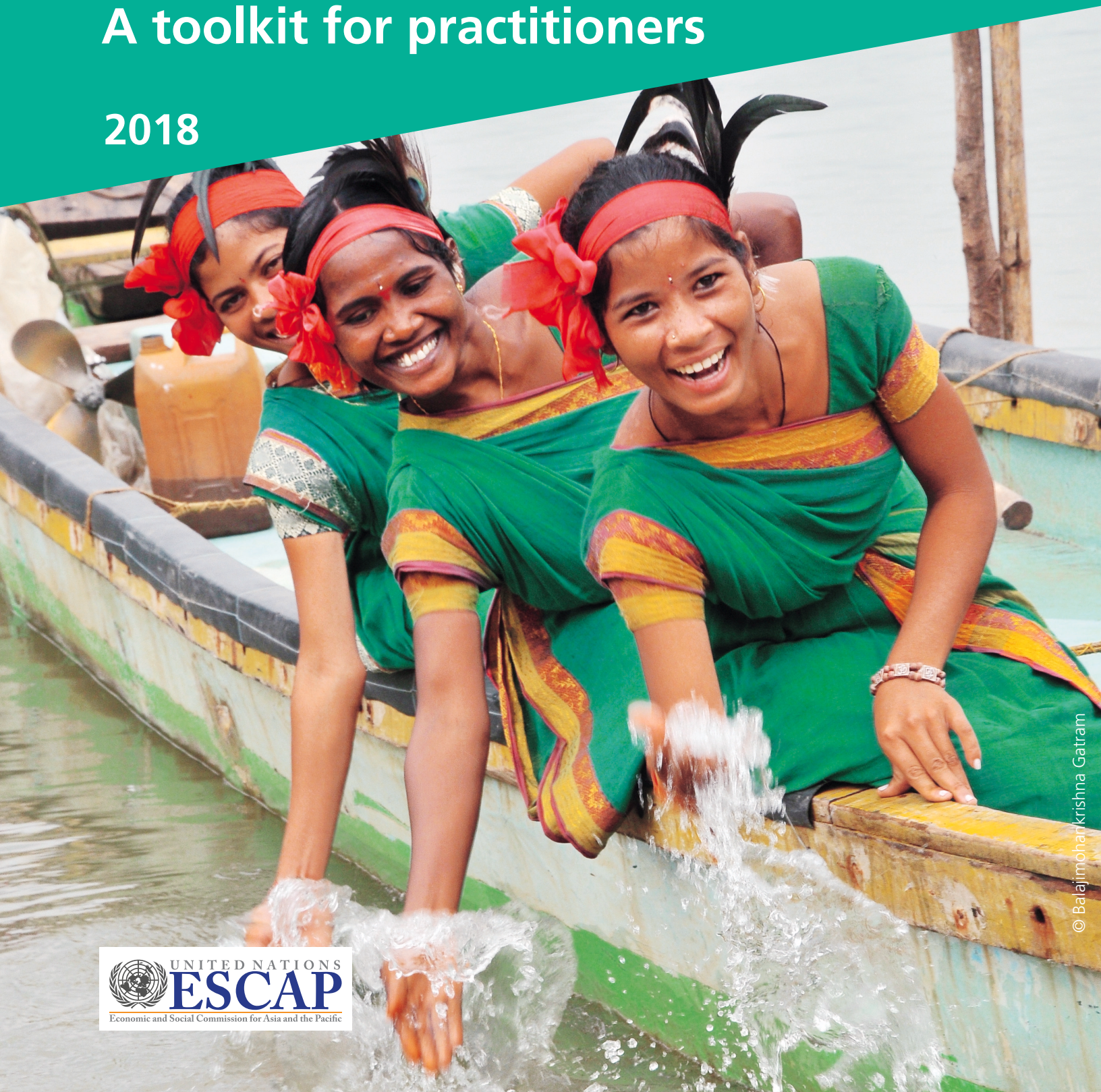
POLICY COHERENCE FOR DISASTER RISK REDUCTION AND RESILIENCE: FROM EVIDENCE TO IMPLEMENTATION

A toolkit for practitioners

2018



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This toolkit was developed under the team leadership of Sanjay Srivastava, Chief of Disaster Risk Reduction Section and overall guidance of Tiziana Bonapace, Director of Information and Communications Technology and Disaster Risk Reduction Division. The authors are Kareff Rafisura (Module 1) and Madhurima Sarkar-Swaisgood with Jiwon Seo and Sooin Bang (Module 2). Valuable advice and inputs were received from Sanny Jegillos (UNDP), and Lawrence Surendra (Sustainability Platform in Asia/Chulalongkorn University). Anoushka Ali edited the toolkit. Chonlathon Piemwongjit and Narada Kalra provided invaluable administrative assistance during the production stage.

Feedback and comments are invited to help improve the usability of this toolkit. Comments are invited to help further refinement of future editions. Please send them to escap-drs@un.org.

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Module 1

FRAMING POLICY COHERENCE

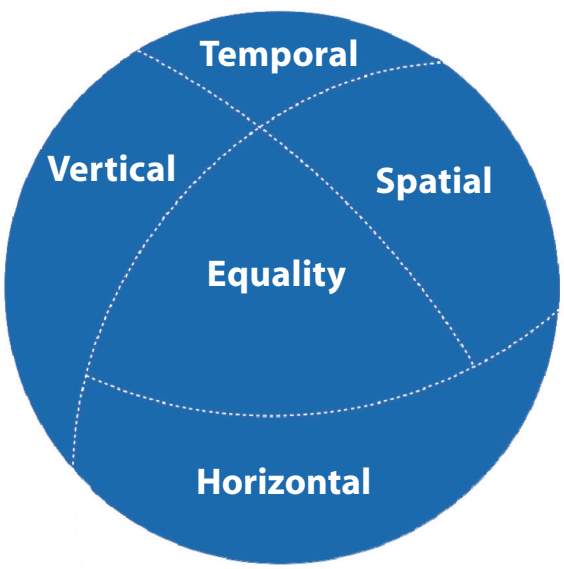
What is policy coherence?

Policy coherence is an approach to policymaking that integrates all relevant policy fields to achieve common policy outcomes by maximizing synergies and eliminating trade-offs. It ensures that the Government of a nation 'pulls in the same direction'[1] across all stages of policymaking and implementation.

From the perspective of disaster risk reduction and resilience, policy coherence requires that policies address the following **dimensions**:

Figure 1

The five dimensions of policy coherence



1) **Horizontal:** In this dimension, various policy areas need to be closely coordinated. Three policy areas that need to be aligned, at least, in order to capitalize on synergies, are disaster risk reduction, climate, and sustainable development. Solutions that deliver the desired outcomes across these three policy areas are desirable.

2) **Vertical:** National policies and local government actions need to be consistent and mutually supportive. Domestic policies and plans should also be aligned with international commitments, such as the 2030 Agenda for Sustainable Development, Sendai Framework for Disaster Risk Reduction 2015-2030, Paris Agreement and other such related global frameworks and their regional implementation plans.

3) **Spatial:** Policies that reduce disasters in one place should not shift risks elsewhere. In this regard, the designing of appropriate policies and interventions address the transboundary aspects of risks (for example, flood risks within the same river basin that spans across several political boundaries).

Spatial coherence is particularly important when addressing risks that involve different source and impacted regions. This is exemplified in the case of sand and dust storms which originate in arid, semi-arid and sub-humid areas but the impacts are felt beyond those dry lands because dust has the propensity to be transported over long-distances.

4) **Temporal:** The elements that determine the disaster risks in a society (hazards, vulnerabilities, capacity to manage) are dynamic and not static. Hence, policy decisions taken today account for future risks and vulnerabilities, especially in the context of climate change.

In the 2030 Agenda for Sustainable Development, Governments pledged that "no one will be left behind". This means that goals and targets should be met not only for all nations and people but also for *all segments of society*.

Governments also committed to "reach the furthest behind first". Thus, in the era of the 2030 Agenda, it is imperative that an additional dimension of policy coherence is added:

5) **Equality:** Policies and interventions should advance equality and should not negatively affect poor and marginalized people. Mechanisms and strong policy coordination across governments are needed to screen policies and decisions to ensure that the differentiated needs and circumstances of the poorest and marginalized are taken on board.

Why is policy coherence for disaster risk resilience and reduction (DRR) important?

1) Because DRR is **indivisibly** linked with the achievement of development goals, namely poverty eradication, economic growth, the reduction of inequality and the development of sustainable cities and settlements. Progress in DRR can contribute to the achievement of these goals and inversely, the lack of progress in DRR can **constrain** the achievement of these development goals.

It is well-documented that disasters can reverse decades of social and economic gains. For example, after the 2015 earthquake in Nepal, the growth rate dropped by over 1.5 percentage points. In Pakistan, the earthquake in 2005 and floods in 2010 and 2011 are associated with the decline in school enrolment. Thus, the Sustainable Development Goals (SDGs) reflect this by incorporating DRR targets into at least four goals, namely no poverty (1), industry, innovation and infrastructure (9), sustainable cities (11), and climate action (13).

A coherent approach to policymaking ensures that disaster risks are addressed to contribute positively to achieving these and other related goals.

2) Because efforts to achieve other goals can potentially **enable**, **constrain** or even **cancel** progress in DRR. The best of intentions can sometimes exacerbate or create new risks. For example, when not executed properly, interventions in infrastructure, land use planning, ecosystems rehabilitation, resource management system (such as irrigation systems) can potentially transfer risks from one area to another or can create behaviours that might be risky in the long-term (for example, incentivize build-up in risky areas).

A coherent approach avoids the risk of achieving progress in one goal at the expense of another.

How is coherence translated into practice?

Table 1 provides examples of coherent and non-coherent policies. Readers should bear in mind that what constitutes an effective DRR policy/measure is highly context dependent and hence what is coherent/non-coherent may vary across countries.

What are examples of coherent and non-coherent policies in your country?

Table 1

Examples of policy coherence for disaster risk reduction

SDGs	Sendai Framework	Paris Agreement	What is coherent?	What is non-coherent?
	Targets A, B	–	Promoting the use of social safety nets for poor people whose livelihoods are exposed to disaster risks Creating market conditions to make it easy for low-income and homeless families to acquire secure tenure and affordable and safe housing	Relocating poor people away from hazard-exposed areas but also away from their sources of livelihoods

Table 1 *(continued)*

SDGs	Sendai Framework	Paris Agreement	What is coherent?	What is non-coherent?
	Target B	–	Promoting climate-smart agriculture (for example, drought-resistant crops, climate forecast applications)	Expanding agriculture to areas exposed to frequent hazards (e.g. drought prone, steep slopes) Creating incentives (for example, through subsidies) to intensify agricultural production without taking into account the changes in seasonality (such as typhoon months, monsoon season, risks of wet/dry spells) and projected changes in climate conditions
	Priority 3; Target C	–	Implementing public health programmes (such as increasing investment levels, research) to anticipate risks of specific diseases (such as malaria and other vector-borne diseases)	Investing in health infrastructure (such as hospitals) without proper risk assessment
	Target D	–	Investing in school safety	Building sub-standard classrooms to solve classroom shortages
	Priority 4	–	Setting up mandatory disaster preparedness measures that respond to the differential circumstances and needs of women before, during and after disasters	Disqualifying women from post-disaster pay-outs because they do not have land titles over lands they till
	Priority 3	–	Promoting ecosystem-based approaches (for example, mangrove restoration) to address saltwater intrusion	Subsidizing water extraction which might deplete aquifers and lead to saltwater intrusion
	Target D	–	Designing huge energy infrastructure based on projected climate scenarios (such as rainfall and temperature patterns)	Investing in new energy infrastructure (such as hydropower plants) that might create new flood and drought risks for downstream locations
	Priority 3	–	Establishing employment guarantee schemes for disaster-affected areas Investing in disaster risk reduction to match risk levels in order to safeguard economic growth	Disqualifying people from post-disaster pay-out schemes because they do not own the land that they cultivate
	Priority 3; Target E	–	Upgrading design and construction standards to take into account changes in weather/climate parameters (such as wind speed) and improved seismic risk assessments Using ICT innovations to translate information about risks into decision support system	Expanding economic infrastructure (such as ports) to seismically active locations or to areas that are projected to be affected by a rise in sea level

Table 1 *(continued)*

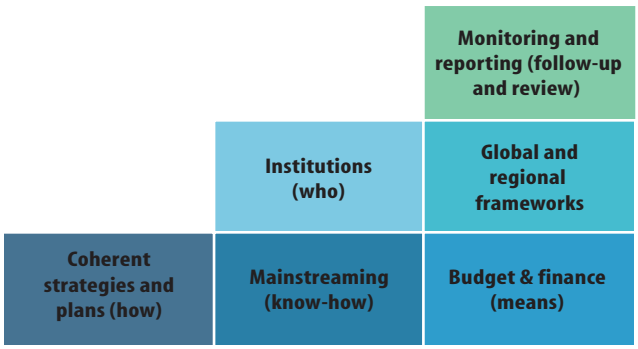
SDGs	Sendai Framework	Paris Agreement	What is coherent?	What is non-coherent?
	Priority 4	Article 7.5; 7.9c.	Implementing social protection schemes (such as safety nets, insurance) to provide relief to low-income households, and to prevent them from resorting to counter-productive coping strategies (for example, withdrawing children from school, selling livelihood assets) Guaranteeing land tenure for the poor to address powerlessness and encourage poor people to invest in resilient housing and/or agriculture	Evicting poor people from their settlements in the name of flood protection
	Targets A, B, C, D	–	Realigning land use in urban areas to reduce hazard exposure Increasing the use of natural infrastructure (such as wetlands, trees, parks) to soak up excess water	Relocating informal settlers, in order to clear waterways, to low land value locations that are exposed to landslides, floods, sea level rise, and other such hazards and where they have fewer livelihood resources
	–	–	Establishing 'safe exploitation' limits of natural resources Reducing waste generation and improving waste management to prevent clogging of drainage that contributes to flooding during heavy downpours	Exploiting new resource areas (such as mining areas, water) which might create new disaster and environmental risks
	Target G	Article 7.1; 7.7c; Article 8.1	Investing in early warning systems	Constructing sea walls and levees which might encourage build-up in areas exposed to sea level rise and storm surges or shift the problem elsewhere
	Priority 3	–	Investing in monitoring ocean-related hazards (for example, El Niño) and feeding data into risk assessments and warnings	Supporting the plantation of certain mangrove species that are not suitable for areas exposed to strong waves, in order to protect the shoreline
	Priority 3	Article 5.2; 7.2	Investing in ecological restoration (such as creation of 'green barriers') to reduce the risks of drought, sand and dust storms	Establishing protected areas which might disenfranchise indigenous peoples and push them to agricultural lands that are exposed to perennial drought and other hazards
	–	–	Building resilience in areas affected by conflict	Investing in resilience-building measures in one area that might aggravate the perception of discrimination by other parties in a conflict
	Target F Priority 4	Article 8.4; Article 9.3-9.4 Article 10	Putting in place measures to incentivize investments in disaster risk reduction from multiple sources	Attracting the "wrong" kind of technology transfer or international support, for example those that erode indigenous resilience qualities

Enhancing coherence – the building blocks

Countries need to put in place the following building blocks in order to enhance coherence.

Figure 2

Building blocks for policy coherence



1) Coherent strategies and plans

Coherence requires strategic frameworks and plans to ensure that policies and institutions work under a different organizing principle, that is, cross-sectoral collaboration which is based on shared priorities and aligned to overarching goals, such as the SDGs.

One of the first steps is to integrate disaster risk reduction targets into existing plans or into plans that implement global frameworks such as SDGs, Sendai Framework for Disaster Risk Reduction 2015-2030, or Paris Agreement. Furthermore, to ensure that such plans deliver on disaster risk reduction the following questions need to be answered:

- ✓ Has a stocktaking exercise/policy review been carried out to check the alignment of your national strategies with the 2030 Agenda, Sendai Framework, Paris Agreement, and other international commitments?
- ✓ Does your country have a specific plan for implementing the 2030 Agenda for Sustainable Development, the Sendai Framework and Paris Agreement? How are they linked, if at all?
- ✓ Who all are responsible for implementing these plans? How are they coordinating?

2) Mainstreaming of disaster risk reduction into sectors

Many governments and other stakeholders are familiar with the concept of mainstreaming which has been widely recognized for over two decades. Mainstreaming is a sub-set of policy coherence and involves the use of risk information and other such tools to address DRR by implementing DRR in sectoral policies, strategies, plans, geographical planning, and project cycle management.[2]

- ✓ Do climate-sensitive sectors have a good understanding of risk in their respective sectors?
- ✓ Do sectors integrate disaster risk reduction into sectoral policies, strategies, plans and projects?
- ✓ Are your sectors fit to deliver the 2030 Agenda, Sendai Framework, Paris Agreement, and other international commitments?

3) Budget and financing

A public budget document is a translation of the national and local policy priorities, which may or may not be matched by the level of financing. Current models of DRR public financing includes stand-alone and sector-integrated funding.[3] Coherent budgeting means that specific budgetary and finance measures are not only incorporated into the mandate of institutions beyond the national disaster management agency, but that these measures do not work at cross-purposes. It also means that financing from different sources beyond the government (for example, from private or international sources) are leveraged to achieve the declared public priorities.

- ✓ Does the recognition that DRR is essential for sustainable development translate into national budget and finance?
- ✓ How is DRR coordinated across public, private, domestic and international sources?

4) Coordinated monitoring and reporting systems

More than just tracking progress and off-track indicators, monitoring and reporting systems can also be used to provide feedback to decision-makers and to the public on policy synergies and contradictions. These are useful inputs that allow for policy adjustments should there be negative or unintended effects.

- ✓ How are sectoral monitoring and reporting mechanisms coordinated (for example, through the planning ministry, or through an overarching statistical authority)?
- ✓ Is the monitoring of SDGs, Sendai and Paris Agreement coordinated at the country level?
- ✓ Does your country's Voluntary National Report (existing or planned) capture disaster risk reduction and resilience issues? Is there a mechanism for the agency responsible for DRR to provide these inputs to all stakeholders?

5) Coherent institutions

Seeing and considering the "big picture" in policy-making requires that Governments strengthen existing mechanisms both horizontally (across sectors) and vertically (national and local levels). Government actions have included the creation of inter-agency task forces/working groups, inter-ministerial coordination mechanisms, and the like. Fostering coherent institutions require the strengthening of workable approaches or revisiting them to ensure that they are still fit-for-purpose in delivering on cross-cutting issues, such as DRR.

Coherent institutions are not only coordinated but also capable of strategically influencing planning, budgeting, laws and sectoral programmes to make them deliver on shared/cross-sectoral policy objectives.

- ✓ Who is responsible for addressing cross-cutting agendas in your country?
- ✓ Which institutions are responsible for ensuring that the SDGs and Sendai targets are achieved? How are they coordinating, if at all?
- ✓ How do you make institutions fit-for-purpose for the implementation of the 2030 Agenda?

6) Regional and global frameworks

Efforts by countries can be complemented or reinforced by regional and global frameworks because they promote norms across the international community. The means of implementation, such as finance, technology and capacity building support that comes with regional and global frameworks contribute to realizing these actions on the ground.

The current regional and policy landscape provides a push for policy coherence. The 2030 Agenda for Sustainable includes a dedicated target (17.14) on enhancing policy coherence for sustainable development. The Regional Road Map for Implementing the 2030 Agenda for Sustainable Development in Asia and the Pacific, adopted by ESCAP member countries in 2017, declares policy coherence, disaster risk reduction and resilience, and climate change as priorities for regional cooperation. In the specific context of disaster risk reduction, coherence and integration is the primary policy direction for the implementation of the Sendai Framework for Disaster Risk Reduction and its Asia Regional Plan. The specific provisions are discussed in the next section.

- ✓ Are regional and global frameworks translated into domestic strategies and plans?
- ✓ Are the measures, coordination structures, and reporting mandated by regional and global frameworks consistent with national context? If not, what actions need to be carried out?
- ✓ How can a country make the best use of regional and global frameworks to complement its own efforts?

Why push for policy coherence now?

Policy coherence is challenging for all countries. Moreover, it is particularly challenging for many developing countries where the mechanisms for policy dialogue are not necessarily in place and the capacities to consider and provide evidence-based inputs to policymaking are weak. Addressing these challenges is imperative; evidence is mounting that risk is outpacing resilience and hence the urgent need for policy coherence.[4] Unfortunately, it is not widely recognized that making progress on and realizing the potential of DRR to support the achievement of development goals goes beyond the responsibility of a one-line ministry or sector.

Policy coherence is only achievable if there is domestic political commitment to allow it to materialize. As mentioned above, regional and global frameworks can provide impetus for enhancing policy coherence.

Risk reduction and resilience is embedded in the 2030 Agenda for Sustainable Development and is a common thread across the various global development frameworks adopted in 2015 and 2016, such as the Addis Ababa. Action Agenda of the Third International Conference on Financing for Development, Paris Agreement, Agenda for Humanity, and the New Urban Agenda. Coherence is further bolstered by the alignment between the Sendai Framework and Sustainable Development Goals indicators. To date, four of the Sendai Framework indicators form part of the Sustainable Development indicators, namely in Goals 1 (ending poverty), 2 (ending hunger), 11 (developing cities and human settlements), and 13 (addressing climate change). This alignment can potentially push countries to break out of policy and institutional failure.

Figure 3

Alignment between Sendai Framework (left) and Sustainable Development Goals (right) at target and indicator level

The Sendai Framework for Disaster Risk Reduction 2015-2030 focuses on anticipatory risk reduction actions at all levels. Under its guiding principles, paragraph 19h states, "The development, strengthening and implementation of relevant policies, plans, practices and mechanisms need to aim at coherence, as appropriate, across sustainable development and growth, food security, health and safety, climate change and variability, environmental management and disaster risk reduction agendas".

Refer to ESCAP (2017b). "Building Resilience to Disasters in Asia and the Pacific: Resilience in the Global Development Frameworks" for a detailed discussion on how the global frameworks adopted between 2015 and 2016 address disaster risk reduction and resilience.[5]

Coherence is critical in harnessing the combined strengths of these frameworks.

Are you convinced that policy coherence is urgent in your country? Why or why not?

What's next?

ESCAP and its partners are committed to supporting member States in building their capacities to enhance policy coherence. ESCAP has been convening a Regional Learning Platform series on policy coherence for disaster risk reduction and resilience annually since 2016. The series provides technical and capacity building support for disaster risk reduction and resilience building in the region with a strong focus on policy coherence. The Platforms feed into and are informed by the analytical work and intergovernmental components of ESCAP works, namely the biennial Asia-Pacific Disaster Report and the Committee on Disaster Risk Reduction respectively.

The next module

Enhancing policy coherence requires tools that can be adapted to the specific circumstances, context and needs of countries. Some key questions to be answered are:

(1) How can we formulate coherence and strategic frameworks and plans to achieve the SDGs?

(2) How can we identify entry or leverage points, within sectors, to maximize investment impacts in DRR to achieve SDGs?

(3) Where are the synergies within the SDGs, that, if tackled together, can lead to better sustainable development?

The purpose of the next module is to (a) answer the above questions using a system thinking approach (b) provide a tool for translating SDGs and their interactions into actionable guidance in order to formulate coherent strategic frameworks and plans, and (c) use disaster resilience as a foundational framework for the approach.

MODULE 2

DEMONSTRATING HOW TO TRANSLATE POLICY COHERENCE FROM CONCEPT TO PRACTICE USING SYSTEMS THINKING

PART I: Disaster Risk Reduction and the 2030 Global Development Agendas

How is DRR related to the SDGs and other global frameworks?

The global frameworks have clearly placed disaster risk reduction at the heart of sustainable development[6] (Figure 4).

Figure 4

Global development frameworks embracing disaster risk reduction

The thread of resilience

At the heart of the sustainable development agenda is disaster resilience.

The paradigm shift from prevention to resilience that began with the Hyogo Framework for Action (2005-2015) has been reiterated and strengthened in the global development frameworks adopted in 2015 and 2016.

Though the terminology may vary, all global development frameworks share many common understandings which including the following:

Hazards are inevitable, but disasters are not – Hazards are endemic in nature and in their hindrance of the process of social and economic development. Such risks cannot be prevented or pre-empted, but they can be assessed, anticipated, mitigated, and adapted to.

Risk reduction is cross-cutting – Resilience is associated with multiple disciplines and sectors, including: natural resource management, food security, health, education, social safety nets, insurance, infrastructure, urban planning, housing, building codes and standards, the private sector, supply chain management, tourism, and livestock. No single sector or agency of the government at any level can handle all the issues.

Working in concert – Coordination is needed within and across sectors, with the full engagement of all State institutions, executive and legislative, both at the national and local levels.

Learning – Capacity needs to be developed across all sectors and at all levels.

Measuring progress – Each of the global development agendas adopted in 2015 and 2016 have specific goals and targets that need to be consistently monitored.

The Sustainable Development Goals (SDGs), in particular, provide a holistic and integrated approach to development and the goals are meant to be integrated, indivisible, and must collectively support a development agenda balancing the economic, social, and environmental dimensions of sustainability.[7] Though DRR is not one of the specific *goals* of the

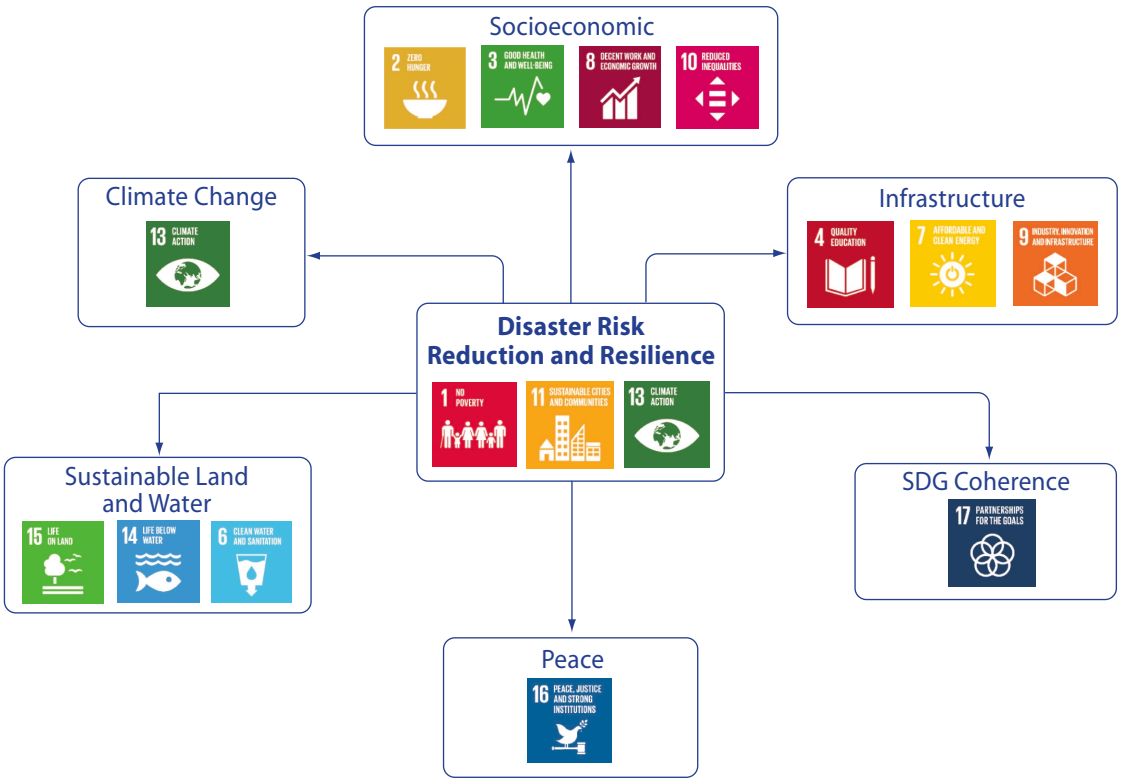
SDGs, there are SDG outcomes that can be hindered by disaster risk. For example, health and well-being outcomes cannot be achieved without managing the risks that are closely associated with disasters such as weak critical infrastructure.[8] In addition, there are several indicators within the targets of the larger Sustainable Development Goals that are directly related to impacts from disasters (Indicators 1.5.1, 1.5.2, 1.5.3, 11.5.2) and also form the basis of Sendai Targets A, B, C, D, and E. Governments aiming to build resilience in accordance to the 2030 Agenda, and in line with the Sendai Framework have to take disaster risk reduction into account to achieve their goals.

What are the disaster-related SDG targets?

The SDGs allow for the incorporation of disaster risk reduction into other policy agendas (already laying the foundations for policy coherence) such as poverty eradication, food security, infrastructure, and urban development – while also responding to climate change.[9] Disaster risk reduction and resilience is not one of the larger goals, but it is linked to at least 13 SDGs and embedded explicitly in at least three (Figure 5).

Figure 5

Interlinkages of disaster-related SDGs



How do the interactions between these goals support policy coherence?

Building greater resilience to disasters has been a long-standing goal of the international community. From 1987 to 2015, several agendas and frameworks were specifically designed to integrate disaster risk reductions into sustainable development policies, planning and programmes at all levels.

However, in biennial assessments that reported progress in the Hyogo Framework for Action, 58 countries in the Asia-Pacific region scored less than three out of five for addressing the underlying risk factors and they were more prepared for responding to disasters rather than reducing risk.[10] Thus, the new agendas, including the 2030 Agenda for Sustainable Development, have built resilience to disasters to be at the heart of sustainable development by incorporating it in 15 out of the 17 goals.

Though these goals are broadly framed as separate and diverse elements, they are, together with their associated targets, inherently interlinked with each other, making up parts of a structure that addresses the disaster risk reduction dimensions of sustainable development (Figure 6). The goals rely on each other and can be mutually reinforcing or conflicting. For example, measures to promote access to food (Goal 2), if applied in an unsustainable manner could lead to increased losses from disasters (Goal 1, Goal 11), aggravate climate change (Goal 13) and endanger life on land (Goal 15). On the other hand, measures to promote access to food (Goal 2), if applied in a sustainable manner, can contribute to improving health and well-being (Goal 3), reduce inequalities (Goal 10), and build disaster resilience.

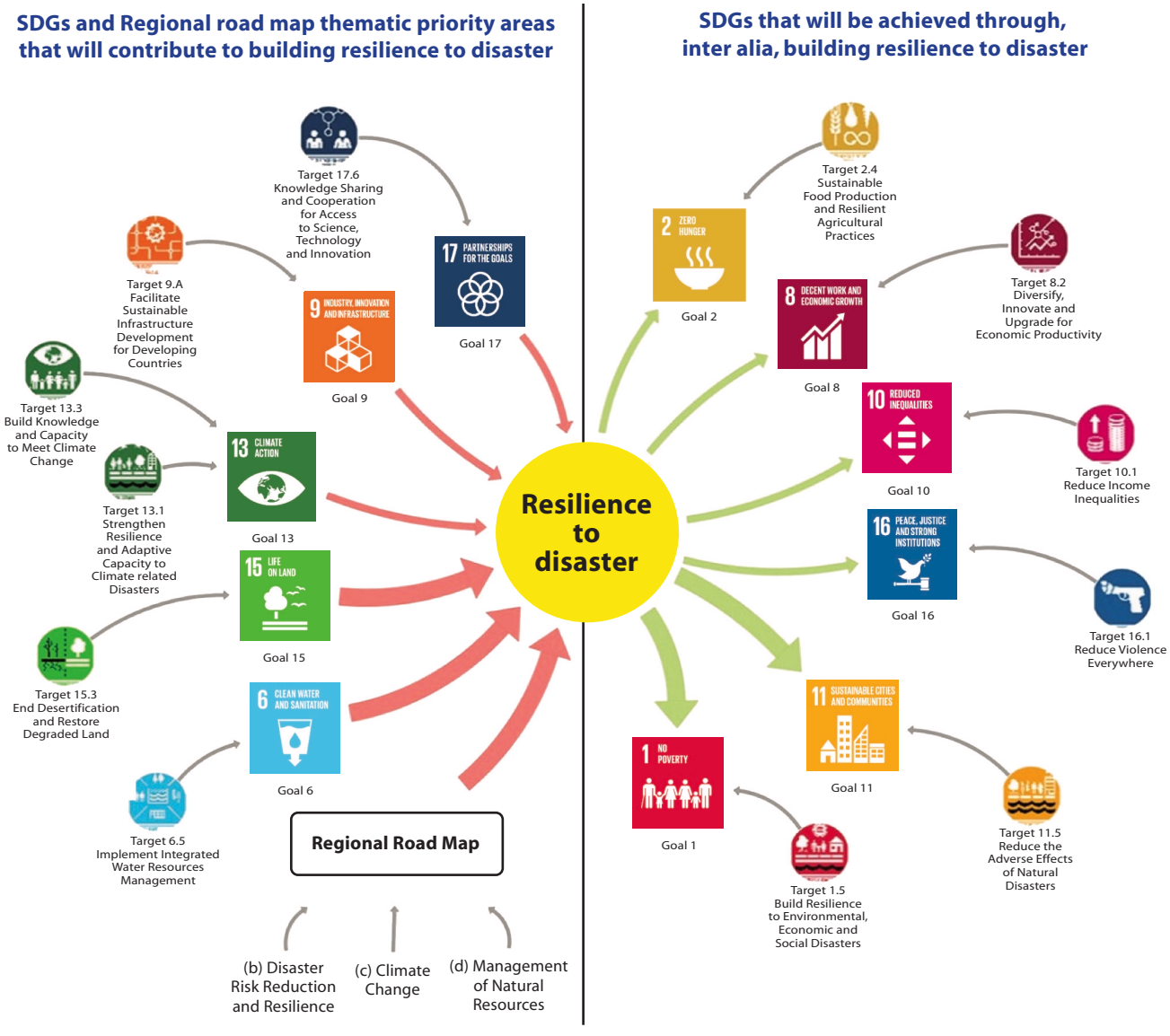
While the notion that the goals are interrelated is intuitive, some practical issues arise in implementation including:

- ✓ The 2030 Agenda notes that these goals are integrated but does not elaborate on how they are interconnected;
- ✓ Most of the existing work on the interconnections are based on conceptual identification of linkages and the quantification of SDGs interlinkages is limited to subjective categorization;
- ✓ Identification and quantification of, particularly disaster-related SDGs, are missing at the national level; and
- ✓ Planners and policymakers typically work in silos and do not have the means to identify or prioritize which measures/goals may reinforce one another or which ones create trade-offs. The lack of integration across various sectors may result in incoherent policies that can hinder the building of resilience to disasters in countries.

To make policies coherent and risk sensitive, the dependencies among the goals need to be evaluated, both across[11] and within the SDGs.[12] This challenge is not new and similar concerns have been identified when attempting to align climate change adaptation with mitigation responses,[13] to alleviate poverty,[14] to meet the Millennium Development Goals (MDGs),[15] and to balance economic development, environmental sustainability, and social inclusion for human well-being.[16]

Figure 6

Conceptual map of disaster-related SDG goals and targets



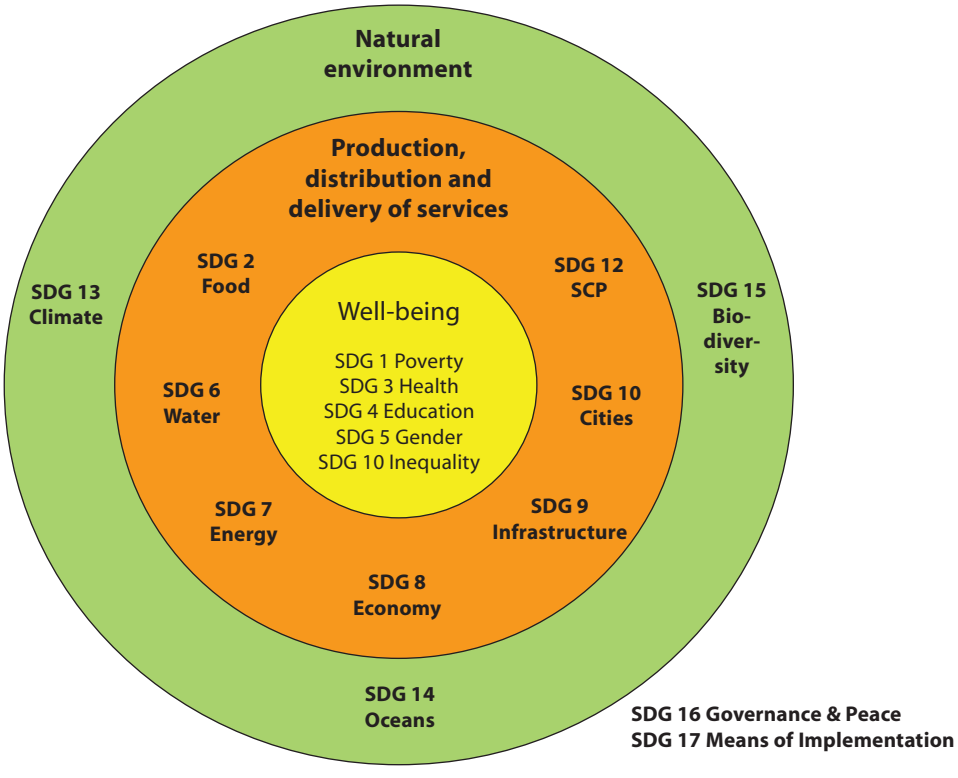
PART II: Data Driven Framework to Examine Interactions Between Disaster-related SDGs

Much of the existing work in understanding synergies as well as trade-offs among the SDGs is limited to more conceptual frameworks that assess the general interactions between the global set of SDGs. The German Development Institute provides a conceptual framework for clustering the SDGs in layers of concentric circles (Figure 7). Here, interlinkages between the SDGs can be identified by examining overlaps; for example, disasters and extreme events are addressed within the context of poverty eradication (Target 1.5), cities (Target 11.5) and climate change (Target 13.1).

ESCAP has developed a framework to assess the interlinkages of associated targets of SDG 6 (clean water and sanitation) with targets under the other 16 goals, (Figure 8).[17]

Figure 7

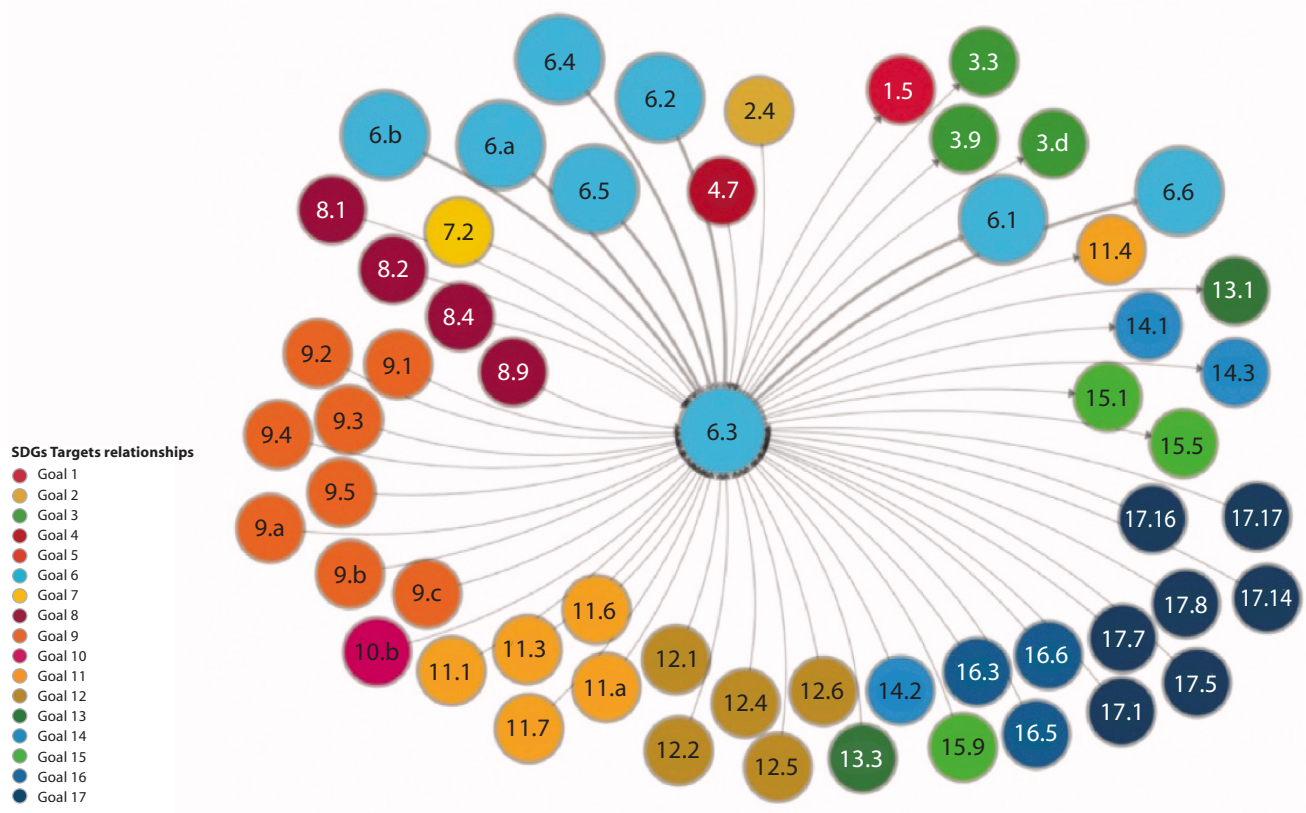
Framework for clustering the SDGs



Source: I. Niestroy, 'How are we getting ready? The 2030 Agenda for Sustainable Development in the EU and its Member States: Analysis and Action so far', German Development Institute Discussion Paper 9, Bonn, Germany, 2016.
Note: SCP- Sustainable consumption and production patterns

Figure 8

Interlinkages of target 6.3 (ESCAP)



Source: UNESCAP (2017). Integrated approaches for Sustainable Development Goals Planning: The case of Goal 6 on water and sanitation.

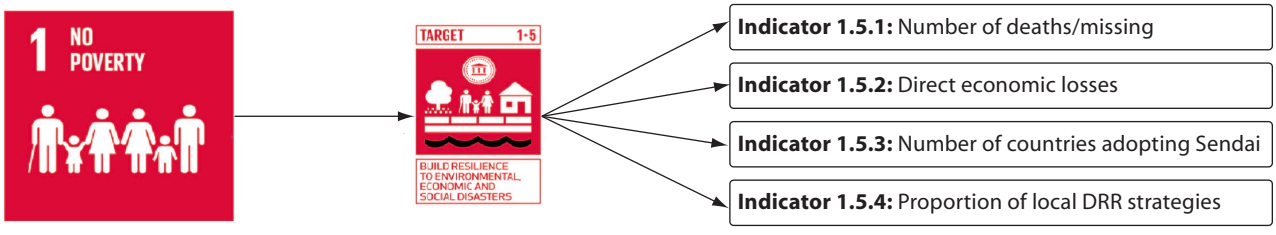
In their most general form, these interactions have been classified as **synergies** (where progress in one goal favours the progress in another) or **trade-offs** (where progress in one goal may be detrimental to the progress in another).[18] Some systematic analysis of interactions between SDGs has been done at the global level where researchers found that SDGs synergies largely outweigh any trade-offs.[19]

But, at an operational level, having a conceptual view of the interaction of the SDGs is not enough. For evidence-based policymaking, it is imperative to quantify interactions at a national (and sub-national) level and have a customized set of synergies and trade-offs for policymakers.

This can only occur when these interactions are measured at the indicator level.

Figure 9

From goal to indicator: measuring interactions



Can quantifying the interactions of SDGs at the indicator level support more targeted and coherent policymaking?

A few studies have examined the interactions of SDGs at the indicator level. The Institute for Global Environmental Strategies (IGES) Report "Sustainable Development Goals interlinkages and network analysis" analyses some country specific linkages for all the sustainable development goals by using proxy indicator data for 108 targets.[20] They found that the structure of SDGs interlinkages is extreme dense and complicated (Figure 10).

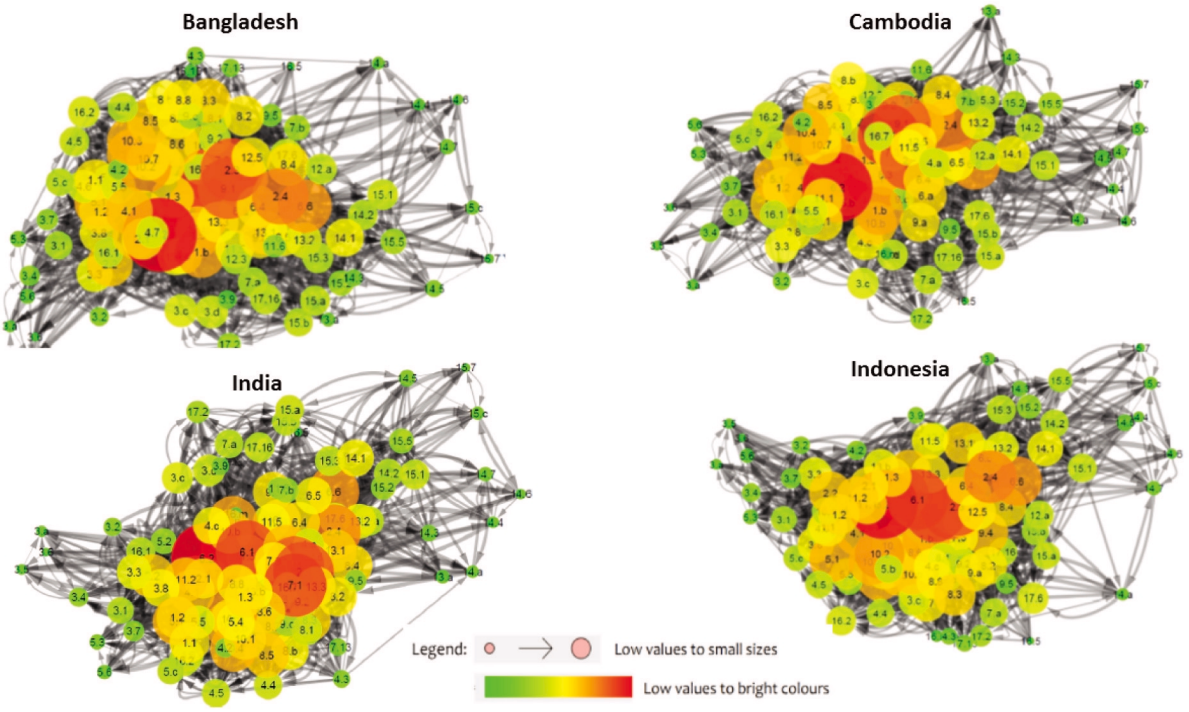
While this tool and the conceptual framework may be able to support the broader notion of policy coherence, more targeted and refined policymaking, and a thorough understanding of policy coherence, requires us to narrow the scope of analysis.

To address this issue and to look at SDGs from a disaster resilience angle, the next section of the toolkit will:

- ✓ Narrow the scope of analysis to only SDGs which are related to disasters and examine the interlinkages from the view point of 'building resilience';
- ✓ Quantify the interlinkages through a similar analysis but instead, use indicator level data that is available on the approved SDG indicators; using some proxies only when data is not available;
- ✓ Provide country-specific key entry points for building resilience to disasters.

Figure 10

IGES weighted SDG interlinkages



Source: Zhou, X., Moinuddin, M., and Xu, Ming, 'Sustainable Development Goals interlinkages and network analysis: A practical tool for SDG integration and policy coherence', (Institute for Global Environmental Strategies (IGES), Japan, 2017).

How do we build a methodology for a systematic and data driven analysis of disaster-related SDG interactions?

Questions to get thinking

What are the inter-relationships across the goals?

Which goals work together to deliver a change in a system, and how do we make the most of those combinations?

What are the tensions between the goals?

A systematic methodology for SDG interactions firstly requires listing out the goals, targets and indicators related to disasters. ESCAP's Asia-Pacific Disaster Report (APDR) for 2017, presents goals, targets, and indicators related to disaster risk reduction. While it can be argued that disaster risk reduction is potentially embedded in all goals, we focus on narrowing the analysis to only the goals/targets/indicators provided in the APDR for 2017. These are given in Table 2.

Table 2

Disaster risk reduction related SDGs (goals, targets, and indicators)[21]

Goal	Target		Indicator	
1. No poverty	1.5	By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters.	1.5.1	Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population
			1.5.2	Direct economic loss attributed to disasters in relation to global gross domestic product (GDP)
			1.5.3	Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030
2. Zero Hunger	2.4	By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.	2.4.1	Proportion of agricultural area under productive and sustainable agriculture
3. Good Health and Well-being	3.9	By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil quality and contamination.	3.9.1	Mortality rate attributed to household and ambient air pollution
			3.9.2	Mortality rate attributed to unsafe water, unsafe sanitation and lack of hygiene (exposure to unsafe Water, Sanitation and Hygiene for All (WASH) services)

Table 2 *(continued)*

Goal	Target		Indicator	
4. Quality Education	4A	Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all.	4A.1	Proportion of schools with access to: (a) electricity; (b) the Internet for pedagogical purposes; (c) computers for pedagogical purposes; (d) adapted infrastructure and materials for students with disabilities; (e) basic drinking water; (f) single-sex basic sanitation facilities; and (g) basic handwashing facilities (as per the WASH indicator definitions)
6. Clean Water and Sanitation	6.5	By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate.	6.5.1	Degree of integrated water resources management implementation (0-100)
			6.5.2	Proportion of transboundary basin area with an operational arrangement for water cooperation
7. Affordable and Clean Energy	7B	By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and landlocked developing countries, in accordance with their respective programmes of support.	7B.1	Investments in energy efficiency as a proportion of GDP and the amount of foreign direct investment in financial transfer for infrastructure and technology to sustainable development services
8. Decent Work and Economic growth	8.1	Sustain per capita economic growth in accordance with national circumstances and, in particular, at least 7 per cent gross domestic product growth per annum in the least developed countries.		N/A
9. Industry, Innovation, and Infrastructure	9A	Facilitate sustainable and resilient infrastructure development in developing countries through enhanced financial, technological and technical support to African countries, least developed countries, landlocked developing countries and small island developing States	9A.1	Total official international support (official development assistance plus other official flows) to infrastructure
10. Reduced Inequalities	10.1	By 2030, progressively achieve and sustain income growth of the bottom 40 per cent of the population at a rate higher than the national average	10.1.1	Growth rates of household expenditure or income per capita among the bottom 40 per cent of the population and the total population
11. Sustainable cities and Communities	11.5	By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations	11.5.1	Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 people
			11.5.2	Direct economic loss in relation to global GDP, including disaster damage to critical infrastructure and disruption to basic services, attributed to disasters
13. Climate Action	13.1	Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	13.1.1	Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 people
			13.1.2	Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030

Table 2 *(continued)*

Goal	Target		Indicator	
	13.3	Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning	13.3.2	Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions
14. Life Below Water	14.1	By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution	14.1.1	Index of coastal eutrophication and floating plastic debris density
15. Life on Land	15.3	By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world	15.3.1	Proportion of land that is degraded over total land area
16. Peace and Justice and Strong Institutions	16.1	Significantly reduce all forms of violence and related death rates everywhere	16.1.2	Conflict-related deaths per 100,000 population, by sex, age and cause
17. Partnerships for the Goals	17.6	Enhance North-South, South-South and triangular regional and international cooperation on and access to science, technology and innovation and enhance knowledge sharing on mutually agreed terms, including through improved coordination among existing mechanisms, in particular at the United Nations level, and through a global technology facilitation mechanism	17.6.1	Number of science and/or technology cooperation agreements and programmes between countries, by type of cooperation

To support policy coherence from a resilience building framework, the following is needed:

- ✓ Understand that interactions between and priorities of the SDGs are not the same for all countries;
- ✓ Identify the key entry points for disaster resilience, i.e., which of the SDGs can be achieved through investments in disaster risk reduction and how the interactions between SDGs can reinforce resilience and risk reduction; and
- ✓ Identify country specific interactions to see which SDGs work together to build resilience (synergy) and which SDGs counter each other to increase risk (trade-offs).

To address these priorities, we developed a step-by-step analytical framework for identification, quantification, and analysis of disaster-related SDGs interlinkages for five pilot countries:

- Bangladesh
- Cambodia
- Maldives
- Myanmar
- Nepal

We then use a system thinking approach (that is explained in later sections) to answer the key questions listed at the beginning of this section.

Step 1: Collecting the data

The ESCAP analysis quantifies the relationships between the disaster-related SDG indicators with trackable time series data from 1990-2010 for the five pilot countries (Table 3). Indicator time-series data availability are different for each country, and the analysis is more robust as the data availability increases. The data availability for each country is mapped out in Appendix I.

Table 3

Available time series SDG indicators for pilot countries

Goal	Target		Indicator name in analysis		Unit	Data source
1. No Poverty	1.5	Resilience of poor and vulnerable	1.5.1	Disaster death	Number of people per 100,000 people	United Nations Statistics Division,SDG indicators global database (http://data.unescap.org/sdg/)
			1.5.2	Disaster loss	Economic loss as a percentage of economic growth	United Nations Global SDG database (https://unstats.un.org/sdgs/indicators/database/)
2. Zero Hunger	2.4	Sustainable food production	2.4.1	Agriculture	Percentage of agricultural land	World Bank, agriculture data (Accessed16072018)(https://data.worldbank.org/indicator/AG.LND.AGRI.ZS)
3. Good Health and Well-being	3.9	Deaths and illnesses from quality	3.9.1	Air quality	Mean percentage of population using clean fuels and technologies for cooking	World Health Organisation, 1 May 2018 (Accessed 17072018) (http://www.who.int/airquality/data/en/)
			3.9.2	Health (water sanitation)	Proportion of people who have access to water and sanitation	World Health Statistics 2017:Monitoring health for the SDGs (http://apps.who.int/gho/data /node.sdg.3-9-data?lang=en)
7. Affordable and Clean Energy	7B	Modern and sustainable energy services	7B.1	Energy	Percentage of total energy use	World Development Indicators, World Bank (Accessed16072018) (https://data.worldbank.org/indicator/EG.USE.COMM.CL.ZS?view=chart)
9. Industry, Innovation, and Infrastructure	9A	Resilient infrastructure development in developing countries	9A.1	Infrastructure Development	Million USD	United Nations Global SDG database (https://unstats.un.org/sdgs/indicators/database/)
10. Reduced Inequalities	10.1	Income growth (bottom 40%)	10.1.1	Economic Growth	Economic Growth per capita	ESCAP Online Global SDG database (http://data.unescap.org/sdg/#data/)
11. Sustainable Cities and Communities	11.5	Resilience to natural disasters	11.5.2	Disaster infrastructure loss	Number of disruptions to basic services and damaged critical infrastructure attributed to disasters	ESCAP Online Global SDG database (http://data.unescap.org/sdg/#data/)
13. Climate Action	13.3	Education, awareness on climate change	13.3.2	Climate resilience	Global climate risk index	Global climate risk index, GermanWatch (https://germanwatch.org/en/cri)
15. Life on Land	15.3	Combat desertification	15.3.1	Land use	Percentage of terrestrial barren land	FAO Land cover data (http://www.fao.org/soils-portal/soil-survey/soil-maps-and-databases/harmonized-world-soil-database-v12/land-cover-data/en/)
16. Peace and Justice and Strong Institutions	16.1	Reduction of all forms of violence	16.1.2	Conflict	Conflict related deaths per 100,000 population	Global SDG Indicator Database (https://unstats.un.org/sdgs/indicators/database/);UCDP Georeferenced Event Dataset (http://ucdp.uu.se/downloads/)

Step 2: Analysing the data

Box 1

Statistics Terminology

Data point: A data point or observation is a set of one or more measurements on a single member of unit of observation.

Time series data: A time series is a series of data points indexed in time order. Most commonly, a time series is a sequence taken at successive equally spaced points in time. Thus, it is a sequence of discrete-time data. An example of time series can be the different heights of ocean tides recorded every day for one year.

Correlation: The dependence or association of two variables in a statistical relationship. Correlation does not imply causation. Thus, a correlation only assesses the strength of the relationship but not the direction. All correlations are bi-directional.

Pearson's correlation (*r*-value): Gives the linear correlation between two variables.

p-value (ρ): When performing a hypothesis test in statistics, a p-value helps determine the significance of the results. It weighs the strength of the evidence (or what the data is telling you about the population).

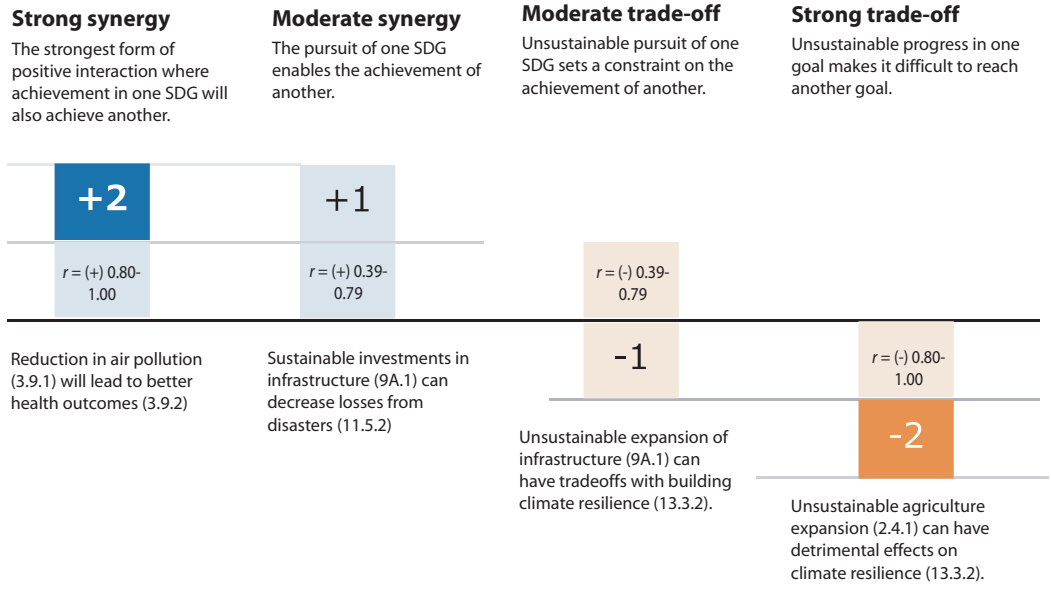
The time series data are then used to quantify the potential interlinkages between SDGs based on a correlation analysis of corresponding indicators using their time series data. A quantified country-specific network of interlinkages between SDG targets using a systems approach was constructed for the 5 selected countries.

The Pearson's correlation value (*r*) is used to assess the relationships between all possible combinations of the indicators for each country. The correlation analysis was only carried out with data pairs consisting of more than 5 data points. This reduces the chance of false detection of synergies/trade-offs resulting from a small number of data. The final mapping of the correlations through the systems approach was done on correlations with a p-value of less than 0.05 which is considered statistically significant (in countries where data is sparse, ρ<0.10 was also considered statistically significant).

An *r*-value greater than 0.8 indicates a high positive association between the indicators and an *r*-value between 0.3 and 0.79 is considered as a medium positive association. Likewise, an *r*-value greater than -0.8 indicates a high negative association between the indicators and an *r*-value between -0.3 and -0.79 is considered as a medium negative association.

Figure 11

International Council for Science modified scoring scale



These values were then scored according to a modified version of the seven-point scale established by the International Council for Science (ICS) in its report "*A guide to SDG interactions: from science to implementation*"[22] and also used by the IGES Report "Sustainable Development Goals interlinkages and network analysis". The report states that:

- ✓ Positive coefficients (for example, r = 0.90) represent positive and **synergizing** linear relationship between each pair (of targets), which builds resilience;
- ✓ Negative coefficients (for example, r = -0.20) represent negative relationships that can increase risks and have **trade-offs** between each pair (of targets);
- ✓ Coefficients with large absolute values (for example, r = 0.90) indicate *strong* relationships while coefficients with smaller absolute values (for example, r = 0.35) indicate *weak* relationships.

The modified scale is shown in Figure 11.

The scoring is as such:

- ✓ An r-value greater than 0.8 was given a score of +2 and termed as having "strong synergies" (i.e., the objectives currently are inextricably linked to the achievement of one another);
- ✓ An r-value between 0.3 and 0.79 was given a score of +1 and termed as having "moderate synergies" (i.e., the pursuit of one objective currently enables the achievement of another objective);
- ✓ An r-value greater than -0.8 was given a score of -2 and termed as having "strong trade-offs" (i.e., the pursuit of one objective currently has detrimental effects on another objective); and
- ✓ An r-value between -0.3 and -0.79 was given a score of -1 and termed "moderate tradeoffs" (i.e., the pursuit of one objective sets a constraint on the achievement of another).

The country-specific correlations and their corresponding 'terms' denoting a synergy or trade-off are given in Appendix II. A summary of the resulting synergies and trade-offs is given in Tables 4-8.

Note that the status of synergies and trade-offs are taken from *available* past indicator data. The synergies and trade-offs might also change, that is, indicators that currently show trade-offs can be converted into synergies. For example, in a country, only focusing on infrastructure expansion (unsustainable) may have a trade-off with climate resilience; however, focusing on sustainable infrastructure development that takes climate resilience into account can lead to synergies in the future where infrastructure is climate resilient.

Thus, in order to achieve coherent policymaking, it may be beneficial to focus more on the synergies while keeping in mind the trade-offs. Additionally, it may be a useful exercise for policymakers to evaluate policies that can be implemented in such a way that current trade-offs turn into future synergies.

Which SDGs work together to build resilience (synergy) and which SDGs counter each other to increase risks (trade-offs)?

Table 4

Bangladesh

	1.5.1 Disaster deaths	1.5.2 Disaster loss	2.4.1 Agriculture	3.9.2 Health	7b.1 Energy	10.1.1 Economic growth	15.3.1 Land use
1.5.2 Disaster loss	●						
3.9.2 Health		●					
7b.1 Energy			●	●			
9a.1 Infrastructure		●	●	●			
10.1.1 Economic growth					●		
13.3.2 Climate resilience			●			●	●
15.3.1 Land use			●	●	●		
16.1.2 Conflict			●	●	●		

Strong Synergy
Achievement in one SDG/goal will also achieve the other

Moderate Synergy
Achievement in one SDG/goal will enable achievement of the other

Strong Trade-off
Unsustainable progress in one SDG/goal can make it difficult to reach the other goal

Moderate Trade-off
Unsustainable pursuit of one SDG/goal can put a constraint on achievement of the other

Leverage points or sectors for disaster resilience

Table 5

Cambodia

	1.5.1 Disaster deaths	1.5.2 Disaster loss	2.4.1 Agriculture	3.9.2 Health	7b.1 Energy	9a.1 Infrastructure	11.5.2 Disaster loss, infrastructure
1.5.2 Disaster loss	●						
2.4.1 Agriculture							
3.9.1 Air quality				●		●	
3.9.2 Health	●		●				
7b.1 Energy				●		●	
9a.1 Infrastructure				●			
10.1.1 Economic growth	●		●				
11.5.2 Disaster loss, infrastructure		●					
13.3.2 Climate resilience				●	●	●	
15.3.1 Land use			●	●		●	
16.1.2 Conflict							●

Strong Synergy
Achievement in one SDG/goal will also achieve the other

Moderate Synergy
Achievement in one SDG/goal will enable achievement of the other

Strong Trade-off
Unsustainable progress in one SDG/goal can make it difficult to reach the other goal

Moderate Trade-off
Unsustainable pursuit of one SDG/goal can put a constraint on achievement of the other

Leverage points or sectors for disaster resilience

Table 6

Maldives

	1.5.1 Disaster deaths	2.4.1 Agriculture	3.9.2 Health	9a.1 Infrastructure
2.4.1 Agriculture				
3.9.1 Air quality				
13.3.2 Climate resilience				

Strong Synergy
Achievement in one SDG/goal will also achieve the other

Moderate Synergy
Achievement in one SDG/goal will enable achievement of the other

Strong Trade-off
Unsustainable progress in one SDG/goal can make it difficult to reach the other goal

Moderate Trade-off
Unsustainable pursuit of one SDG/goal can put a constraint on achievement of the other

Leverage points or sectors for disaster resilience

Table 7

Myanmar

	1.5.1 Disaster deaths	2.4.1 Agriculture	3.9.2 Health	7b.1 Energy	9a.1 Infrastructure	10.1.1 Economic growth	13.3.2 Climate resilience
3.9.1 Air quality							
3.9.2 Health							
7b.1 Energy							
9a.1 Infrastructure							
13.3.2 Climate resilience							
15.3.1 Land use							
16.1.2 Conflict							

Strong Synergy
Achievement in one SDG/goal will also achieve the other

Moderate Synergy
Achievement in one SDG/goal will enable achievement of the other

Strong Trade-off
Unsustainable progress in one SDG/goal can make it difficult to reach the other goal

Moderate Trade-off
Unsustainable pursuit of one SDG/goal can put a constraint on achievement of the other

Leverage points or sectors for disaster resilience

Table 8

Nepal

	1.5.1 Disaster deaths	2.4.1 Agriculture	3.9.2 Health	7b.1 Energy	9a.1 Infrastructure	13.3.2 Climate resilience	15.3.1 Land use
1.5.2 Disaster loss	●				●		
3.9.1 Air quality			●				
3.9.2 Health	●	●					
7b.1 Energy		●	●				
9a.1 Infrastructure		●	●			●	
11.5.2 Disaster loss, Infrastructure				●			●
15.3.1 Land use		●	●	●		●	

● **Strong Synergy**
Achievement in one SDG/goal will also achieve the other

● **Moderate Synergy**
Achievement in one SDG/goal will enable achievement of the other

● **Strong Trade-off**
Unsustainable progress in one SDG/goal can make it difficult to reach the other goal

● **Moderate Trade-off**
Unsustainable pursuit of one SDG/goal can put a constraint on achievement of the other

Leverage points or sectors for disaster resilience

Reflect: Are these SDGs and their indicators connected? Has this been your experience at the operational level?

Step 3: Interpreting the data using systems thinking approach

The systems thinking approach identifies the interactions between various parts of a system – a city, a society, a sector – and ensures that they jointly deliver more than the sum of the parts. In today's world, setting goals is the priority. However, if the SDGs are to truly shift the global system onto a sustainable path, there needs to be thinking that goes deeper to address the underlying causes of incoherent policymaking. Successfully delivering the SDGs requires a strong systems approach.

Mapping the activities around the individual goals will certainly accelerate progress. But, looking *across* the goals at possible synergies and trade-offs will take us to the next level. As noted in the previous sections, the SDGs do not work in isolation; they have multidimensional linkages and interactions that need to be better understood to formulate mutually beneficial strategies. We need to rigorously leverage and learn more about these interactions, maximizing those that have synergies and minimizing, or even reversing, those that have trade-offs, particularly when looking at the more cross-cutting goals such as sustainable consumption and production, infrastructure and industrialization, and climate change.

Hence, mapping the relationships of the disaster related SDG indicators to one another via a systems approach can generate high value addition; it involves examining the system of each country to check for resilience as a whole. Using this systems approach, we mapped out the country-specific quantified synergies and trade-offs, including the key *leverage points* for disaster resilience that can be the starting point for a coherent policy discussion.

Box 2

Systems analysis terminology

Leverage points: These are the instances where change is possible, i.e., where a small shift in one thing can produce a big change in everything. Each intervening indicator can identify points of entry for the systems as a whole, however different leverage points have different abilities to influence change, (Meadows D. [1999]. Leverage points: Places to intervene in a system, *The Sustainability Institute*).

Note again that the following systems maps show the current status of potential synergies and trade-offs. The system may also change (i.e., counteracting indicators can be turned into enabling indicators) if there is a change in various policies across the sectors.

BANGLADESH

Key messages from the systems analysis:

(1) The key leverage points for building disaster resilience are health and infrastructure development. Investments in health and infrastructure can also potentially reduce deaths and losses from disasters or vice versa (i.e., investment in reducing deaths and losses from disasters can have positive impacts on health and infrastructure);

(2) Agriculture has a number of synergies through land use and energy which can also build climate resilience;

(3) There may be trade-offs on health and climate resilience if land use expands in an unsustainable manner.

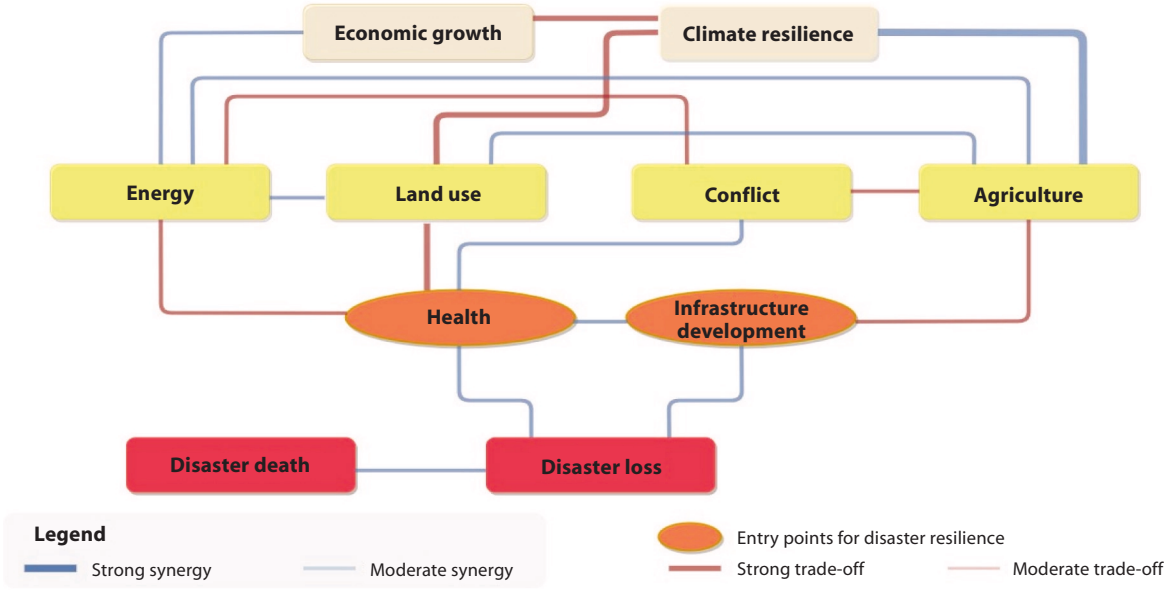
In Bangladesh, the potential primary entry points identified for building resilience to disasters are through health and infrastructure. Accomplishments in health and sustainable infrastructure development can enable achievements in reducing deaths and loss from disasters. Figure 12 maps the synergies and trade-offs for the disaster-related SDG system.

For example, in Bangladesh, health (3.9.2) and infrastructure development (9a.1) targets enable each other, therefore, the infrastructure development in Bangladesh also supports better health outcomes. On the other hand, agriculture (2.4.1) and conflict (16.1.2) are constraining objectives where the pursuit of more agriculture land may be detrimental to conflict reduction.

The objectives that are inextricably linked to the achievement of one another are health, infrastructure, agriculture, land use, climate resilience and economic growth. Towards SDG coherence, it may be useful to enhance synergistic policies across these sectors.

Figure 12

Bangladesh: Synergies and trade-offs among disaster-related SDGs



Reflect: Does the systems map correctly indicate the entry points, synergies, and trade-offs? Has this been your experience at the operational level? What additional input is needed to correctly reflect Bangladesh's path to further achieving disaster resilience?

CAMBODIA

Key messages from the systems analysis:

(1) The key leverage points for building disaster resilience are health and economic development. Investments in health and economic growth can also potentially reduce deaths and losses from disasters or vice versa (i.e., investments in reducing deaths and losses from disasters can have positive impacts on health and economic growth);

(2) Health has the greatest number of synergies with other sectors; it has synergies with air quality, energy, infrastructure development, agriculture, and climate resilience. Thus, taking health into account when developing policies in these sectors can increase overall resilience;

(3) There may be trade-offs on health, infrastructure development and land use if land use and infrastructure expand in an unsustainable manner.

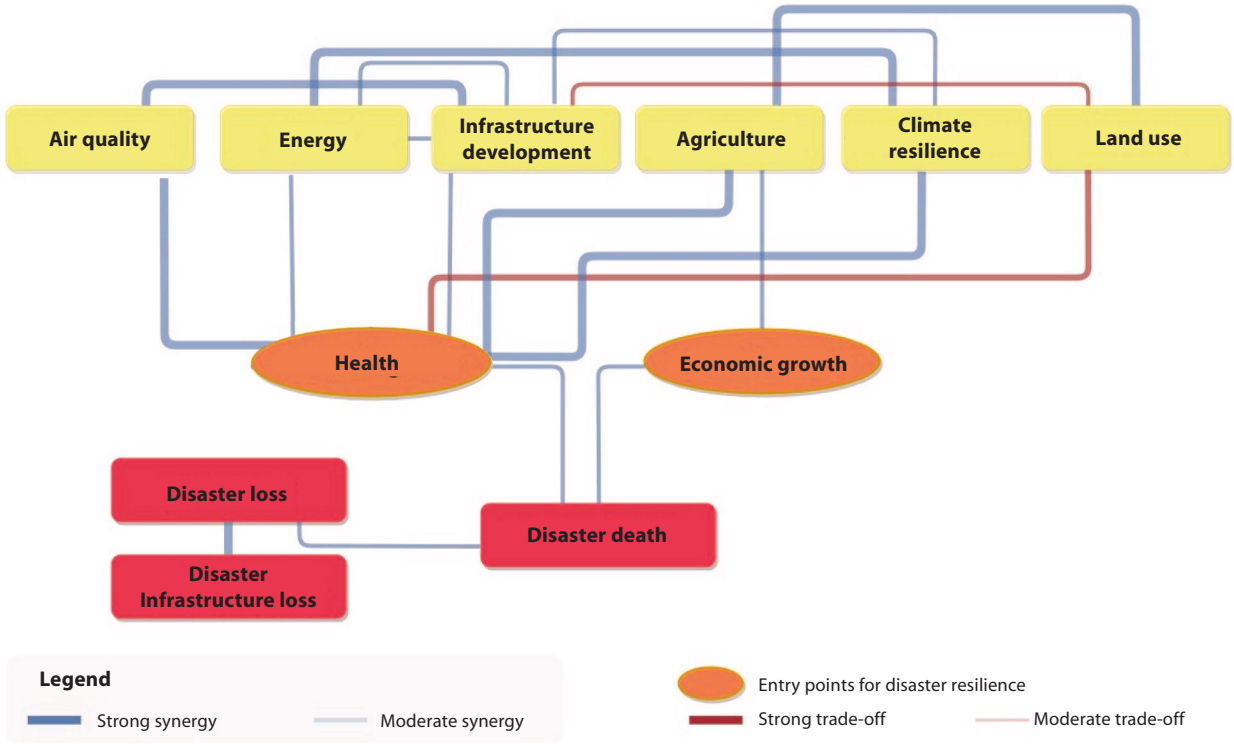
In Cambodia, the potential primary entry points identified for building resilience to disasters are through health and economic growth where accomplishments in health and the economy can enable achievements in reducing deaths and loss from disasters. Figure 13 maps the synergies and trade-offs for the disaster-related SDG system.

For example, in Cambodia, health (3.9.2) and air quality (7b.1) targets enable each other. Therefore, policies across productive sectors that support better air quality also support better health outcomes. Of the 5 pilot countries, in this analysis, Cambodia seems to have the least number of trade-offs.

The objectives that are inextricably linked to the achievement of one another are health, agriculture, air quality, energy and infrastructure development, agriculture and climate resilience. Towards SDG coherence, it may be useful to introduce or enhance synergistic policies across these sectors.

Figure 13

Cambodia: Synergies and trade-offs among disaster-related SDGs



Reflect: Does the systems map correctly indicate the entry points, synergies, and trade-offs? Has this been your experience at the operational level? What additional input is needed to correctly reflect Cambodia's path to further achieving disaster resilience?

MALDIVES

Key messages from the systems analysis:

(1) The key leverage points for building disaster resilience is the agriculture/fisheries sector. Investments in agriculture can also potentially reduce deaths and losses from disasters or vice versa (i.e., investments in reducing deaths and losses from disasters can have positive impacts on agriculture);

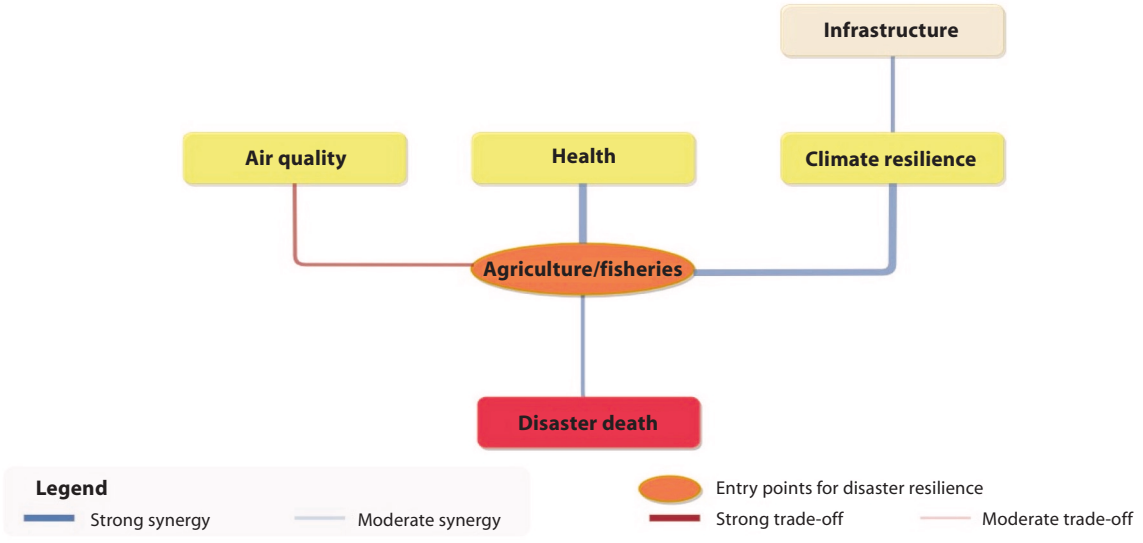
(2) Building resilience in agriculture/fisheries sector can also support better health outcomes and climate resilience.

As the data availability (Annex I) shows, the data for Maldives is sparse and less robust than other pilot countries. From the available data for Maldives, the potential primary entry point identified for building resilience to disasters is through agriculture/fisheries where getting better disaster information in this sector enables a reduction in disaster deaths. Figure 14 maps the synergies and trade-offs for the disaster-related SDG system.

For example, in Maldives, agriculture (2.4.1), climate resilience (13.3.2) and infrastructure (9a.1) targets all have synergies. Therefore, sustainable agriculture/fisheries, together with sustainable infrastructure development also supports climate resilience. Current policy synergies in the sectors should be augmented.

Figure 14

Maldives: Synergies and trade-offs among disaster-related SDGs



Reflect: Does the systems map correctly indicate the entry points, synergies, and trade-offs? Has this been your experience at the operational level? What additional input is needed to correctly reflect Maldives' path to further achieving disaster resilience?

MYANMAR

Key messages from the systems analysis:

(1) The key leverage points for building disaster resilience are health and land use. Investments in health and sustainable land use can also potentially reduce deaths and losses from disasters or vice versa (i.e., investments in reducing deaths and losses from disasters can have positive impacts on health and sustainable land use);

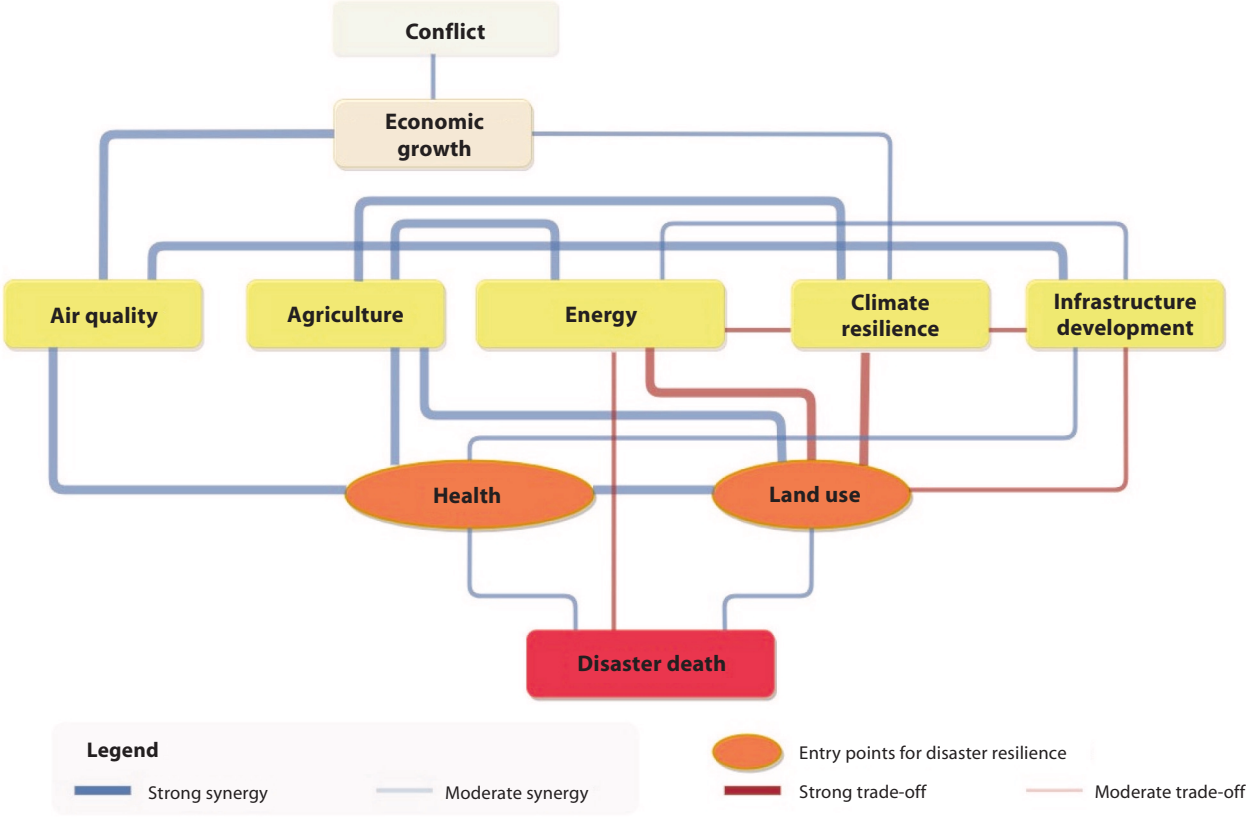
(2) Health and agriculture have the greatest number of synergies with other sectors including air quality, energy, infrastructure development and climate resilience. Investments in these sectors can increase overall resilience;

(3) Focusing on social issues/sectors such as better air quality and climate resilience can also encourage economic growth and development.

In Myanmar, the potential primary entry points identified for building resilience to disasters are through health and land use where accomplishments in health and current sustainable land development enable reduction in deaths from disasters. Figure 15 maps the synergies and trade-offs for the disaster-related SDG system.

Figure 15

Myanmar: Synergies and trade-offs among disaster-related SDGs



For example, in Myanmar, health (3.9.2) and land use (15.3.1) targets are indivisible and the pursuit of sustainable land use also achieves the goals of better health outcomes. On the other hand, infrastructure development (9a.1) and climate resilience (15.3.1) are constraining objectives where the pursuit of unsustainable infrastructure development may be detrimental to achieving climate resilience. Interestingly, in Myanmar, the pursuit of climate resilience can enable the achievement of economic growth and the reduction of conflict.

The objectives that are inextricably linked to the achievement of one another are health, agriculture, land use, energy, climate resilience, and economic growth. Towards SDG coherence, it may be useful to introduce or enhance synergistic policies across these sectors.

Reflect: Does the systems map correctly indicate the entry points, synergies, and trade-offs? Has this been your experience at the operational level? What additional input is needed to correctly reflect Myanmar's path to further achieving disaster resilience?

NEPAL

Key messages from the systems analysis:

(1) The key leverage points for building disaster resilience are health and infrastructure. Investments in health and sustainable disaster resilient infrastructure can also potentially reduce deaths and losses from disasters or vice versa (i.e., investments in reducing deaths and losses from disasters can have positive impacts on health and sustainable land use);

(2) Health has the greatest number of synergies with other sectors including air quality, energy, infrastructure development and climate resilience. Therefore, taking health into account, when looking at investments in these sectors, can increase overall resilience;

(3) Focusing on social issues/sectors such as better air quality and climate resilience can potentially encourage better development.

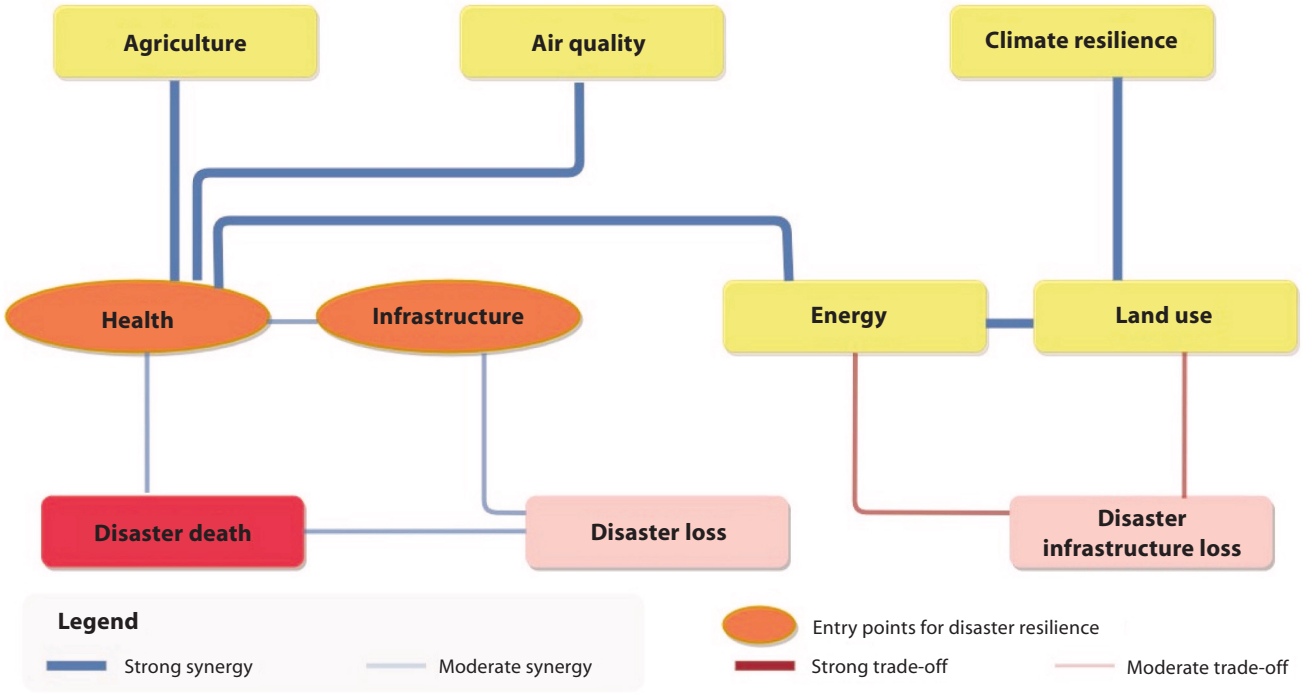
In Nepal, the potential primary entry points identified for building resilience to disasters are through health and infrastructure. In the current scenario, accomplishments in healthcare may also enable achievements in reducing deaths and losses from disasters. On the other hand, the pursuit of potentially unplanned energy development can be detrimental to achieving a reduction in disaster losses. Figure 16 maps the synergies and trade-offs for the disaster-related SDG system.

For example, in Nepal, health (3.9.2) and air quality (15.3.1) targets are indivisible and the pursuit of reduction in air quality also achieves the goals of better health outcomes. On the other hand, unsustainable land (15.3.1) and energy development (7b.1) are constraining objectives for disaster losses where the pursuit of potentially unsustainable infrastructure and land use can worsen losses from disasters.

The objectives that are inextricably linked to the achievement of one another are health, agriculture, air quality, energy and climate resilience. Towards SDG coherence, it may be useful to introduce or enhance synergistic policies across these sectors.

Figure 16

Nepal: Synergies and trade-offs among disaster-related SDGs



Reflect: Does the systems map correctly indicate the entry points, synergies, and trade-offs? Has this been your experience at the operational level? What additional input is needed to correctly reflect Nepal's path to further achieving disaster resilience?

Step 4: Putting it all together: Validating the systems analysis and developing a country-specific policy coherence approach in order to build disaster resilience and prioritize investments

The systems approach can be used to prioritize investment in areas which have the most synergies and are key entry points to build disaster resilience. The assessments can also foster the examining of cross-sectoral policies that are needed in the future to convert counteracting or constraining SDGs into ones that mutually enable each other.

However, solely using the systems approach to SDGs is not enough for policy coherence. This analysis must be considered within the context of country-specific future risks from disasters. It should also be further validated via other established methodologies.

In the next section, we present a complete picture for building disaster resilience among the five pilot countries. Along with our systems analysis, we provide a future-scenario based multi-hazard risk analysis, for each country, in order to examine potential future needs and gaps.

Box 3

Disaster risk reduction terminology

The following definitions are taken from the report of the open-ended intergovernmental working group on indicators and terminology relating to disaster risk reduction from the seventy-first session of the UN General Assembly.

Hazard: A process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation.

Exposure: The situation of people, infrastructure, housing, production capacities, and other tangible human assets located in hazard-prone areas.

Vulnerability: The conditions determined by physical, social, economic, and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards.

Disaster risk: The potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability and capacity.

Resilience: The ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the perseveration and restoration of its essential basic structures and functions through risk management.

Source: General Assembly, 'Report of the open-ended intergovernmental expert working group on indicators and terminology relating to disaster risk reduction', Seventy-first session, document A/71/644. Available at: https://www.unisdr.org/we/inform/publications/51748

The validators of systems analysis

Average annual loss estimates

The Global Assessment Report on Disaster Risk Reduction (GAR) is a biennial global assessment of disaster risk reduction and offers a comprehensive review and analysis of the natural hazards that are affecting humanity. The main metric for the report is the measurement of average annual loss (AAL). AAL is the expected loss per annum associated with the occurrence of future perils/hazards assuming a very long observation timeframe. It considers the damage caused on the exposed elements by small, moderate and extreme events and its results offer a useful and robust metric for risk ranking and comparisons.

Resilience measures – World Bank

In their report, *"Unbreakable: Building the Resilience of the Poor in the Face of Natural Disasters,"* the World Bank estimates the savings of a 'resilience package' through which social/well-being losses from disasters can be mitigated. The instruments increase people's ability to cope with asset losses and generate benefits that contribute to a broader development agenda.

We further validate our results with these measures in order to provide a more comprehensive policy analysis for the pilot countries.

BANGLADESH

What are the disaster risks that threaten the achievement of SDGs?

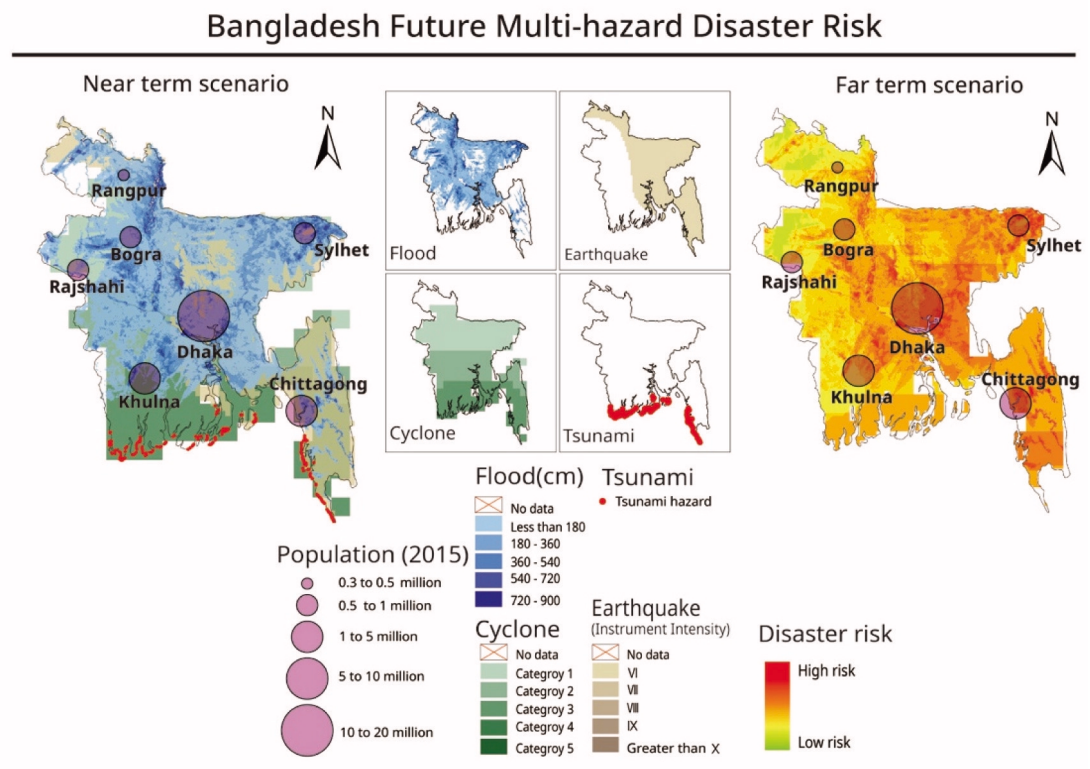
Bangladesh is one of the most hazard-prone countries in the world with frequent inundation from seasonal and flash floods, and cyclones, droughts, and earthquakes occurring periodically.[23] Between 1996 and 2015 these disasters resulted in an annual average death toll of 679 people and an annual average total loss of $2,283 million, which is equivalent to 0.73 per cent of GDP.[24] Future-term multi-hazard risk analysis by ESCAP (Figure 17) shows that much of the western part of Bangladesh, along with the major cities are going to be further exposed to floods, cyclones, earthquakes, and tsunamis. In addition, southern Bangladesh is also projected to be exposed to stronger cyclonic winds than the north.

The Climate Risk Index (CRI)[25] ranks Bangladesh in the top ten (ranking 6th) of 182 countries for exposure and vulnerability to extreme events due to climate change.[26] Climate change will increase physical exposure due to the spatial extension of hazards, with hazards hitting new places and people. In particular, floods will affect greater areas, and salinization will affect delta regions.[27]

In Bangladesh, 24.3 per cent of the population lives below the national poverty line, with 14.8 per cent living on less than $1.90 a day, and the lowest 20 per cent of the population holding only 8.6 per cent of national income.[28] The World Bank has previously reported that poor people (defined as the bottom 20 per cent of the population in terms of consumption) experience only 11 per cent of total asset losses from disasters, but suffer 47 per cent of well-being losses

Figure 17

Bangladesh: Multi-hazard Risk Map



(defined as the different abilities of poor and non-poor people to cope with asset losses, using indicators such as savings, remittances, social protection, and post disaster transfers).[29]

What policy messages can we gather from the combined systems analysis and the validators?

The SDGs systems map for Bangladesh (Figure 12) shows that building resilience to disasters may be supported across several sectors including health (SDG 3) and infrastructure (SDG 9). Investments in these entry points will not only support disaster resilience but can be useful in guiding more risk-sensitive cross-sectoral policies in agriculture and climate resilience.

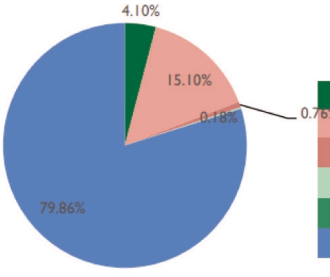
Our recommendations for investment in health is potentially supported by the GAR established annual average loss. For Bangladesh, the total projected AAL is $3.84 billion (Figure 18).[30] Almost 50 per cent of this loss will be in the social sector, namely, health, education, etc.

From the World Bank report, we further note that the risk to well-being (i.e., social sector risk) is greater than the risk to economic assets. The well-being losses indicate the disaster risks of poor people who are more vulnerable, but have a negligible impact on a country's aggregate wealth because they own almost nothing and have very low incomes. A set of policies that focus on scalable social nets and post disaster support could potentially have annual well-being gains of $3.6 billion,[31] which could potentially counteract the average annual loss.

Thus, increasing social expenditure now (on health, for example) can help mitigate future costs from disasters. Furthermore, greater investment in social sectors like health can also increase overall resilience through its indivisible interlinkages with climate and infrastructure.

Figure 18

Bangladesh: Average Annual Loss by hazard (GAR 2015) and resilience policy estimated savings



Hazard	Value	AAL/Capital stock	AAL/GFCF	AAL/Social expenditure	AAL/Total reserves	AAL/Gross savings
	(million US$)	(%)	(%)	(%)	(%)	(%)
Earthquake	126.46	0.03	0.36	1.98	0.72	0.24
Cyclonic Wind	465.85	0.12	1.34	7.28	2.65	0.88
Storm Surge	23.35	0.01	0.07	0.36	0.13	0.04
Tsunami	5.50	0.00	0.02	0.09	0.03	0.01
Volcano		0.00	–	–	–	–
Flood	2,463.17	0.62	7.07	38.50	14.02	4.64
TOTAL	**3.084**	**0.8**	**8.8**	**48.2**	**17.6**	**5.8**

Source: GAR 2015

	Risk to assets (Percentage of GDP)	Resilience (Percentage)	Risk to well-being (Percentage of GDP)
Current status	2.27	66	3.45
Status with policies that can reduce well-being losses	2.17	84	2.58

Source: S. Hallegatte, and others, 'Unbreakable: building the resilience of the poor in the face of natural disasters', (2016).
Note: GFCF = Gross fixed capital formation

Reflect: Does this analysis reflect ground realities?

CAMBODIA

What are the disaster risks that threaten the achievement of SDGs?

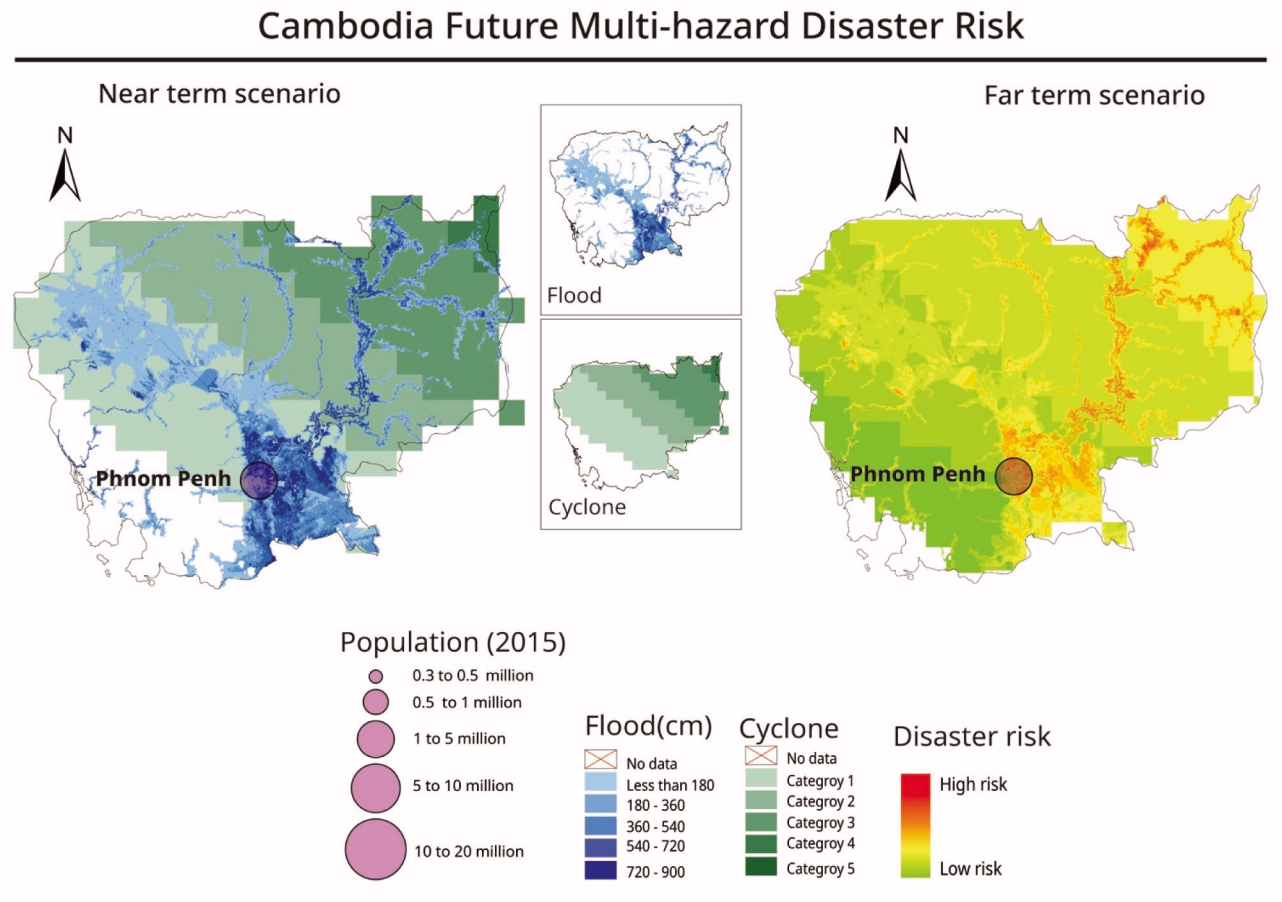
Cambodia is one of the most hazard-prone countries in Southeast Asia, affected by floods and droughts on seasonal basis.[32] Between 1996 and 2015, hazards that occurred in the country resulted in an annual average death toll of 58 people and an annual average total loss of $242 million, which is equivalent to 0.88 per cent of GDP.[33] Future-term multi-hazard risk analysis by ESCAP (Figure 19) shows that much of the land area of Cambodia is projected to be exposed to hazards, with the northern and eastern areas particularly exposed to cyclones and much of the southern coastal region to be affected by floods. Southern Cambodia is also projected to be exposed to stronger floods than the north.

The Climate Risk Index (CRI)[34] ranks Cambodia at 13 out of 182 countries for exposure and vulnerability to extreme events due to climate change.[35] Climate change will increase physical exposure due to the spatial extension of hazards, with hazards hitting new places and people. In particular, floods will affect greater areas, and salinization will affect delta regions.[36]

In Cambodia, 17.7 per cent of the population live below the national poverty line.[37] The World Bank has previously reported that poor people (defined as the bottom 20 per cent of the population in terms of

Figure 19

Cambodia: Multi-hazard Risk Map



consumption) experience only 11 per cent of total asset losses from disasters, but suffer 47 per cent of well-being losses (defined as the different abilities of poor and non-poor people to cope with asset losses, using indicators such as savings, remittances, social protection, and post disaster transfers).[38]

What policy messages can we gather from the combined systems analysis and the validators?

The SDGs systems map for Cambodia (Figure 13) shows that building resilience to disasters may be supported across several sectors including health (SDG 3) and economic growth (SDG 10). Investments in these entry points will not only support the building of resilience to disasters but can also be useful in guiding more risk-sensitive, cross-sectoral policies in agriculture, energy, air quality, infrastructure and climate resilience.

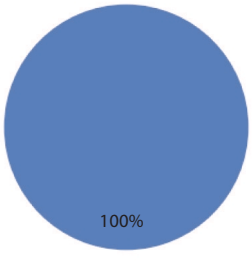
Our recommendation for investment in health is potentially supported by the GAR established annual average loss. For Cambodia, the total projected AAL is $251 million (Figure 20).[39] About 37 per cent of this loss will be from the social sectors which incorporate health issues.

From the World Bank report, we further note that risk to well-being (i.e., social sector risk) is greater than risk to economic assets. The well-being losses indicate disaster risks of poor people who are more vulnerable but have a negligible impact on a country's aggregate wealth because they own almost nothing and have very low incomes. A set of policies with a focus on scalable social nets and post disaster support could potentially have annual well-being gains of $678 million,[40] which could counteract the average annual loss and produce a real impact on income growth (SDG 8 and SDG 10).

Thus, implementing and investing in policies that can reduce well-being losses, especially focusing on social sectors, can help mitigate the bearing of future costs associated with the connections between disasters and conflicts. Furthermore, investment in social sectors like health as well as the productive sectors can also increase overall resilience through its indivisible interlinkages with climate and air quality.

Figure 20

Cambodia: Average Annual Loss by hazard (GAR 2015) and resilience policy estimated savings



Hazard	Value	AAL/Capital stock	AAL/GFCF	AAL/Social expenditure	AAL/Total reserves	AAL/Gross savings
	(million US$)	(%)	(%)	(%)	(%)	(%)
Earthquake	0.00	0.00	0.00	0.00	0.00	0.00
Cyclonic Wind	0.01	0.00	0.00	0.00	0.00	0.00
Storm Surge	0.00	0.00	0.00	0.00	0.00	0.00
Tsunami	0.00	0.00	0.00	0.00	0.00	0.00
Volcano		0.00	–	–	–	–
Flood	251.19	0.92	10.31	37.48	5.56	16.19
TOTAL	**251.00**	**0.90**	**10.30**	**37.50**	**5.60**	**16.20**

Source: GAR 2015

	Risk to assets (Percentage of GDP)	Resilience (Percentage)	Risk to well-being (Percentage of GDP)
Current status	1.90	53	3.61
Status with policies that can reduce well-being losses	1.52	74	2.05

Source: S. Hallegatte, and others, 'Unbreakable: building the resilience of the poor in the face of natural disasters', (2016).

Reflect: Does this analysis reflect ground realities?

MALDIVES

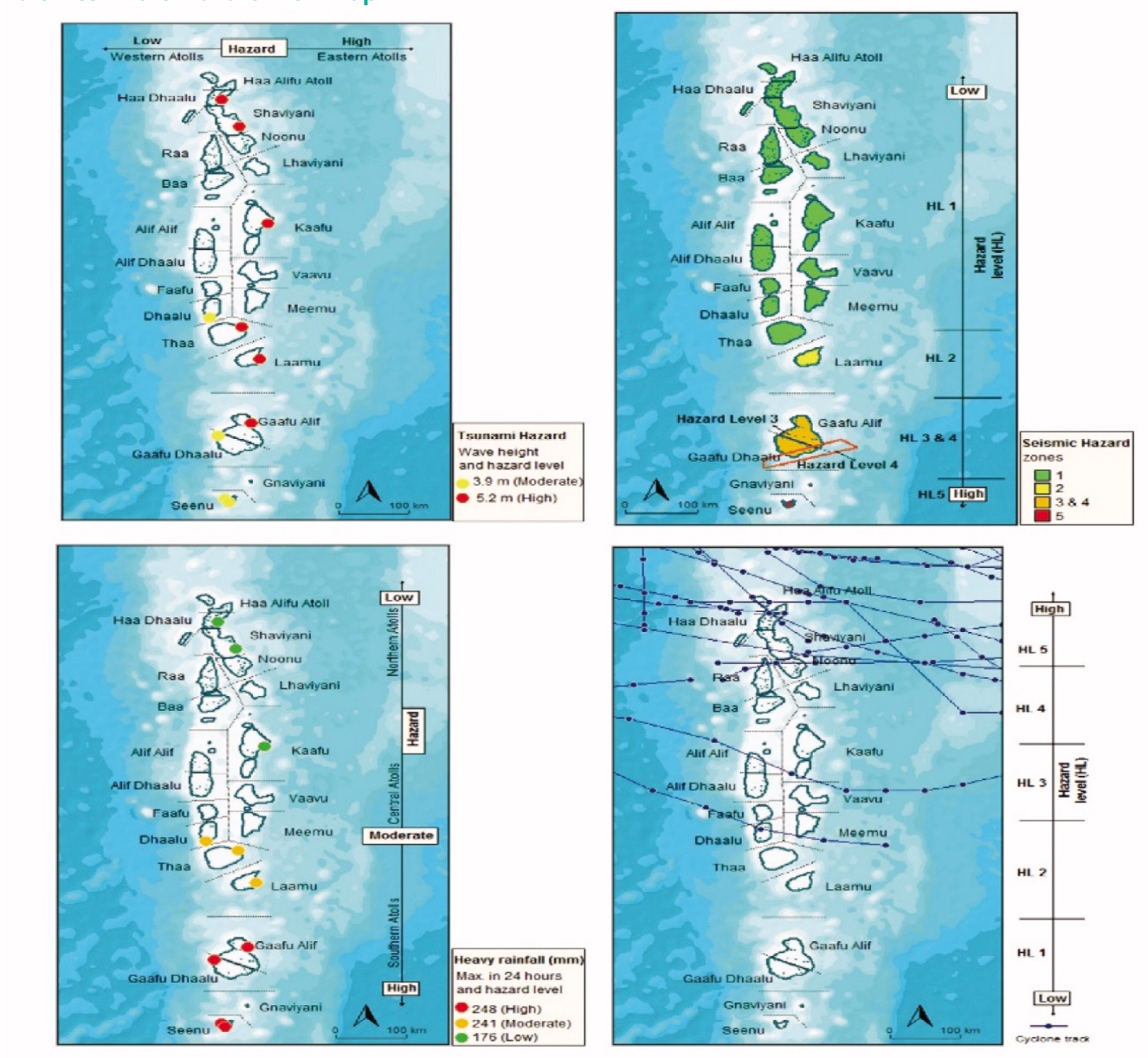
What are the disaster risks that threaten the achievement of SDGs?

Maldives is one of the lowest-lying countries in the world, and consequently is greatly threatened by rise in sea levels and coastal storm surges.[41] Between 1990 and 2014, tsunamis accounted for 96.3 per cent of the deaths and 74 per cent of economic losses caused by disasters.[42]

Disaster and climate risk information for Maldives is also scarce. Some future term multi-hazard risk analysis by ESCAP (Figure 21) shows that Maldives is the most likely to be affected by tsunamis in the future.

Figure 21

Maldives: Multi-hazard Risk Map



Source: RMSI, UNDP and GOM, 2006; DIRAM, 2008; RIMES, MHE, and MMS 2012.

According to the Notre Dame-Global Adaptation Index (ND-GAIN) which indicates a country's current vulnerability to climate disruptions, Maldives is ranked high on the vulnerability to climate disruption scale (124 out of 181).[43]

In Maldives, 15.7 per cent of the population live below the national poverty line and 7.3 per cent live on less than $1.90 a day.[44] The World Bank has previously reported that poor people (defined as the bottom 20 per cent of the population in terms of consumption) experience only 11 per cent of total asset losses from disasters, but suffer 47 per cent of well-being losses (defined as the different abilities of poor and non-poor people to cope with asset losses, using indicators such as savings, remittances, social protection, and post disaster transfers).[45]

What policy messages can we gather from the combined systems analysis and the validators?

The SDGs systems map for Maldives (Figure 14) shows that building resilience to disasters may be supported through the agricultural (SDG 2) sector. Sustainable investment in agriculture will not only support resilience to disasters but can be useful in guiding more risk-sensitive cross sectoral policies in health (SDG 3) and climate resilience (SDG 13).

AAL data is not available for Maldives. However, analysis by the FAO states, "The importance of agriculture in the country in the past has been underestimated since its contribution has been measured on the grounds of its value added to GDP. The contribution to GDP is low, yet from a livelihood and employment perspective, it is vital to the economy in terms of its economic and social welfare value. It is estimated that 9,000 farmers and 14,000 fishermen are actively engaged in both sectors supporting a large group of rural families."[46]

More investments in data collection are needed in the Maldives to make policy recommendations. Nonetheless, our analysis suggests that investments in sectors like agriculture, that intersect with social and welfare sectors of the country, can build resilience to disasters and have positive effects through linkages with health and climate resilience.

However, particularly in case of Maldives (as well as other Small Island Developing Countries), not only is there sparse data on the SDG indicators, but these indicators may not reflect issues on the ground. For example, the indicator for disaster related deaths is the number of deaths per 100,000. However, the population of Maldives was about 417,492, in 2016. Therefore, the measure for this specific indicator may not be adequate to reflect the disaster deaths in Maldives. Hence, more work needs to be done in localizing the SDGs indicators to better reflect the country's characteristics.

Reflect: Does this analysis reflect ground realities?

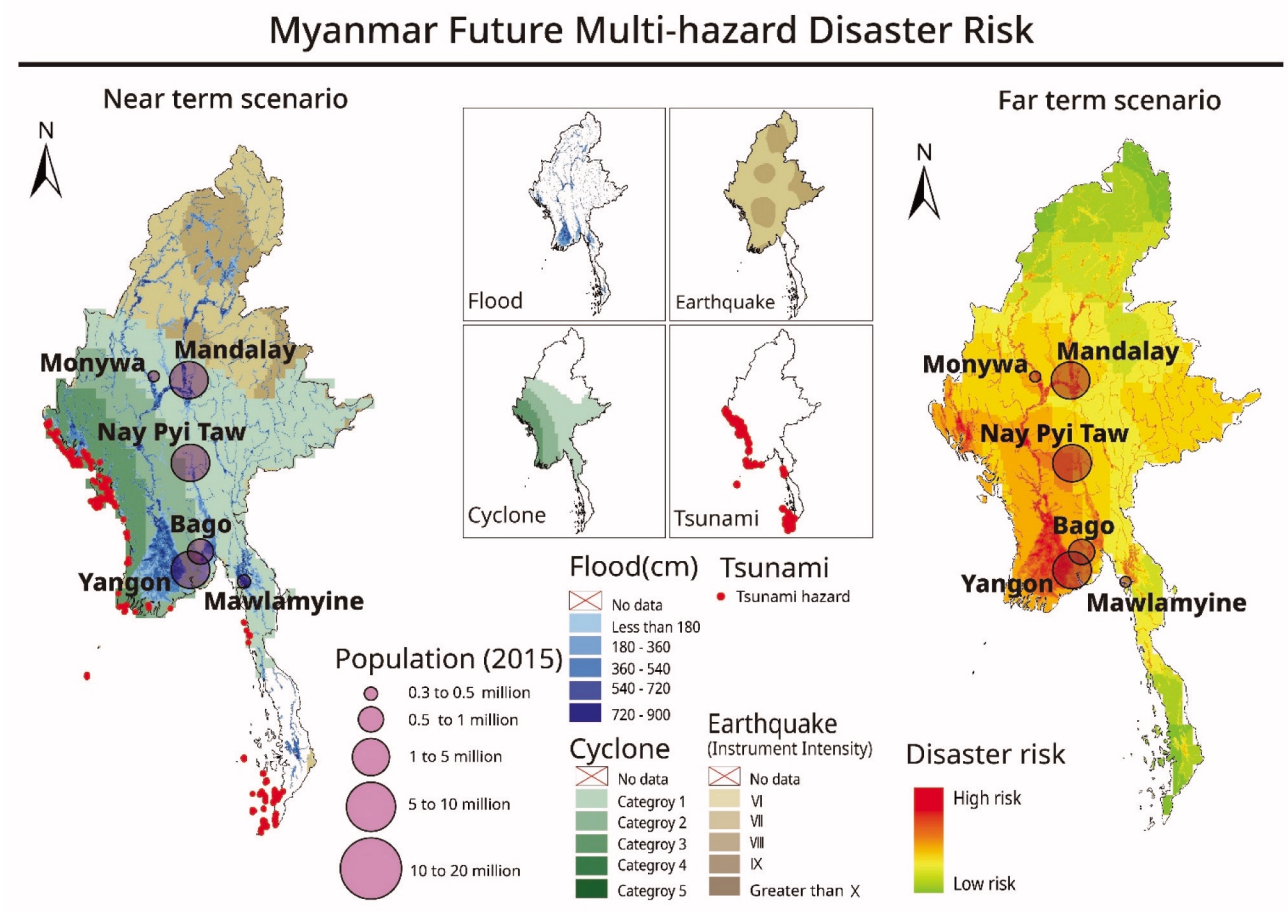
MYANMAR

What are the disaster risks that threaten the achievement of SDGs?

Myanmar is one of the most hazard-prone countries in the world and is affected by floods, earthquakes, tsunamis, storm surges, and droughts.[47] Between 1996 and 2015 there were, a total of, 41 hazard events in Myanmar.[48] Over this period, the hazards resulted in an annual average death toll of 7,146 people, or 14.71 deaths per 100,000 inhabitants, and an annual average of $1,300 million total losses, equivalent to 0.74 per cent of GDP.[49]

Figure 22

Myanmar: Multi-hazard Risk Map



Future term multi-hazard risk analysis by ESCAP (Figure 22) shows that Myanmar will be more exposed to hazards such as floods, cyclones, earthquakes, and tsunamis. Almost the entire land area of Myanmar is projected to be exposed to earthquakes, most of the southern and central regions to cyclones, and much of the western and southern coastal region to floods and tsunamis. Western Myanmar is also projected to be more exposed to stronger cyclonic winds that the east.[50]

The Climate Risk Index (CRI)[51] ranks Myanmar at 2 out of 182 countries for exposure and vulnerability to extreme events due to climate change.[52] Climate

change will increase physical exposure due to the spatial extension of hazards, with hazards hitting new places and people. In particular, floods will affect greater areas, and salinization will affect delta regions.[53]

In Myanmar, 32.1 per cent of the population live below the national poverty line, with 6.4 per cent living on less than $1.90 a day, and the lowest 20 per cent of the population holding only 7.3 per cent of national income.[54] The World Bank has previously reported that poor people (defined as the bottom 20 per cent of the population in terms of consumption) experience only 11 per cent of total asset losses from disasters, but suffer 47 per cent of well-being losses (defined as the different abilities of poor and non-poor people to cope with asset losses, using indicators such as savings, remittances, social protection, and post disaster transfers).[55]

What policy messages can we gather from the combined systems analysis and the validators?

The SDGs systems map for Myanmar (Figure 15) shows that building resilience to disasters may be supported across several sectors including health (SDG 3), and land use (SDG 15). Investments in these entry points will not only support building resilience to disasters but can be useful in guiding more risk-sensitive cross sectoral policies in agriculture (SDG 2), air quality (SDG 3), infrastructure development (SDG 9), economic growth (SDG 8 and 10), conflict (SDG 16), climate (SDG 13) and land use (SDG 15).

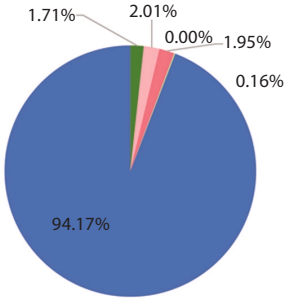
In addition, investments in energy sector is supported by the GAR established annual average loss. The total projected AAL for Myanmar is $2.07 billion (Figure 23).[56] While disaggregated AAL data for social expenditure is missing for Myanmar, AAL data from the subsectors (Figure 24) suggests that the services sector (which includes energy and electricity) will suffer from the greatest losses (around 24 per cent of the total AAL).

While the monetary benefits of a set of resilience policies for sectors is not available for Myanmar, the total average annual loss mirrors that of Bangladesh. Both have similar multi-hazard profiles as well. A set of policies that focus on scalable social nets integrated into economic development could potentially have large annual well-being gains.[57] This can also support the systems analysis that suggests health as a key entry point for disaster resilience.

Investments in energy as well as in social sectors like health can also increase overall resilience through its indivisible interlinkages with agriculture, climate, and infrastructure development.

Figure 23

Myanmar: Average Annual Loss by hazard



Hazard	Value	AAL/Capital stock	AAL/GFCF	AAL/Social expenditure	AAL/Total reserves	AAL/Gross savings
	(million US$)	(%)	(%)	(%)	(%)	(%)
Earthquake	35.57	0.02	…	…	0.51	…
Cyclonic Wind	41.76	0.02	…	…	0.60	…
Storm Surge	40.61	0.02	…	…	0.58	…
Tsunami	3.27	0.00	…	…	0.05	…
Volcano	…	0.00	…	…	…	…
Flood	1,956.65	1.00	…	…	28.10	…
TOTAL	**2,078.00**	**1.10**	**…**	**…**	**29.80**	**…**

Source: GAR 2015

Figure 24

Myanmar: Average Annual Loss by Sector

Sector	Subsector	Capital stock (million US$)	Average Annual Loss (AAL) (million US$)
Residential (income)	Low	68,993	423.97
	Middle low	20,971	126.27
	Middle high	0	0
	High	0	0
Services	Commercial	45,803	280.20
	Industrial	34,851	212.23
Education	Private	456	0.42
	Public	24,466	147.93
Health	Private	81	0.03
	Public	11	0
Public buildings		0	0
National		195,631	1,191.06
Fiscal		93,470	571.90

Distribution by sector

Reflect: Does this analysis reflect ground realities?

NEPAL

What are the disaster risks that threaten the achievement of SDGs?

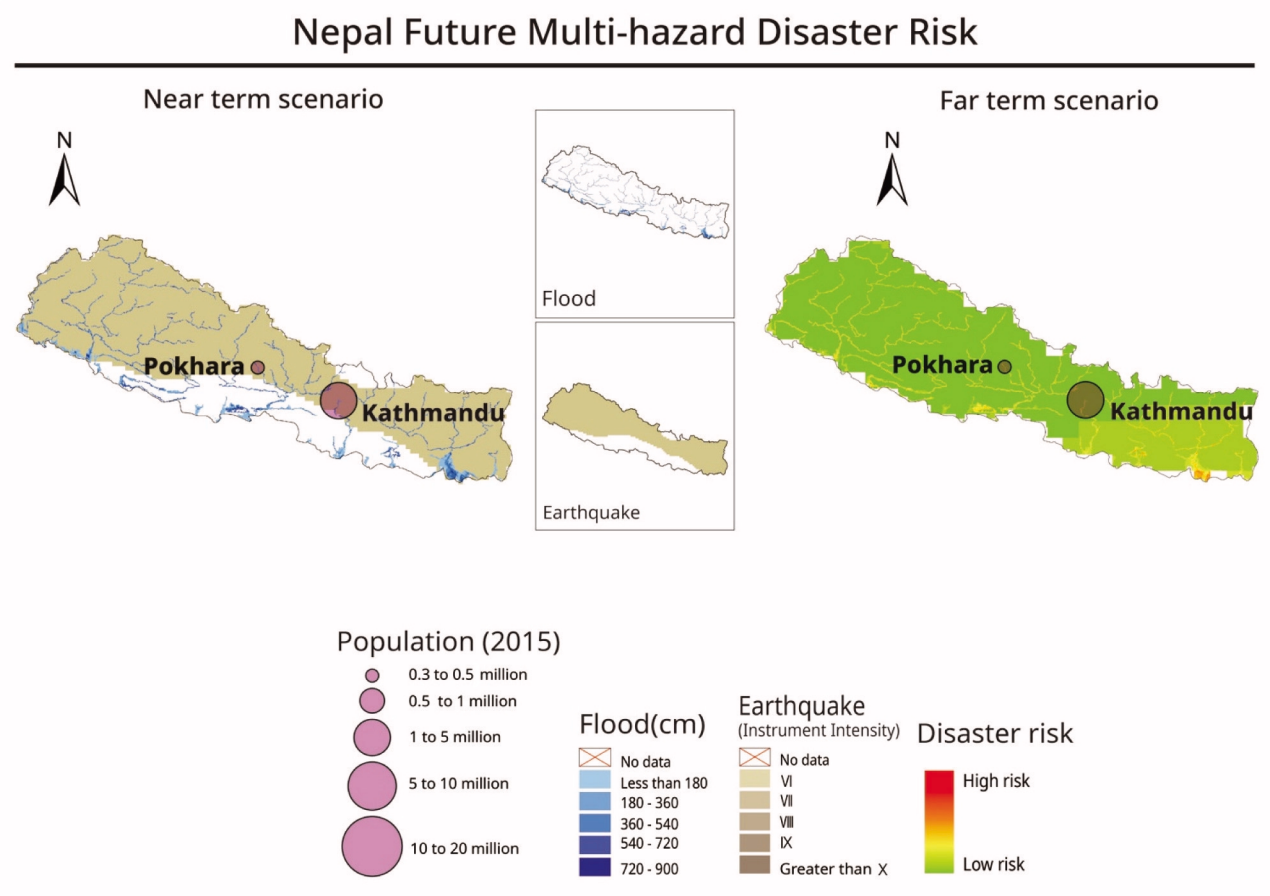
Nepal is susceptible to floods and landslides that are triggered by rapid snow and ice melt in the mountains. It is also subject to episodes of extreme, torrential rainfall, in the foothills, during the monsoon season.[58] Droughts, which are also becoming more frequent, are further endangering the livelihood of the Nepalese.[59] Between 1996 and 2015, the hazards that occurred in the country resulted in an annual average death toll of 198 people and an annual average of $20.981 million total losses, equivalent to 0.03 per cent of GDP.[60]

Future-term multi-hazard risk analysis by ESCAP (Figure 25) shows that Nepal is likely to be more exposed to hazards, such as floods and earthquakes and the extent of the areas affected will vary depending on the characteristics of the hazard. Though the expected intensity of the hazards in each region will vary, the southern part of Nepal and its shared border with India is projected to be more exposed to severe floods. In particular, floods will also affect greater areas because of the glacial melt in the Himalayas due to climate change.[61]

The Climate Risk Index (CRI)[62] ranks Nepal at 42 out of 182 countries for exposure and vulnerability to extreme events due to climate change.[63] Climate

Figure 25

Nepal: Multi-hazard Risk Map



change will increase physical exposure due to the spatial extension of hazards, with hazards hitting new places and people. In particular, floods will affect greater areas, and salinization will affect delta regions.[64]

In Nepal, 25.2 per cent of the population live below the national poverty line, with 15 per cent living on less than $1.90 a day, and the lowest 20 per cent of the population holding only 8.3 per cent of national income.[65] The World Bank has previously reported that poor people (defined as the bottom 20 per cent of the population in terms of consumption) experience only 11 per cent of total asset losses from disasters, but suffer 47 per cent of well-being losses (defined as the different abilities of poor and non-poor people to cope with asset losses, using indicators such as savings, remittances, social protection, and post disaster transfers).[66]

What policy messages can we gather from the combined systems analysis and the validators?

The SDGs systems map for Nepal (Figure 16) shows that building resilience to disasters may be supported across several sectors including health (SDG 3), infrastructure, (SDG 9), energy (SDG 7), and land use (SDG 15). Investment in these entry points will not only support building resilience to disasters but can be useful to guide more risk-sensitive cross sectoral policies in agriculture (SDG 2), air quality (SDG 3), and climate resilience (SDG 13).

Our recommendations for investment in health is also supported by the GAR established annual average loss. For Nepal, the total projected AAL is $173 million (Figure 26).[67] About 13 per cent of this loss will be

from the social sectors which incorporate the health sector.

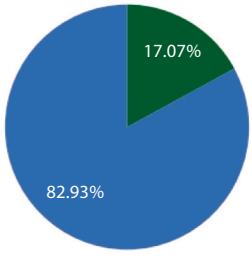
Our recommendations for investment in resilient infrastructure is further partially supported by GAR. Whereas for the other pilot countries there is a large difference between the AAL from GFCF and the AAL from social expenditure (of over 20 per cent), for Nepal, however, this difference is only 8 per cent. Therefore, the economic sectors should be also taken into account for national investments (as suggested by the systems analysis).

From the World Bank report, we further note that while risk to well-being (this is, social sector risk) is still greater than risk to economic assets, for Nepal, the difference is much smaller than in other countries. The well-being losses indicate disaster risks of poor people who are more vulnerable, but have a negligible impact on a country's aggregate wealth because they own almost nothing and have very low incomes. A set of policies with a focus, not only on, scalable social nets and post disaster support but also accelerated reconstruction, and financial support, could potentially have annual well-being gains of $282 million,[68] which may counteract the average annual loss.

Thus, investing in a resilience package that focuses more on social sectors while also focusing on economic sectors can help mitigate the future cost of disasters. Furthermore, investments in social sectors like health can also increase overall resilience through its indivisible interlinkages with agriculture, climate, and air quality.

Figure 26

Nepal: Average Annual Loss by hazard (GAR 2015) and resilience policy estimated savings



Hazard	Value	AAL/Capital stock	AAL/GFCF	AAL/Social expenditure	AAL/Total reserves	AAL/Gross savings
	(million US$)	(%)	(%)	(%)	(%)	(%)
Earthquake	29.50	0.05	0.68	2.17	0.56	0.39
Cyclonic Wind	0	0	0	0	0	0
Storm Surge	0	0	0	0	0	0
Tsunami	0	0	0	0	0	0
Volcano		0	–	_	–	–
Flood	143.34	0.27	3.29	10.55	2.71	1.88
TOTAL	**173**	**0.3**	**4.0**	**12.7**	**3.3**	**2.3**

Source: GAR 2015

	Risk to assets (Percentage of GDP)	Resilience (Percentage)	Risk to well-being (Percentage of GDP)
Current status	1.04	63	1.64
Status with policies that can reduce well-being losses	0.93	81	1.15

Source: S. Hallegatte, and others, 'Unbreakable: building the resilience of the poor in the face of natural disasters', (2016).

Reflect: Does this analysis reflect ground realities?

Limitations

Several limitations must be kept in mind while using the proposed integrated approach as a tool for policy coherence. These limitations are analysed as follows:

i) Challenges in identification of SDG interlinkages using the official SDG indicators

Well defined indicators with reliable data are required to quantify the SDG linkages. While the global indicator framework for the SDGs and targets was formally agreed up on by the UN Statistical Commission at its 48th session, the indicators are still being refined. In addition, the global indicators need to be complemented by indicators at the regional and national levels to truly reflect country realities (as seen in the case of Maldives).

ii) Challenges in reliable and trackable data for quantification

Reliable and trackable time series data for indicators is crucial to enable effective quantification of SDG interlinkages in order to ensure the robustness of the results. In the current research, we used official time series data that is available on the website for the Sustainable Development Solutions Network's Global Monitoring indicators. However, due to the lack of fully trackable time series data for all indicators, the correlational analysis and the resulting systems map may be skewed towards those indicators for which there is the most data available.

iii) Challenges in quantification of causality

Currently, the strength of the inter-linkages is estimated based on correlational analysis of the indicator-level-time series data corresponding to relevant targets. However, correlation does not necessarily establish causality. In future stages of the analysis, other options to quantify directionality of links to better reflect causality can be explored.

Looking ahead

These modules on policy coherence are part of a larger effort to understand and implement policy coherence at the national and sub-national levels. Based on country request and interest, future modules in this area can include (a) localization of the systems analysis using country or district specific indicator data, (b) understanding coherence in monitoring and reporting systems, (c) understanding coherence in disaster risk reduction budget and finance, and (d) understanding institutional coherence.

Appendices

Appendix I: Disaster-related SDG indicator data availability (2000-2015)

Figure 1

Bangladesh

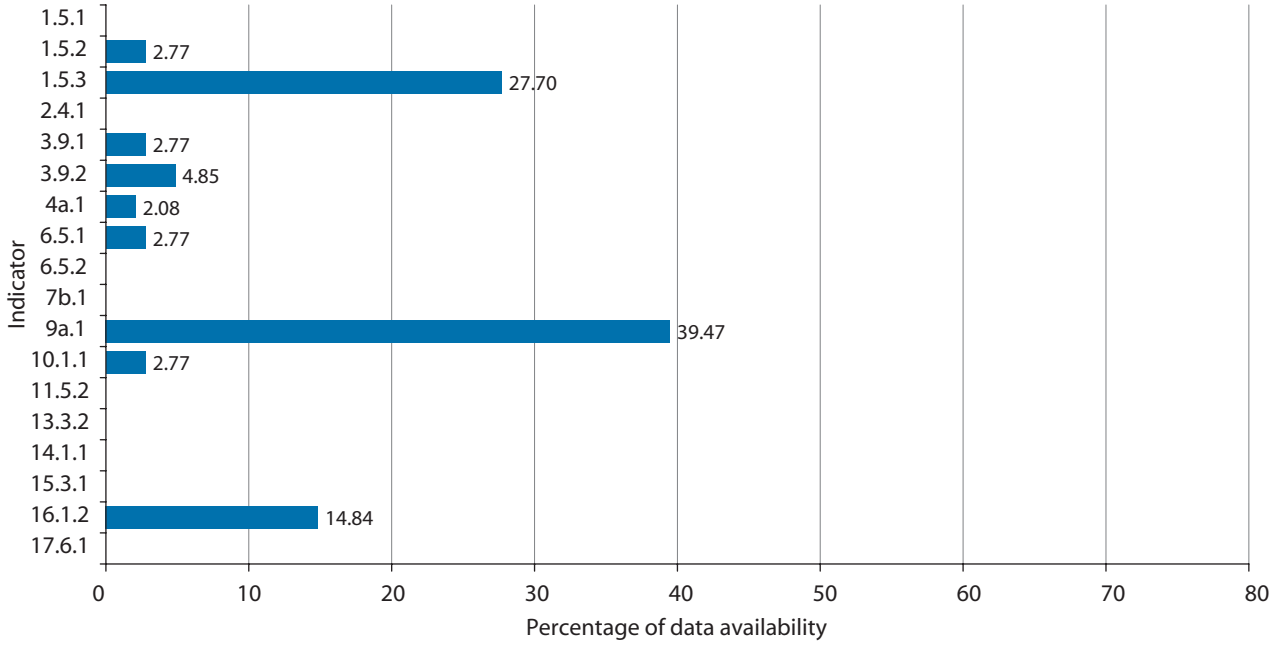


Figure 2

Cambodia

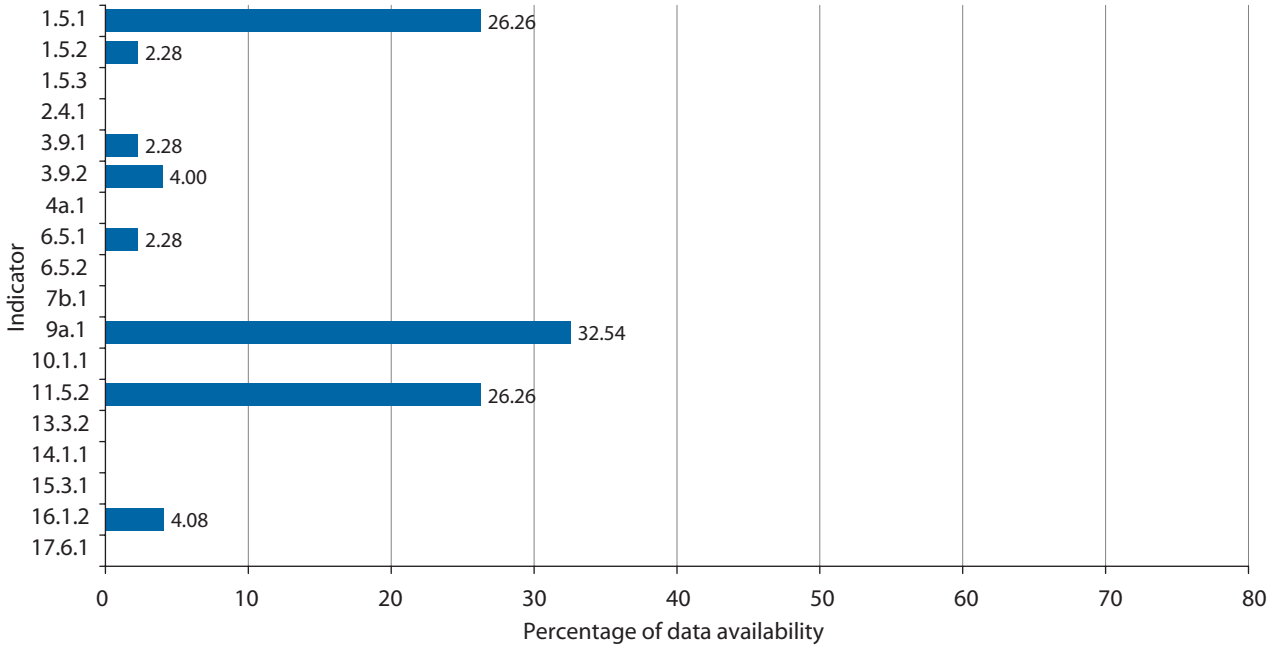


Figure 3

Maldives

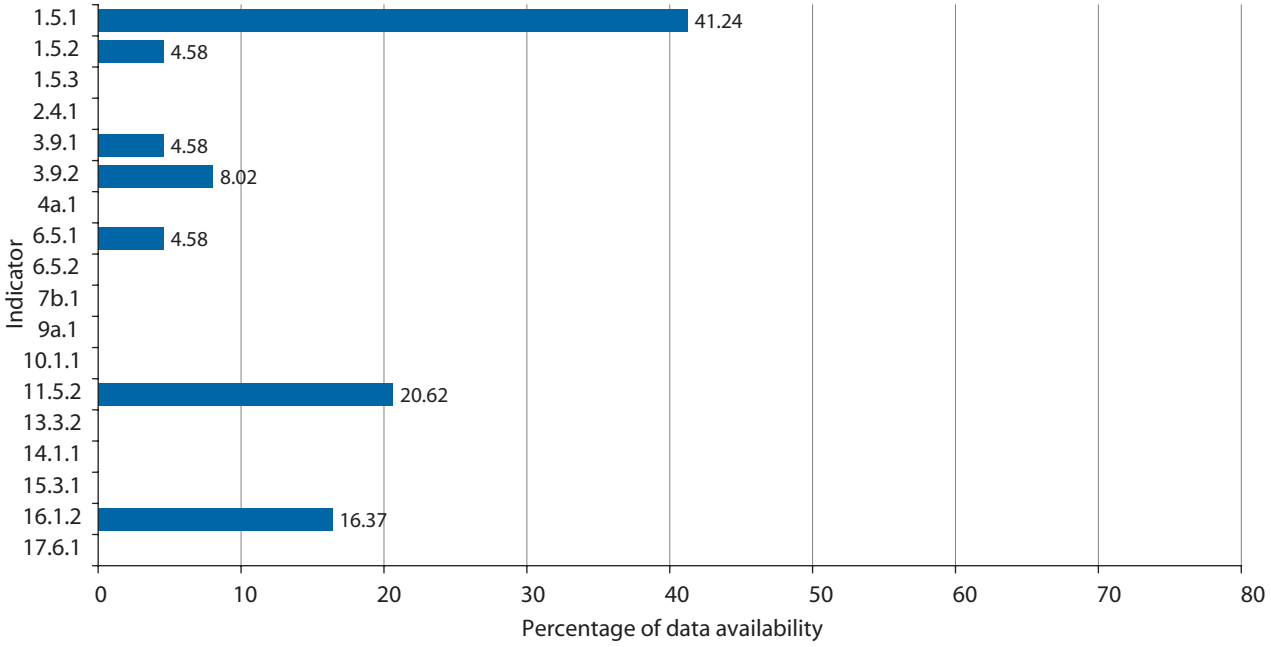


Figure 4

Myanmar

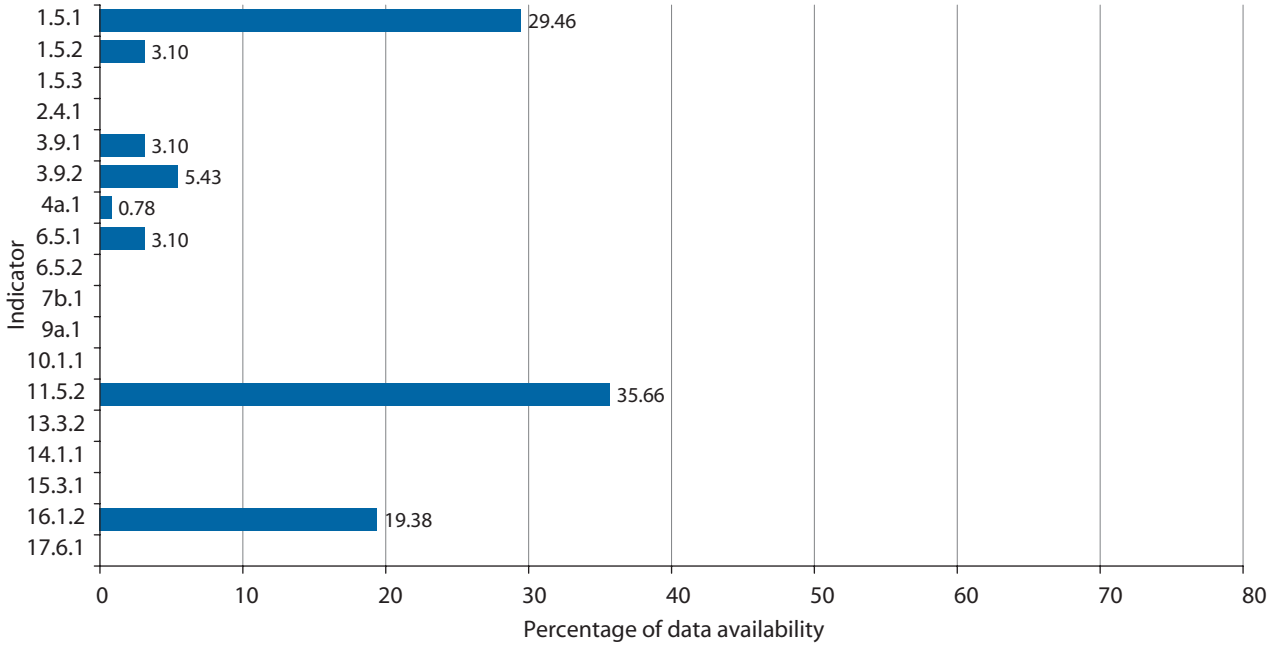
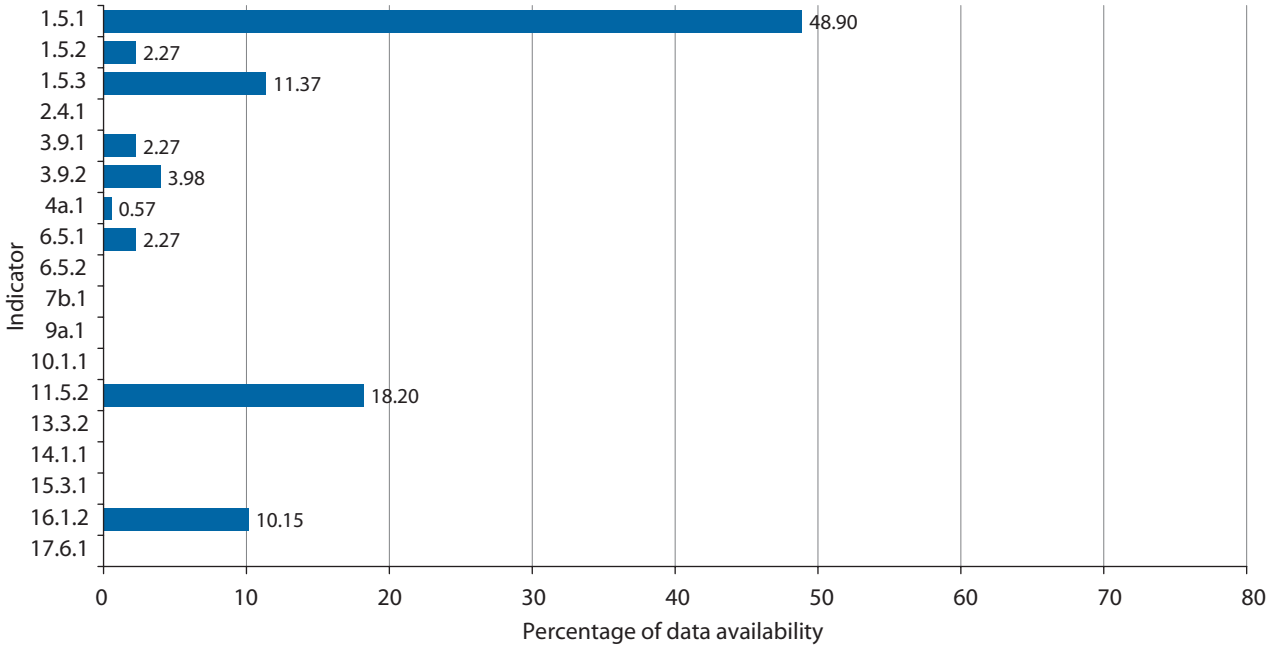


Figure 5

Nepal



Appendix II: Correlation matrices and corresponding scores for synergies and trade-offs

Table 1

Bangladesh: Indicator correlation matrix and corresponding scores for correlations

	1.5.1 Disaster deaths	1.5.2 Disaster loss	2.4.1 Agriculture	3.9.1 Air quality	3.9.2 Health	7b.1 Energy	9a.1 Infra-structure	10.1.1 Economic growth	11.5.2 Disaster, Infra-structure Loss	13.3.2 Climate resilience	15.3.1 Land use
1.5.2 Disaster loss	N/A										
2.4.1 Agriculture	N/A	NS									
3.9.1 Air quality	N/A	NS	NS								
3.9.2 Health	N/A	0.603**+ +1	NS	NS							
7b.1 Energy	N/A	NS	0.788* +1	NS	-0.778* -1						
9a.1 Infrastructure	N/A	0.599**+ +1	-0.643* -1	NS	0.629* +1	NS					
10.1.1 Economic growth	N/A	NS	NS	NS	NS	0.469*+ +1	NS				
11.5.2 Disaster, Infrastructure Loss	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
13.3.2 Climate resilience	N/A	NS	0.818*+ +2	NS	NS	NS	-0.886*+ -2	-0.830* -2	N/A		
15.3.1 Land use	N/A	NS	0.568* +1	NS	-0.987*+ -2	0.734* +1	NS	NS	N/A	-0.784*+ -1	
16.1.2 Conflict	N/A	NS	NS	NS	0.496*+ +1	-0.561* -1	NS	NS	N/A	NS	NS

Notes: *p<0.05, **p<0.10

+To provide the correct interpretations of the scores, some correlations were reversed for the indicators to be theoretically consistent

Positive correlations = both variables move in the same direction; Negative correlation= the variable move in opposing directions

N/A = SDG indicator data not available

NS = Correlation between indicators is not significant

+1 = Moderate synergy; +2 = Strong synergy; -1 = Moderate trade-off; -2 = Strong trade-off

Table 2

Cambodia: Indicator correlation matrix and corresponding scores for correlations

	1.5.1 Disaster deaths	1.5.2 Disaster loss	2.4.1 Agriculture	3.9.1 Air quality	3.9.2 Health	7b.1 Energy	9a.1 Infra-structure	10.1.1 Economic growth	11.5.2 Disaster, Infra-structure Loss	13.3.2 Climate resilience	15.3.1 Land use
1.5.2 Disaster loss	0.669** +1										
2.4.1 Agriculture	NS	NS									
3.9.1 Air quality	NS	NS	NS								
3.9.2 Health	0.531*+ +1	NS	0.880* +2	0.984* +2							
7b.1 Energy	NS	NS	NS	NS	0.671* +1						
9a.1 Infrastructure	NS	NS	NS	NS	0.842* +2	0.732* +1					
10.1.1 Economic growth	0.354**+ +1	NS	0.259** +1	NS	NS	NS	NS				
11.5.2 Disaster, Infrastructure Loss	NS	0.998* +2	NS	0.995* +2	NS	NS	NS	NS			
13.3.2 Climate resilience	NS	NS	NS	NS	0.891*+ +2	0.888*+ +2	0.817*+ +2	NS	NS		
15.3.1 Land use	NS	NS	0.827*+ +2	NS	-0.885*+ -2	NS	-0.601*+ -1	NS	NS	NS	
16.1.2 Conflict	NS	NS	NS	NS	NS	NS	NS	NS	0.960* +2	NS	NS

Notes: * p<0.05, ** p<0.10

+ To provide the correct interpretations of the scores, some correlations were reversed for the indicators to be theoretically consistent

Positive correlations = both variables move in the same direction; Negative correlation= the variable move in opposing directions

N/A = SDG indicator data not available

NS = Correlation between indicators is not significant

+1 = Moderate synergy; +2 = Strong synergy; -1 = Moderate trade-off; -2 = Strong trade-off

Table 3

Maldives: Indicator correlation matrix and corresponding scores for correlations

	1.5.1 Disaster deaths	1.5.2 Disaster loss	2.4.1 Agriculture	3.9.1 Air quality	3.9.2 Health	7b.1 Energy	9a.1 Infra-structure	10.1.1 Economic growth	11.5.2 Disaster, Infra-structure Loss	13.3.2 Climate resilience	15.3.1 Land use
1.5.2 Disaster loss	N/A										
2.4.1 Agriculture	0.311**+ +1	N/A									
3.9.1 Air quality	NS	N/A	NS								
3.9.2 Health	NS	N/A	-0.743* -1	0.991* +2							
7b.1 Energy	N/A	N/A	N/A	N/A	N/A						
9a.1 Infrastructure	NS	N/A	NS	NS	NS	N/A					
10.1.1 Economic growth	NS	N/A	NS	NS	NS	N/A	NS				
11.5.2 Disaster, Infrastructure Loss	NS	N/A	NS	NS	NS	N/A	NS	NS			
13.3.2 Climate resilience	NS	N/A	0.837*+ +2	NS	NS	N/A	0.554**+ +1	NS	NS		
15.3.1 Land use	NS	N/A	NS	NS	NS	N/A	NS	NS	NS	NS	
16.1.2 Conflict	NS	N/A	NS	NS	NS	N/A	NS	NS	NS	NS	NS

Notes: * p<0.05, ** p<0.10

+ To provide the correct interpretations of the scores, some correlations were reversed for the indicators to be theoretically consistent

Positive correlations = both variables move in the same direction; Negative correlation= the variable move in opposing directions

N/A = SDG indicator data not available

NS = Correlation between indicators is not significant

+1 = Moderate synergy; +2 = Strong synergy; -1 = Moderate trade-off; -2 = Strong trade-off

Table 4

Myanmar: Indicator correlation matrix and corresponding scores for correlations

	1.5.1 Disaster deaths	1.5.2 Disaster loss	2.4.1 Agriculture	3.9.1 Air quality	3.9.2 Health	7b.1 Energy	9a.1 Infra-structure	10.1.1 Economic growth	11.5.2 Disaster, Infra-structure Loss	13.3.2 Climate resilience	15.3.1 Land use
1.5.2 Disaster loss	NS										
2.4.1 Agriculture	NS	NS									
3.9.1 Air quality	NS	NS	NS								
3.9.2 Health	0.546* +1	NS	0.959*+ +2	0.979*+ +2							
7b.1 Energy	-0.485*+ -1	NS	0.919* +2	NS	0.938* +2						
9a.1 Infrastructure	NS	NS	NS	0.901* +2	0.622* +1	0.560* +1					
10.1.1 Economic growth	NS	NS	NS	-0.991* -2	NS	NS	NS				
11.5.2 Disaster, Infrastructure Loss	NS	NS	NS	NS	NS	NS	NS	NS			
13.3.2 Climate resilience	NS	NS	-0.900* -2	NS	NS	-0.771*+ -1	-0.793* -1	0.651**+ +1	NS		
15.3.1 Land use	0.450**+ +1	NS	0.959* +2	NS	0.980* +2	-0.932*+ -2	-0.599* -1	NS	NS	-0.920* -2	
16.1.2 Conflict	NS	NS	NS	NS	NS	NS	NS	0.383*+ +1	NS	NS	NS

Notes: * p<0.05, ** p<0.10

+ To provide the correct interpretations of the scores, some correlations were reversed for the indicators to be theoretically consistent

Positive correlations = both variables move in the same direction; Negative correlation= the variable move in opposing directions

N/A = SDG indicator data not available

NS = Correlation between indicators is not significant

+1 = Moderate synergy; +2 = Strong synergy; -1 = Moderate trade-off; -2 = Strong trade-off

Table 5

Nepal: Indicator correlation matrix and corresponding scores for correlations

	1.5.1 Disaster deaths	1.5.2 Disaster loss	2.4.1 Agriculture	3.9.1 Air quality	3.9.2 Health	7b.1 Energy	9a.1 Infra-structure	10.1.1 Economic growth	11.5.2 Disaster, Infra-structure Loss	13.3.2 Climate resilience	15.3.1 Land use
1.5.2 Disaster loss	0.798* +1										
2.4.1 Agriculture	NS	NS									
3.9.1 Air quality	NS	NS	NS								
3.9.2 Health	0.372** +1	NS	0.967*+ +2	0.992* +2							
7b.1 Energy	NS	NS	-0.511* -1	NS	0.928* +2						
9a.1 Infrastructure	NS	0.783*+ 1	-0.537* -1	NS	0.687* +1	NS					
10.1.1 Economic growth	NS	NS	NS	NS	NS	NS	NS				
11.5.2 Disaster, Infrastructure Loss	NS	NS	NS	NS	NS	-0.745*+ -1	NS	NS			
13.3.2 Climate resilience	NS	NS	NS	NS	NS	NS	-0.706*+ -1	NS	NS		
15.3.1 Land use	NS	NS	0.451*+ +1	NS	0.656*+ +1	0.948*+ +2	NS	NS	-0.795* -1	0.807* +2	
16.1.2 Conflict	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Notes: * p<0.05, ** p<0.10

+ To provide the correct interpretations of the scores, some correlations were reversed for the indicators to be theoretically consistent

Positive correlations = both variables move in the same direction; Negative correlation= the variable move in opposing directions

N/A = SDG indicator data not available

NS = Correlation between indicators is not significant

+1 = Moderate synergy; +2 = Strong synergy; -1 = Moderate trade-off; -2 = Strong trade-off

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FROM RISK TO RESILIENCE SERIES

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