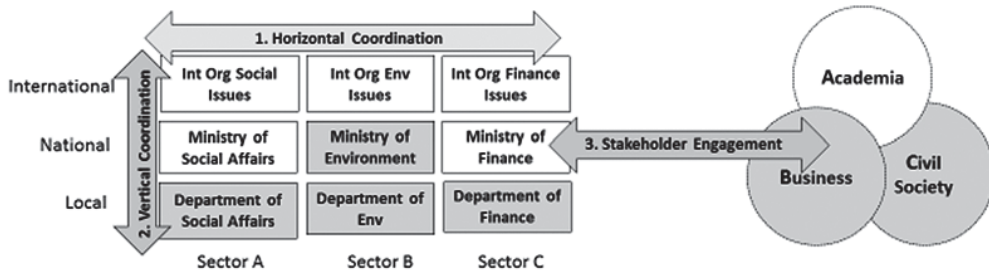


Figure 6.2. Governance for transport (eco-driving)

Chapter 4 focuses on integrated sustainable municipal solid waste management (ISWM) in fast-growing cities in Asia. The chapter underlines that multiple actors and associated coordination/engagement mechanisms contributed to the success in many of the selected cases; this is partially a reflection of the need to promote interactions between multiple stakeholders at the local level. The comparatively higher levels of coordination/engagement also underline that integrated solutions require modifying the behaviour of many actors operating across different stages of waste management. The chapter notes the importance of coordination with national environmental agencies to meet financing and technical shortfalls. In so doing, the need for other MOI, particularly appropriate funding and institutional capacity building; political commitment and leadership are also cited as important (see Figure 6.3).

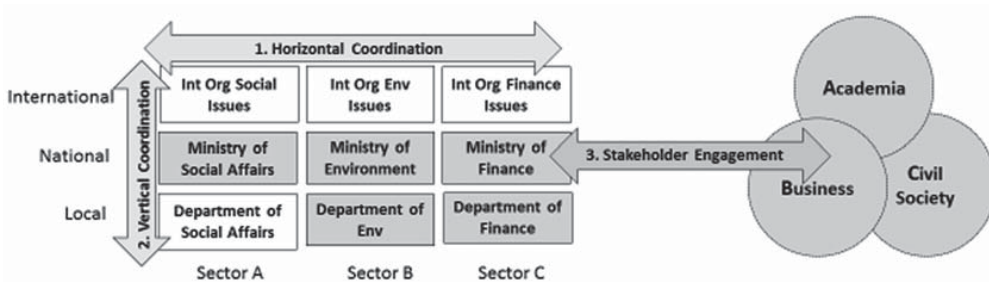


Figure 6.3. Governance for solid waste management

The final chapter on the Water-Energy-Food-Nexus (WFEN) is slightly different than the other chapters as it draws upon lessons learned from previous experience with IWRM and a recent set of recommended reforms in India based on WFEN. Building on existing literature and the Indian case study, the chapter contends that nexus-based policy-making requires coordination across different departments/ministries and stakeholders from different sectors. It further recommends the importance of a strong coordinating agency

within the existing institutional framework to move from a siloed approach to a shared vision on the design of integrated action plans for water, energy and food security. Finally, the chapter emphasises the importance of strengthening science-policy interactions and capacity building for policy makers; this will help ensure that evidence-based knowledge can be applied to the development of relevant policy and strategies, and thereafter translated into practical actions (see Figure 6.4).

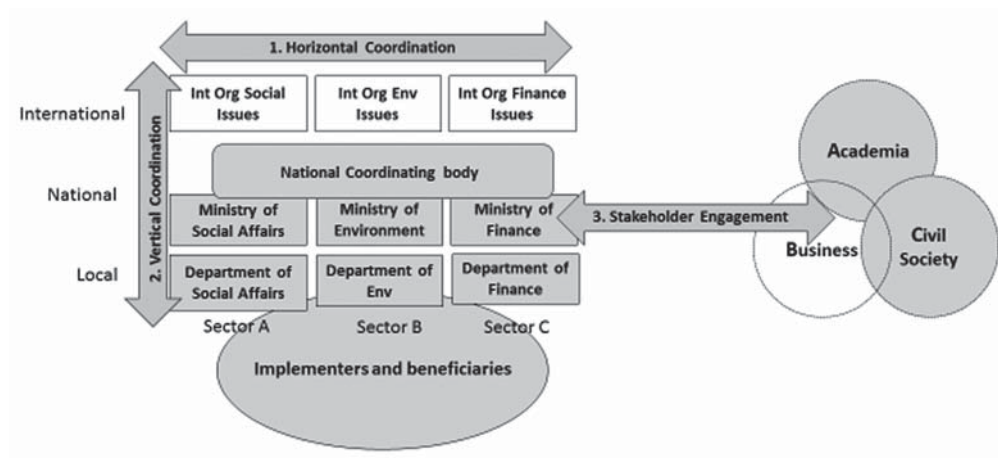


Figure 6.4. Governance for WEFN

## 2. Concluding Thoughts

Although the need for vertical and horizontal integration varied across cases, all the integrated solutions featured in the four chapters underline a need to engage with stakeholders outside governments. This may reflect the growing importance of governance beyond governments (moving from views on governance that have tended to focus more on public administration and management). It may also signal the comparative ability of businesses and civil society to more flexibly manoeuvre across sectoral and spatial boundaries than government agencies. However, such findings clearly demonstrate the need to work with multiple actors on MOI, including, for example, by collaborating with business to address gaps in financing. While engaging with these actors to acquire MOI is common for many development or environmental projects, failure to consider these familiar success factors can also undermine an integrated approach. Future iterations of this research may seek to more explicitly incorporate key MOI into conceptual models, illustrating which actors are responsible for MOI to overcome such common hurdles.

Another broader set of lessons emerging from this research is the relatively limited engagement of international actors—apart from the notable caveat of regional networks successfully promoting eco-driving. The absence of such actors and weak integration at the international level is partly attributable to the narrow scope of integrated solutions



highlighted in the report. It may also be because international organisations may not be involved in the selected cases featured herein. Also international engagement, although less visible, is helping to provide the normative foundations and ideational framing more apparent in some of the higher-level institutional and policy responses to climate change and sustainable development such as the NDCs.

There are some limitations to the current presentation of the results outlined in this report. Many of the case studies highlighted have been implemented over a time-period where the levels of involvement and engagement with different actors vary considerably. For example, in the eco-driving case, the role of national level agencies was determined as important after measurable success of a specific practice was observed at the local level. It may be more accurate to present the conceptual model in Chapter 1 at several key stages to best illustrate where and when coordination between certain actors matters the most. Adding a temporal dimension might also serve to reflect the role and extent of international actors, which influence some of the background conditions not immediately evident in these summaries. Presenting several key examples at critical junctures, or using a single or set of cases, may also inform research on transitions—helping to better identify ways sustainable practices emerge and grow to scale via interactions over time and across multiple levels (Loorbach 2010).

Another set of limitations involves the lack of discussion of more nested models of governance. These models underline that frequently collaboration between a set of actors occurs within a larger set of institutional structures that are, in turn, located in an even wider set of decision-making architectures. This view would look more like a set of boxes within boxes (or Russian tea dolls) as opposed to the stacked structure that is employed earlier in this chapter and throughout much of the report. Because the nested nature of these areas influences each other, there is a need to look more closely at the interactions between levels of decision-making. While this view is useful (and possibly more accurate than the conceptual model used in the report), it is also challenging to use as a basis for policy recommendations. Similarly, research that points to polycentric governance to highlight the diverse combinations of actors that interact in sometimes distinct and other times overlapping spheres of activity offers a useful image that is difficult to employ as a basis for policy recommendations (Andersson and Ostrom 2008).

A final set of limitations involves what some might term the “glue” that holds the collection of actors and institutions together in the pursuit of more integrated solutions. This introductory chapter has less to say about some of the intangible factors beyond the actors and the institutions and processes that can align their interests. Points that are worthy of attention in this regard range from having clearly defined roles and responsibilities to adequate resource mobilization and allocation rules that are consistent with implementation responsibilities. There is further a set of political issues that are not featured much in the report. For example, even sufficient coordination and engagement will not matter much if relevant agencies are constantly being overridden by the personal avarice of an overreaching leadership or external powerbrokers. Alternatively, skilled political leadership can have the opposite effects if it is used, for instance, to identify

solutions that navigate around status quo impulses of vested interests. Finally, there is also likely to be a role for examining the resilience and adaptive capacity to learn by doing and avoid repeating mistakes for many of the decision-makers working on integrated solutions. Though this chapter does not reflect much on the above issues, they are given some consideration in the case study chapters. There also may be scope for their inclusion in a modified form of the report's main conceptual model.

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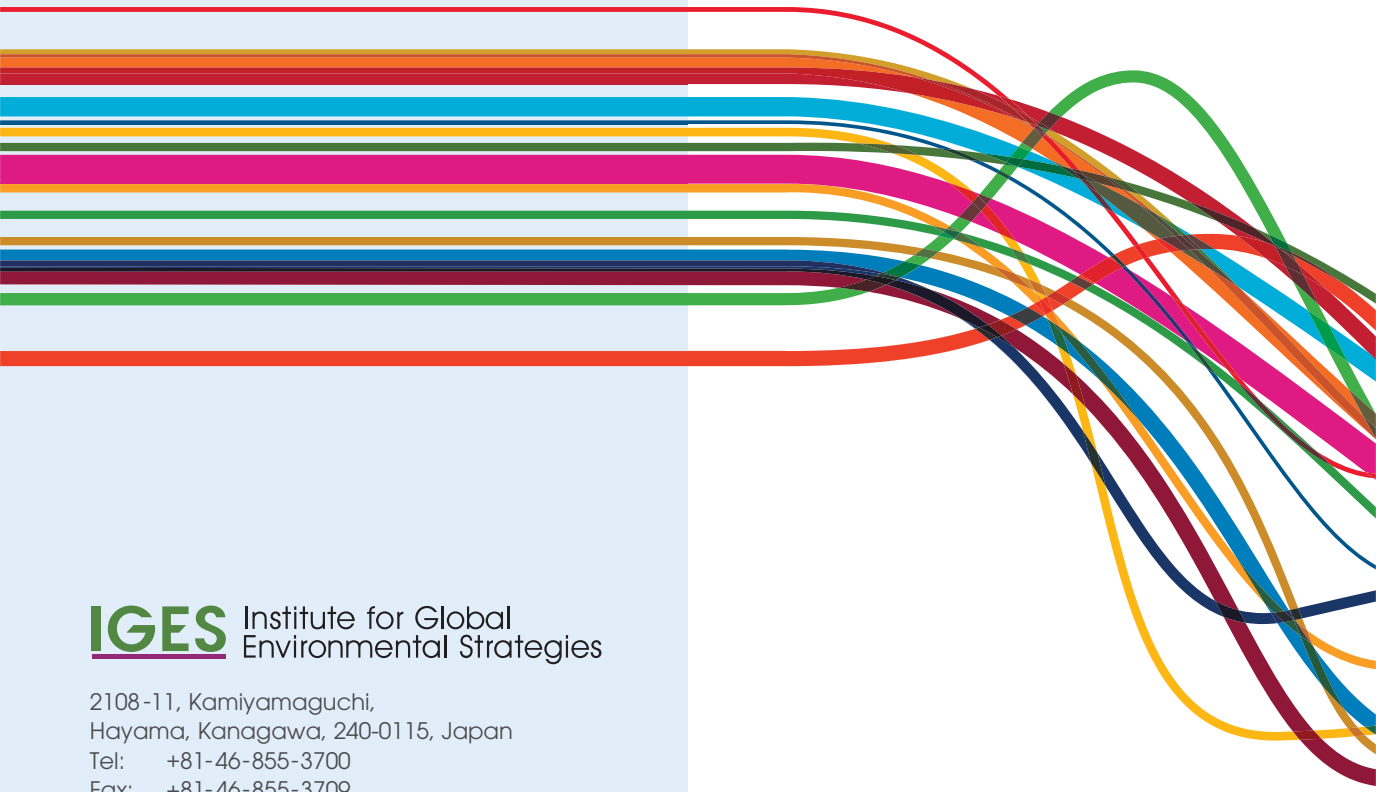
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