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Climate change resilience — an opportunity for reducing inequalities

BACKGROUND PAPER

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Building resilience to climate change: three principles at the core of the policy process

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Summary:

Resilience of a community or country to climate change and its effects is influenced by their level of exposure and vulnerability, and by the mitigation and adaptation policies that exist. Even though mitigation and adaptation policies are complementary and both need to be strategically designed to strengthen resilience and adaptive capacity, competing priorities, structural inequalities, and inefficient policy processes are formidable challenges to achieve such coordination. This paper discusses the main features of the policy process needed to implement adequate adaptation policies and reduce exposure and vulnerability to climate change. These features allow policymakers to better scope, design, implement, and monitor the effects of adaptation policies.

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1. Introduction

Resilience of a community or country to climate change and its effects is influenced by their level of exposure and vulnerability, and by the mitigation and adaptation policies that exist. Even though mitigation and adaptation policies are complementary and both need to be strategically designed to strengthen resilience and adaptive capacity, competing priorities, structural inequalities, and inefficient policy processes are formidable challenges to achieve such coordination. This paper discusses the main features of the policy process needed to implement adequate adaptation policies and reduce exposure and vulnerability to climate change. These features allow policymakers to better scope, design, implement, and monitor the effects of adaptation policies.

Vulnerability and exposure to climate hazards are above all closely linked to existing underlying inequalities. Differences in access to public services, unequal voice in government and media, as well as differences in wealth and income, are structural conditions that determine exposure and vulnerability to climate change. Public policy increasingly recognizes that climate hazards are felt disproportionately by those most exposed and vulnerable. The effects of climate hazards on those more exposed, vulnerable, and least able to cope and adapt further worsen inequalities, in a vicious circle.

Thus, it seems wise to identify and implement policies that address immediate needs while also tackling underlying structural inequalities (such as poverty alleviation, income diversification, access to justice, etc.). This combined approach would lead to lower risks of adverse impacts from climate change and improved development outcomes. These challenges point to the need for a policymaking system that is integrated and coherent, participatory, and flexible. These are principles that, when applied to the policy process, can prove helpful to design adaptation policies, in particular given the underlying uncertainty of climate change, the locality of the effects, and the interconnected nature of economic, social, and environmental issues.

There is the need to integrate (or mainstream) adaptation objectives into longer-term development processes, such as the 2030 Agenda for Sustainable Development, with careful consideration for the uncertainties inherent to forecasting the climate change scenarios and the climate hazards created by a changing climate.

A participatory approach is needed to understand risks and vulnerability and the various priorities and interests of stakeholders, particularly at the local level. Better understanding of these risks and priorities through the engagement of local communities and stakeholders leads to better policy understanding and design.

In the context of a changing climate and greater weather variability that will bring more climate hazards, policymakers must also fully embed uncertainty into the long-term plans, using

iterative and adaptive processes. This requires a more flexible policy process, capable of incorporating lessons from each step of the process to improve knowledge and outcomes. In the context of uncertainty, no and low regret policies constitute a good starting point for adaptation, as they can address immediate vulnerabilities and structural inequalities, while at the same time they do not compromise the foundations for future resilience.

2. Policy coherence and integration across sectors

Sustainable development and resilience are multidimensional challenges, which defy single definitions or solutions. The objectives to pursue relate to multiple sectors, increasing the need for substantive coordination and integration of policy interventions. Particularly in the context of hazards caused by climate change, rather than focusing on individual risks, resilience requires the policymaking process to manage change and uncertainty in a more integrated way (Arup, 2014).

Integration and coherence of policies across sectors is also the most pertinent way to address root causes of vulnerability, which are often interrelated and cumulative. Poverty and development status, for example, are obvious determinants of the capacity of people to cope and adapt to shocks. But there is also an underlying connection between vulnerabilities and multiple inequities in access to assets, land, work, political processes, and others. All these inequities need to be dealt simultaneously, as they all play a role in determining exposure to climate-related shocks and the capacity to cope and adapt. Integrating and designing coherent policies strengthens resilience to climate hazards for the most vulnerable, by addressing several crucial dimensions of their livelihoods, but also by taking advantage of potential co-benefits, while avoiding unintended consequences and maladaptation.

A. Integration to support a multi-sectoral approach

In many countries, there are plans for adaptation to climate change and for development in general, but they are often fragmented and overlook the multidimensionality of livelihoods and structural inequalities. In order to minimize current and future impacts of climate hazards on livelihoods, strategic coping and adaptation policies should be considered an integral part of the framework and process of sustainable development. This implies embracing and respecting a multi-sectoral approach. The challenge lays in how to effectively coordinate and integrate multi-sectoral policies under a single overarching vision that is consistent with long term objectives and that does not lose sight of relevant priorities at sectoral level.

A case in point is the challenge of food systems, which is one of the most critical sectors affected by climate change and requiring a multi-sectoral approach, given the number of interrelated dimensions that need to be addressed simultaneously in order to minimize current

and future impacts of climate change on food security and livelihoods in general. Agricultural practices, for instance, need to change to improve yields and ensure sufficient food production, but also to preserve ecosystems and natural resources in the long-run. The preservation of ecosystems, through new management responses of natural resources, will be determinant to ensure sustainable livelihoods and food security. Thus, policies to stimulate agricultural productivity should integrate ecosystem preservation goals, instead of being designed in parallel to environmental policies and being mostly driven by technological and economic objectives.

A community-based forest rehabilitation for slope stability project in the Bolivian Altiplano is a concrete example of a successful integration of new management of natural resources and adaptation objectives. The project was implemented over the course of 15 years using a community forestry approach both to generate income and to stabilize slopes at risk of landslides. The slopes had become exposed as a result of environmental degradation. The assessment of the project was done in close consultation with communities, and results in fact show that livelihoods were more diversified, watersheds improved, while risks from landslides decreased. This highlights the importance of management of ecosystems and livelihoods as an integrated strategy for climate change adaptation and development (Renaud, Sudmeier-Rieux and Estrella, 2013).

Adaptation strategies also need to be embedded in a more diversified livelihood, particularly for the most vulnerable. Stabilizing and increasing income levels of the most disadvantaged groups will help ensure their livelihoods are more resilient. Social protection systems for instance, including safety nets, can protect lower income groups against short-term economic and food price shocks, enhancing their coping capacity and perhaps their capacity to aspire to transformative change in the future. Integrating also instruments or policies that promote access to insurance and capital markets can complement those protection schemes and help local small landholders to cope with possible negative consequences posed by extreme weather events and to invest in new crops or any relevant input that can help the adaptation process to future climate hazards.

Policies specifically designed for the agricultural sector can be complemented by other interventions that improve rural-urban linkages, in order to promote alternative sources of income, enhance food security for both rural and urban households, while reducing poverty, especially in countries where the process of urbanization is accelerating (United Nations, 2013). In China, for instance, the existence of areas of high population density combined with lower transport costs has encouraged labour intensive manufacturing to use labour force from rural areas. Evidence from an FAO report shows that in agricultural based economies, non-farm sources of income represent about 20 – 30 per cent of total income for rural households. Remittances from household members who migrated to urban areas can be a significant portion of the non-farm income of households (FAO, 2012). Policies that facilitate the transfer of such remittances would then also come as very necessary.

One main challenge is however to ensure that multi-sectoral approaches lead to transformative adaptation strategies that can enhance resilience to climate hazards. For instance, there is issue of how to cope and adapt to the impact of higher temperatures on human health. In terms of extreme heat, heatwave national plans are being increasingly used, especially in countries where temperatures can reach unbearable levels. In India for example, officials are launching a program to protect people from extreme heat in two high-risk regions, after a devastating heat wave killed at least 2,500 people across the country in 2015. The cities involved in the program will spend months preparing for summer by educating children about heat risk, stocking hospitals with ice packs and extra water, and training medical workers to identify heat stress, dehydration and heat stroke.

These plans are geared towards reducing health risks in an incremental way—which by itself brings about the challenge of strengthening health systems as a whole, but ideally they could be complemented with a myriad of policies in other sectors, such as transportation, building design, and urban land use management (WHO, 2009). These multi-sectoral policies would lead to a more transformative adaptation strategy. For instance, the so called "urban heat island"[1] effects – a major source of heat aggressive for human health – can be reduced by substituting bitumen for concrete or for more heat-reflective substances, or by creating more green spaces (Silva, Phelan and Golden, 2010). Furthermore, urban policies to improve the roads, rules and signalling for bicyclists, pedestrians and other alternative road users improves their safety, and incentivizes the uptake of these means of transportation, which creates both health and climate benefits by decreasing air pollution, physical inactivity, and GHG emissions.

B. Integrated policies that promote co-benefits

Resilience enhancing policies can present benefits for development objectives, and vice-versa. The potential for such co-benefits has important implications for designing and implementing adaptation and development policies and need to be properly assessed. Policies with potential co-benefits bring cost-effectiveness advantages, which may encourage policymakers in implementing them but not in all cases they are easy to devise. Also, potential co-benefits may help integrate a specific policy into an existing policy framework. In this regard, an integrated approach can both take advantage and encourage policies that present benefits for resilience to climate hazards and sustainable development.

A good example in the context of food security is the introduction of social protection schemes. Social protection schemes, including safety nets, can protect the most vulnerable against short-term economic and food price shocks, enhancing their coping capacity. But at the same time, they can also contribute to long-term resilience, by strengthening the ability of smallholders to manage risks and adopt better adaptation strategies. Evidence has shown that

[1] An urban heat island (UHI) is a city or metropolitan area that is significantly warmer than its surrounding rural areas due to human activities.

climate change reduces investment incentives in agriculture and the ability to adopt better adaptation strategies, with negative indirect effects on food production. As observed in the Nile Basin of Ethiopia, where changes in temperatures and rainfall have been taking place in the past 20 years, farmers with financial constraints did not introduce recommended adaptation methods, while those who could afford to adapt undertook soil conservation, used different crop varieties, and irrigate their farms (Deressa, and others, 2009). Thus, predictable social security programmes that target the most vulnerable, particularly the small landholders, by providing a robust safety net, can stimulate the investment in more productive human capital and technologies. By ensuring a basic level of consumption, this type of safety nets enable small landholders to engage in higher-return production strategies, even though riskier from a subsistence point of view. Similarly, access to insurance and capital markets can also help local small landholders to cope with possible negative consequences posed by extreme weather events and to invest in new crops or any relevant input that can help the process of adaptation to climate hazards.

As discussed previously, uncertainties are high at the local level in particular. It is then difficult to predict the impact of climate hazards on the agricultural sector. Due to this uncertainty, adaptation options would benefit by being embedded in more diversified livelihoods, particularly for the most vulnerable. And a diversified farming system can also have co-benefits. Integrating horticulture and livestock for instance, can enhance nutritional outcomes, as it improves rural households' access to food from different sources. A case in point is a diversified farming system at the household level in Viet Nam, integrating vegetation, aquaculture, and cages for animal Husbandry (VAC). This system has contributed to improvements in both income and nutritional outcomes (FAO, 2013).

The health sector is also another domain that can benefit from a number of policies in other sectors. For instance, improving fuel and combustion efficiency for decreased GHG emissions requires actions in the energy sector, but has co-benefits in the health sector, by decreasing air pollution and decreasing a burdening demand for health services. Relatively simple and extremely efficient measures, such as the use of improved cook stoves in households, could avert the loss of many of the 2.9 million deaths occurred in 2013 due to indoor air pollution, while decreasing GHG and pollutant emissions. Many initiatives are already in place, such as the ambitious pledge by the Global Alliance for Clean Cook Stoves (a public-private partnership hosted by the UN Foundation) to foster the adoption of clean cook stoves and fuels in 100 million households by 2020.Coherent policies to avoid maladaptation

Sectoral adaptation policies are designed to address unidimensional issues, such as a specific source of vulnerability. However, when these policies are not integrated and coordinated without taking into consideration other sectors, maladaptation may arise due to inconsistency with other dimensions of vulnerability. The same challenge may arise between short term solutions, which may be inconsistent with other long term adaptation needs. This is what defines maladaptation and failing to anticipate the consequences of interventions, poor planning, or an excessive focus

on short-term objectives can result in greater vulnerability in the future, negative effects on other communities or sectors, or less options in the future. An integrated approach, instead, presents the advantage of taking into consideration different priorities and several sources of information that are crucial in the policymaking process in order to avoid maladaptation.

The example of Morogoro, Tanzania is often used to illustrate a maladaptation strategy, despite the fact that local actors have adapted to climate hazards challenges in many ways. As discussed previously, livelihood diversification is considered an efficient adaptation strategy, by incorporating non-farm income activities. Many farmers in Morogoro have tapped more into natural resources for subsistence and alternative income – for instance by increasing access to mining and developing new artisanal activities. These strategies have helped in responding to short-term needs, but in the long term they present a number of new challenges due to natural resources degradation, in particular deforestation and land cover change, which has negative consequences on land and water conditions. This is expected to limit adaptive capacities in the long term, due to the degradation of environmental conditions.

At the same time, the efficiency in the use of natural resources can also lead to maladaptation. Governments tend to create incentives for farmers to conserve water use with access to more efficient irrigations options. However, irrigation that is more efficient can lead farmers to use more water by expanding the size of the irrigated crops. In some cases, promoting greater efficiency results in greater total water use (FAO, 2015, chap. 3). Another typical example of maladaptation, which takes place more often in richer countries, is when policies to protect the population from heat waves and avoid excess demand on urgent health services results in greater use of private air conditioning and consequently greater demand for energy (O'Brien, and others, 2012). This type of adaptation initiatives simply shifts the pressure from one sector to another, representing a maladaptation. The overall vulnerability of the system is not reduced; instead, one source of vulnerability is replaced by another.

An integrated approach can help design coherent policies and avoid some of these unintended consequences. In coastal areas, there is often the challenge of avoiding the destruction of sand dunes due to the construction of tourism facilities close to the water. The degradation of sand dunes not only alters the costal ecosystem, but in the long run it also increases the facilities' exposure to storms and water rise (Magnan, 2014). This represents a typical trade-off between economic development and environmental challenges. Ideally, an integrated approach would attenuate the trade-off, by limiting the habitat degradation and consequently the collateral effect on assets' exposure to climate-related hazards. An integrated approach may not completely avoid the trade-off, but it can take into account the negative effects and put in place compensation mechanisms, such as the protection of marine ecosystems to allow them to maintain their natural resilience and adaptive capacities, and then ensuring their buffer function against waves (Magnan, 2014).

C. Overcoming constraints to integration

An integrated approach is not an easy task, however, due to the complex nature of the policymaking process and diverging stakeholders' priorities. Even though an integrated policy process can benefit greatly from the recognition of diverse interests, circumstances, social-cultural contexts, and expectations, in practice integration remains an immense challenge (IPCC, 2014).

There are concrete difficulties to integrate policies and agendas effectively:

- the complexity of the problems and of the options;
- the uncertainties about policy impacts;
- the existence of institutions with specific mandates;
- difficulties created by short-term funding cycles, and;
- how to incorporate phasing and timing issues in planning and budgeting concerns.

At the institutional level, there are often limited financial and human resources, especially at the local level. The absence of key adaptation leaders and advocates and limited local data and tools to monitor and assessing adaptation effectiveness are additional constraints. As a result, the focus is typically on simpler approaches of analysis and on choosing policies that avoid causing unintended harm. There is also a pervasive underestimation of the complexity of adaptation as a social process, creating unrealistic expectations about achieving intended adaptation outcomes (Mimura, and others, 2014; United Nations, 2015). Inadequate assessments that fail to integrate adaptation options and their outcomes or lack of them therefore of are part of the problem.

Adaptation initiatives should for instance take into consideration local social characteristics and cultural values. The need to improve the livelihoods of women is undeniably a necessary condition for inclusive and sustainable development, but the question is often through which process this is more viable . In India, for example, despite the rapid growth in recent years, a combination of factors led to the decline in the participation of women in the country's labour force and greater vulnerability. There are multiple factors explaining this decline, but in particular, there are social constraints deeply rooted in local culture, such as the lack of what is culturally deemed "suitable jobs for women" (as defined by local communities). In many traditional areas, women's work outside the home is acceptable only under certain conditions. In India, however, these suitable job opportunities for women in villages and small towns have declined dramatically (Chatterjee, Murgai and Rama, 2015, 2016). Even when laws are in place to ensure equal rights in labour markets for women and men, cultural barriers prevent women from exercising their right (Barry, 2016). For communities that are exposed to climate and economic hazards, this situation acts to sustain existing vulnerabilities. Policies for economic

empowerment and growth must be integrated and coherent with cultural and social policies to ensure that the desired outcome of policies is achieved (Masson, and others, 2016).

In addition, the process of integration should also take into consideration different sectoral or stakeholders' priorities, and sometimes align adaptation strategies with sectoral activities. Disregarding sectoral approaches in favour of a cross-sectoral ideal is sometimes overly simplistic. A recent study of the European experience found that "comprehensive policy integration cannot be achieved through a single multi-sectoral strategy" (Nordbeck and Steurer, 2015). At best, multi-sectoral governance arrangements can communicate a vision and respective priorities. Each stakeholder has its own priorities that require political dialogue and negotiation. According to the authors, "better policies usually emerge from conflicts between specialists advocating competing solutions, not from a vague consensus". Because of this, the coordinating agency has an important role to play in engaging, listening, and responding to political processes, while encouraging actors to explore integration that has synergies with their sectoral perspective (United Nations, 2015).

In sum, policy integration, if it is to be effective, must balance a holistic and coherent vision with the existing sectoral and local contexts. Policymaking has to take into account specific sectoral contexts and priorities, both political and cultural. And the integration process has also to take into consideration practical implementation at the sectoral level and available financing sources for each sector, while providing sufficient financial and institutional support to committees and other bodies involved in coordinating multi-sectoral programs. These aspects of policy integration need to be pondered through ex-ante assessments.

3. Involving all stakeholders to identify risks and implement solutions

Incorporating different voices with equal importance and respect in the same policy process is no easy: these voices are often very disparate or even opposing, and are shaped by different educational and cultural backgrounds. They are, as a consequence, often bypassed or curtailed in policy making. Despite the difficulty, involving stakeholders remains important, especially since inequalities are more acute and felt more sharply at the local level. This section argues that involving stakeholders, beyond being necessary, must respect three conditions: i) participation must be equitable and meaningful (to reduce inequalities), ii) local knowledge plays a critical role (to make better identification of problems), and iii) relies on valuable social networks (to have better implementation of projects).

Though the impacts of climate hazards are felt more strongly at the local level, adaptation must be a collective effort, in order to have efficient, long-term, equitable solutions to the local problems. Governments are called to step up and intervene, using their unique capacity to

convene stakeholders from all sectors (private, civil society, scientific and academic), to mobilize national action, and to act first where other sectors would otherwise not (or would take too long or would feature just an elite of interests). Governments can also ensure that the solutions reached are equitable and respect both majorities and minorities.

However, effective adaptation needs political negotiations, as a solution for bridging diverse interests and limitations and a key aspect of those negotiations is who gets to be involved in it. Regrettably, the most vulnerable, who are disproportionately more affected by climate and weather and should thus have more voice, are often left out of political processes or inadequately represented. Inequality in political participation is at the source of vulnerability and exposure to climate hazards, as noted in chapter II. Policymaking should then strive to be as inclusive of all stakeholders as possible, not least because there are also advantages to broader participation, namely in terms of building synergies and avoiding trade-offs. It is also a fairer process, capable of addressing better the underlying causes of vulnerability while considering the links with other development objectives. In line with this, the Rio Declaration on Environment and Development includes a provision on guaranteeing citizens' rights to information, participation and justice on environmental issues.

There are also disadvantages to unbalanced or lopsided policymaking. Certain problems might be left unidentified and unattended, with potential dire consequences in the future, since those who could identify them and advocate for their resolution are not present. Even with correct identification of problems, the solutions chosen might have unintended consequences on groups that are not present in the negotiations. The range of solutions analysed might also be smaller and less imaginative due to potential lack of diversity of views. Lastly, the solutions might turn out to be (or be perceived as) unrepresentative of the community they apply to and ultimately end up not being adopted. Thus, the involvement of all stakeholders is an integral part in improving the outcomes at each stage of the policymaking process and the policy cycle. Chapter III, for example, shows the importance of engaging stakeholders in the design of assessments of vulnerabilities, impacts and policy responses.

Climate adaptation is an objective most likely in competition with other priorities. The policymaking process stands to benefit greatly from being fully participatory and make early and clear recognition of diverse interests, circumstances, social-cultural contexts, and expectations.

A. Ensuring equitable and meaningful participation of stakeholders

Problems are increasingly complex, defying any simple definition or solution. At the same time, as highlighted in the previous section, policy objectives (including climate objectives) are increasingly being defined in the context of multiple sectors (energy, health, agriculture, transportation, among others) and their realization (or lack of) is substantially felt at the local level. Consequently, several sectors and levels of governance are increasingly being called to act

together and simultaneously, specifically local and national governments (see previous section on integration and the need for multisector coherence).

The interaction between these two levels governments is ever more crucial and an important component of well-designed adaptation strategies and implementation. National actors have a particular role in creating the policy space (legal frameworks), providing information, and facilitating financial support. In this regard, they can have a large impact in promoting economic development at the local level, to strengthen local communities' capacities and resilience. National governments also have a role in identifying and protecting vulnerable groups (IPCC, 2014). On the other hand, because local structures are less fragmented compared to national level structures, it is easier to coordinate and implement policies at the local level. Local agencies also have important roles to play in scaling up adaptation strategies, and in understanding local needs and risks.

However, the legitimacy of local participation depends on including those who are influential, but also those who are most affected. Understanding these structural inequalities of social and political power is very important, in order to give voice and agency to those who are otherwise invisible to the process. Many factors—economic status, political voice, religion, culture, tradition, illiteracy, disability—have the potential to limit the participation of some individuals or groups from the process, fostering inequality in political voice and influence over the political process. For example, those with greater experience in decision-making processes and greater social and political capital may dominate the decision process. In the case of hurricane Katrina, it can be argued for instance that the Industrial Canal that runs along the west of the Lower 9th Ward, which failed and flooded the city, was placed in that specific location due to the limited local political power of the area's inhabitants (mostly poor African-Americans). In contrast, the districts inhabited primarily by white wealthy households had better protective infrastructure, even if their elevation was also low. Moreover, poorer and minority residents had less access to the local political processes that were involved in the recovery process (see chapter II for a complete discussion). Even when the appropriate groups are included, interests and priorities may be irreconcilable and outcomes may result from micro-politics and differences in power relations (Few, Brown and Tompkins, 2007).

Thus, without *meaningful* participation of *all* stakeholders, there is the risk that inequalities increase due to the ability of certain groups to exert a disproportionate influence. In this regard, major public actors and agencies have first to place trust in the capabilities of local key stakeholders to deliberate and propose effective and equitable solutions. Achieving this in practice requires the identification and inclusion of appropriate stakeholders from the beginning. In addition, engagement must go beyond minimal information sharing and consultations. Stakeholders must have the opportunity to argue for and decide on alternative options.

Involving local communities in the management of resources such as any existing climate adaptation funds or other programs could provide this opportunity and be an avenue to combat

corruption in their allocation and implementation since climate adaptation projects must often engage with economic activities that are particularly prone to corruption, such as forestry and water resources management (Petherick, 2014). Namely, through the implementation of participatory budgeting programs, whereby ordinary citizens get involved in budget meetings with local government officials and get to vote about how (usually, part of) the budget will be spent. Entire communities become better informed to monitor policy implementation, and accountability is made more diffuse and ongoing. In Brazil (where participatory budgeting started in 1989), municipalities with participatory budgeting have been shown to use their public finances significantly more effectively than those without participatory budgeting. Though there might be concerns among experts to keep decision-making power away from the apparently uninitiated on complex matters, locals can surprise with different forms of expertise (Petherick, 2014). At any rate, locals will be the ones determining the success of any given project.

B. Taking advantage of local knowledge

Because the most intense and direct effects of climate events are experienced at the local level, scoping (or identifying) objectives and risks can benefit tremendously from knowledge accumulated by local communities. There is an obvious role for this knowledge in tailoring interventions to local context and conditions; for example, local knowledge can inform technical assessments of adaptation options and vice-versa (see chapter III). Furthermore, it can help reduce inequalities, as local experience and knowledge can provide particular insights into the causes and solutions of vulnerability and exposure. For the citizens of the city of Gorakphur, India, tapping into local knowledge already brought significant benefits in terms of climate resilience for a community constantly challenged by floods, heat waves, storms, and other climate-related shocks.

Understanding the local impact and context also helps to avoid actions that may lead to adverse climate outcomes, more vulnerability or decreased welfare (maladaptation) or incomplete solutions. In Sri Lanka, for example, the introduction of high-yielding, hybrid varieties of rice seeds had an initial beneficial effect on yields, but undermined the ability of farmers to adapt to changing conditions. The support for the new seeds eroded indigenous knowledge of the almost 2,000 traditional varieties that existed and undermined local seed banks. To the detriment of small famers in Sri Lanka, the new fertilizer-depended seeds are less able to cope with the increasing water salinity in the region caused by higher temperatures, the rise of the sea level, and the failure of irrigation systems (Ensor and Berger, 2009, chap. 5).

To avoid such outcomes, studies have shown that adaptation choice and implementation are facilitated when there is constructive and transparent engagement with the communities at risk, particularly in island environments (Nurse, and others, 2014). A study of the Fijian tourism sector concluded that "approaches that explicitly integrate stakeholders into each step of the process from vulnerability assessment right through to consideration of alternative measures can provide a sound basis for assisting destinations with the implementation of appropriate

adaptation interventions" (Moreno and Becken, 2009, ; as seen in Nurse, and others, 2014). Moreover, since adaptation options are often subjective, stakeholder participation can help tackle better the priorities and expectations that the people have regarding the sector targeted for adaptation (*ibid*).

C. Taking advantage of local social capital

The implementation stage of policies also stands to benefit when scientific groups and public agents interact more closely with local communities, since in communities with high levels of social capital, these are likely to be more effective in circulating, for example, health and related messages (Frumkin and McMichael, 2008). In addition, from this interaction, inequalities in the communities can be reduced at a much faster pace. This interaction is also proving critical to improve climate impact assessments, particularly to reduce uncertainty in scenario results (see chapter III).

In the context of food security, an example of fruitful interaction of this kind is the Southern Agricultural Growth Corridor of the United Republic of Tanzania (SAGCOT). SAGCOT integrates several stakeholders – private sector, government, and civil society – in a common platform in order to achieve the triple objective of agricultural productivity, food security, and protection of local livelihoods, while protecting the ecosystem (United Nations, 2013). The participation of several stakeholders, including at the local level has helped promote an efficient use of natural resources, and of the ecosystem as a whole, considered an important aspect for the sustainability of the whole agriculture and food system.

Lastly, local measures do not depend solely on what a local government does, as much as they also depend on what it encourages and supports – namely, the use of local social capital. In the Colombian city of Manizales, for instance, national and regional authorities worked together with local communities and leaders to discourage settlement on unstable slopes that threatened livelihoods and lives. A public awareness campaign was undertaken, the risks of living in dangerous land were explained, and a relocation scheme was put in place. Beside this, local women were trained to create and maintain slope stabilisation measures in their respective locations. Most notably, these women's training programme was supported not only by the municipal government, but also local academic institutions, local technical specialists, and local NGOs. This full range of actors was also called upon to review any new urban plans, in the form of a local committee (Arup, 2014).

4. An iterative and flexible policy process to cope with uncertainties

The need for addressing underlying inequalities that determine vulnerabilities is a long-term process that requires transformative policies, but this is usually at odds with a perspective that aims to reduce immediate vulnerabilities without addressing underlying causes. Effective policy action for climate-resilient sustainable development under uncertain scenarios requires policy processes that are flexible and adaptable and that can identify the structural inequalities that perpetuate vulnerability. Policymakers increasingly recognize this challenge and the need to focus on immediate and near-future decisions that have longer-term impacts, ideally facilitating transformation, while maintaining flexibility to adjust to changing conditions and information. The effect of uncertainty on adaptation policy action can be reduced by reframing the challenge in terms of the implications for near-term decisions while maintaining flexibility in adaptation plans and strategies.

The magnitude of the effects of climate change is constantly revised with new climate projections, impact assessments, environment statistics and information from other sources included that provided by local stakeholders. Climate technologies are steadily improving, particularly in what regards assessments, environment statistics and information and communication technologies (see chapters III and V). Despite continuous improvements, climate and weather predictions are still fraught with uncertainty and there is still only a limited understanding of how climate affects weather events, and how climate hazards threaten local communities (Committee on Extreme Weather Events and Climate Change Attribution, and others, 2016). At the same time, long-term trends in inequality, population growth, urbanization, economic globalization, technological change and others will interact in profound ways with climate hazards in ways that are difficult to foresee (see chapter I). Moreover, future climate trends depend on national and international actions being taken in the next few years and decades. A recent report on the melting of the West Antarctic ice sheet, for example, found that sea levels will possibly rise by as much as three feet by the end of the century, with sever implications for the world's coastal cities (Gillis, 2016). This new estimate of the sea level rise speed is roughly twice the expected increase in the plausible worst-case scenario just three years ago indicated by the IPCC (Church, and others, 2013).

The implications of uncertainty to policymaking are profound. The uncertainty of forecasting long-term climate trends and their effect on weather patterns is compounded by the need to be geographically precise since the effects of climate hazards are felt at the local level. Policymakers need information not only on global and regional climate trends, but also on their expected effect on local weather and on local communities. The uncertainty of climate trends and constantly changing information are a challenge to policymaking processes that must be responsive and relevant to the needs and competing development priorities. Thus, policymakers

must contend with the inherent conflict between short-term actions and the need of making them consistent with longer-term development strategies.

Rather than seeing adaptation actions as individual actions, it is important to see them as part of an evolving pathway where decisions are repeatedly revisited (Reisinger, and others, 2014)—based on assessments that are also constantly revised. Policymaking processes must continuously monitor, assess, and adapt to new information and changing priorities (Davoudi, Brooks and Mehmood, 2013). In practice, policymakers are faced with the challenge of incorporating uncertainty into daily action, using iterative and adaptive processes. For effective policy making it is particularly important to understand the value of emerging information and the risks of lock-in and path dependence. This has placed a strong focus on identifying ways for policymakers to benefit from flexibility, risk diversification and to adopt a portfolio approach of complementary policy options.

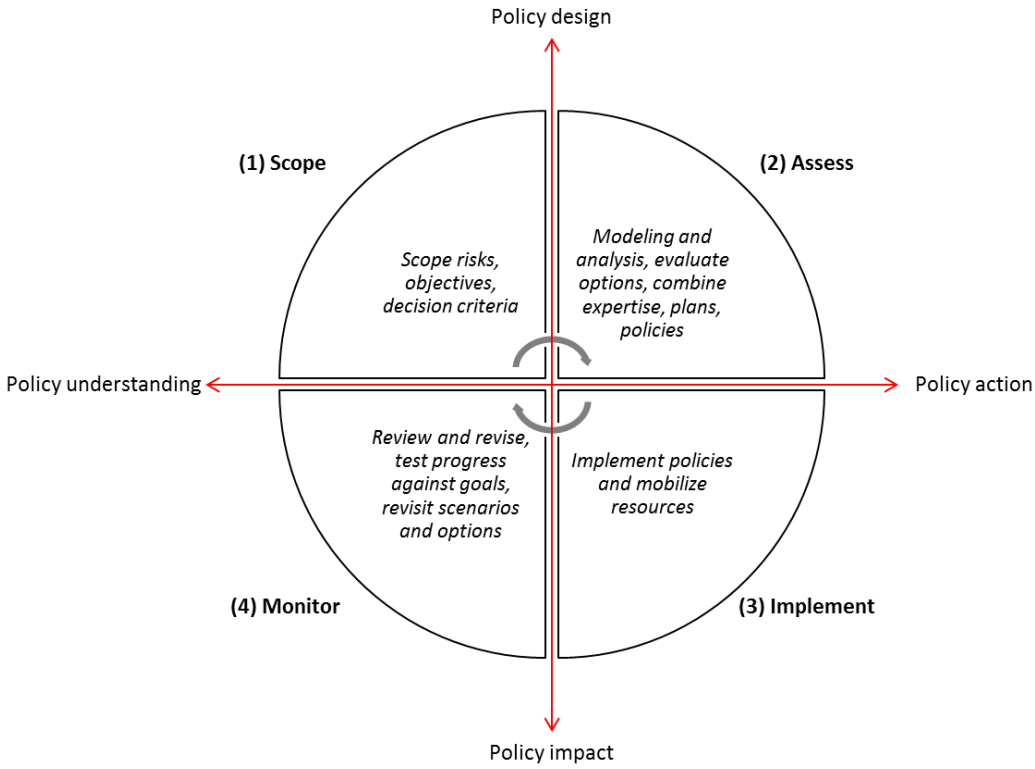
The usefulness of being flexible to new information and adaptation options in light of new information is illustrated by a study of the impact of three adaptation options used by farmers in Ethiopia's Nile Basin—changing crops, water conservation, and soil conservation. Veronesi and Di Falco (2012) find that, when each of the options is taken in isolation, they have no effect on improving net revenues for farmers. However, when adaptation options are combined, the gains for farmers are large and significant. For example, the authors find that changing crops combined with water conservation strategies delivers the largest gains of any of the other adaptation options. The study concludes that adaptation to climate change based upon a portfolio of strategies is superior to single-option strategies. The study also sheds light on the need to remove structural barriers that some groups have in accessing the full range of strategies, either because of poor socio-economic status and access to financial resources, or due to a lack of knowledge that comes from low levels of education or lack of information. A flexible decision making process allows for experimentation and learning in the search for best adaptation options.

A. The policy making process

A decision making process comprises a series of activities, starting from policy design, implementation and monitoring the impacts. Sometimes referred to as "iterative risk management", the process can be divided into four distinct stages, illustrated in figure IV.1. The four quadrants in the figure represent each of the four steps of the policy cycle: scoping of policies and objectives, analysis and assessments of options and objectives, implementation of policies, and monitoring and review of impacts. At each stage, progress can be measured in terms of the quantity and quality of effects along each of the four axes: policy design, policy action, policy impact, and policy understanding. Policy design represents qualitative improvements in the design of policies that come from greater understanding during the scoping process. Policy action captures a certain degree of ambition of desired effect, perhaps size of the project, or the number of people to be helped, etc. Policy impact is typically measured with pre-defined metrics of policies and projects, such as the number of people affected or the value of the

improvements. Policy understanding is meant to capture the knowledge that comes from monitoring and evaluating the policies.

Figure IV.1: Decision making process in four stages



Source: UNDESA, adapted from Jones, and others (2014, fig. 2–3).

B. An iterative policy process to better cope with climate hazards

Learning and reviewing are important to track progress and improve outcomes. Lessons from practical experiences and from pilot programs need to be continually identified and incorporated into adaptation plans. In the context of hazards caused by climate change and the need for resilient sustainable development, flexibility is a key characteristic of the process if it is to be useful in situations with persistent uncertainties, long timeframes, emerging new information, and a multidimensional and multi-sectoral set of factors. Crucially, policy interventions need to be iterative and flexible, allowing for changes informed by the knowledge gained.

Flexibility requires the ability to incorporate lessons from each step of the policymaking process to improve knowledge and outcomes as new information is gathered, goals and priorities change, and new lessons are learned. Achieving this requires a focus on the ability of the policy process to deliver on its multiple objectives, particularly its flexibility and adaptability to new

information or changing conditions (Arup, 2014). It helps to approach adaptation not as a specific problem being addressed, but rather as a continuous process of improvement that is integral to the existing policy framework (Watkiss, 2015).

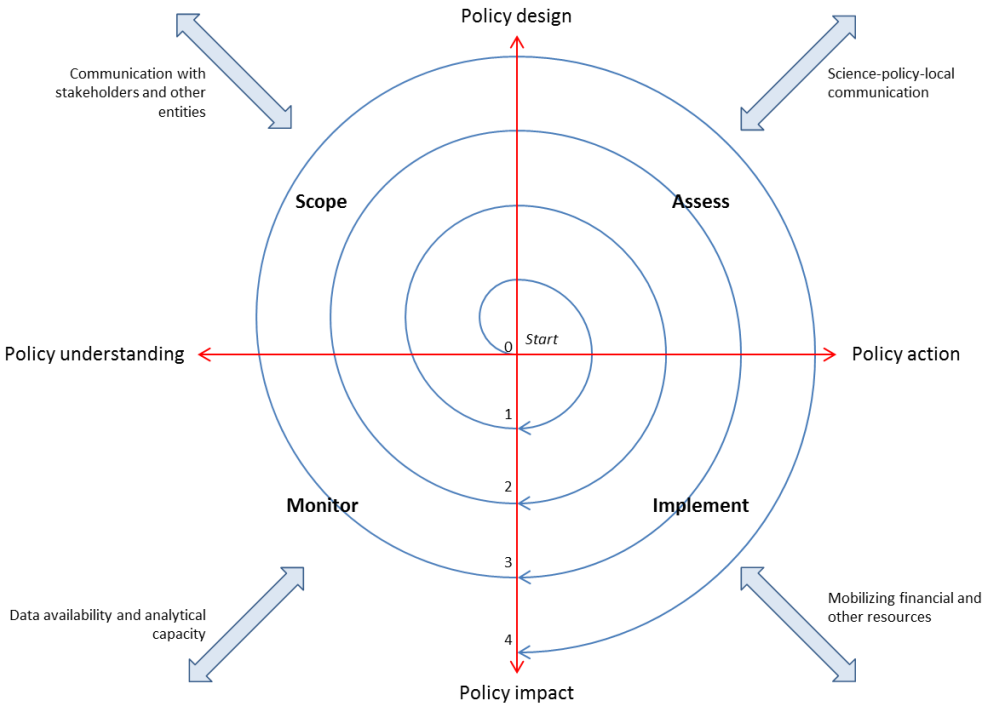
The decision making process presented in figure IV.1 presents a static picture, but underlying the structure are dynamic forces that are changing circumstances, priorities, forecasts, and constraints. If, for example, intended outcomes are not achieved as circumstances change, or if unintended consequences are identified, the process must be able to adjust the scope, the method, and the goals to be achieved. This iteration is strengthened by the participation of stakeholders in scoping and designing policy interventions, defining success measures and goals, assessing options by gathering and interpreting decision-relevant information before and after the interventions, and revisiting the scope and assumptions based on that experience (Jones, and others, 2014).

Building from the policy cycle illustrated in figure IV.1, the circuit between policy design, assessments, implementation, monitoring and evaluation is shown in figure IV.2.[2] An iterative policy cycle should be in constant and rapid evolution to adjust to new information and lessons. Iteration must be aware of their context, involve all stakeholders, leverage expert and local knowledge, and indicate a pathway between knowledge generation, decision-making, and action.

At each stage, there is also a role to play in leveraging other resources and benefitting from the participation of stakeholders. For example, in designing and scoping policy options, the process is served by involving stakeholders from many organizations, communities, and government agencies that can present their priorities and concerns (see section on participation, below). When assessing policy options, policymakers may benefit from interactions from academia and experts in quantitative modelling, as well as from local knowledge and experiences (see chapter III). When implementing policies, there is a need to mobilize resources from many sources, which will have an effect on the outcomes. Monitoring the policy outcomes is also related to existing data and analytical capacity, and the quality of the science-policy interface to communicate results into actionable policy recommendations. As the process benefits from more information and from greater participation, a virtuous cycle should lead to successive improvements in outcomes as well as improvements in each stage of the process (moving away from the origin in each of the axes shows in figure IV.2).

[2] It is important to also point to the integrated nature of the challenge of adaptation and climate-resilient sustainable development, as well as the importance of a broad participatory process, as explained above. These dimensions are not evident in the policy cycle diagram, but are understood to exist at all steps of the process.

Figure IV.2: Iterative spiral of improvement in policy interventions



Source: UNDESA. The four quadrants are the four steps of the policy cycle: scoping, assessment, implementation, and monitoring. The spiral arrow that begins at the centre represents the policy path. The four axes (design, action, impact, and understanding) are increasing in some qualitative or quantitative way as it moves away from the axis.

B.1. Sustainable Water Management in Lima[3]

The Sustainable Water Management in the City of the Future project, or SWITCH, conducted research and implemented pilot projects to demonstrate the importance of learning from experiences and from stakeholder dialogue and knowledge exchange. The objective of SWITCH was to develop new solutions for increasing the efficiency of urban water systems and their resilience to a range of future climate change scenarios. The project's approach was to strengthen the connections between experts and stakeholders with decision makers to facilitate knowledge sharing. The project's major outcome was the development of the "SWITCH approach," defined by the following four key features:

- Creation of a strategic planning process that views the city's water cycle as an integrated system, encouraging integrated and coherent solutions for water management;

[3] This example is based on information published in the project's website (www.switchurbanwater.eu) and (Arup, 2014).

- Building on pilot experiences that are designed for up-scaling;
- Creation of learning alliance platforms that involve all relevant stakeholders during the process of research, design and implementation of activities; and
- Development of a training toolkit in partnership with the learning alliance.

In Lima, the SWITCH project aimed to find ways to make green areas sustainable in an area where annual rain is scarce by finding innovative ways to reuse wastewater.[4] The SWITCH project built from the lessons of previous efforts to reuse treated wastewater, including on finding ways to safely use the water for urban agriculture and city greening. One major barrier to the reuse of treater water is the lack of a legislative and regulatory framework and proper institutional setting.

The SWITCH project was able to identify solutions to these barriers by involving national and local authorities ranging from the water authority and national ministries, and local governments and NGOs. The learning alliances also ranged from national policy issues to local lessons derived from the pilot project that showed the viability of using treated wastewater to irrigate a green area to meet the needs of the local population. The project was able to demonstrate the effective reuse of water, which led to national policy guidelines on the safe re-use of wastewater, increased public awareness, and new financial mechanisms to promote small-scale wastewater treatment initiatives.

The SWITCH approach has allowed the project to learn for local knowledge and experience and to leverage this knowledge in the identification, development, and implementation of solutions. The project also provides a template for new projects to improve governance and financial management structures, to identify new uses for water, and to incorporate natural systems in water treatment cycles, among others.

B.2. The Chicago Climate Action Plan

Chicago's Climate Action Plan is another example of embracing the uncertainty of climate change and its risks by building flexibility into decision-making processes. Based on existing future scenarios, the plan aims for the future conditions rather than trying to strengthen and build resilience of the status quo (City of Chicago, 2016). More importantly, the plan embraces the inherent uncertainty in forecasting tools. The plan uses projections and scenarios of climate change and the likely effects on the city to propose specific actions under five main categories: energy efficient buildings, clean and renewable energy sources, improved transportation options, reduced waste and industrial pollution, and adaptation. In the case of adaptation, the plan calls

[4] In Lima, annual rainfall is approximately 13 millimeters per year.

for nine specific goals, ranging from managing heat, improve cooling capacities, protect air quality, engage stakeholders, and plan for future scenarios.

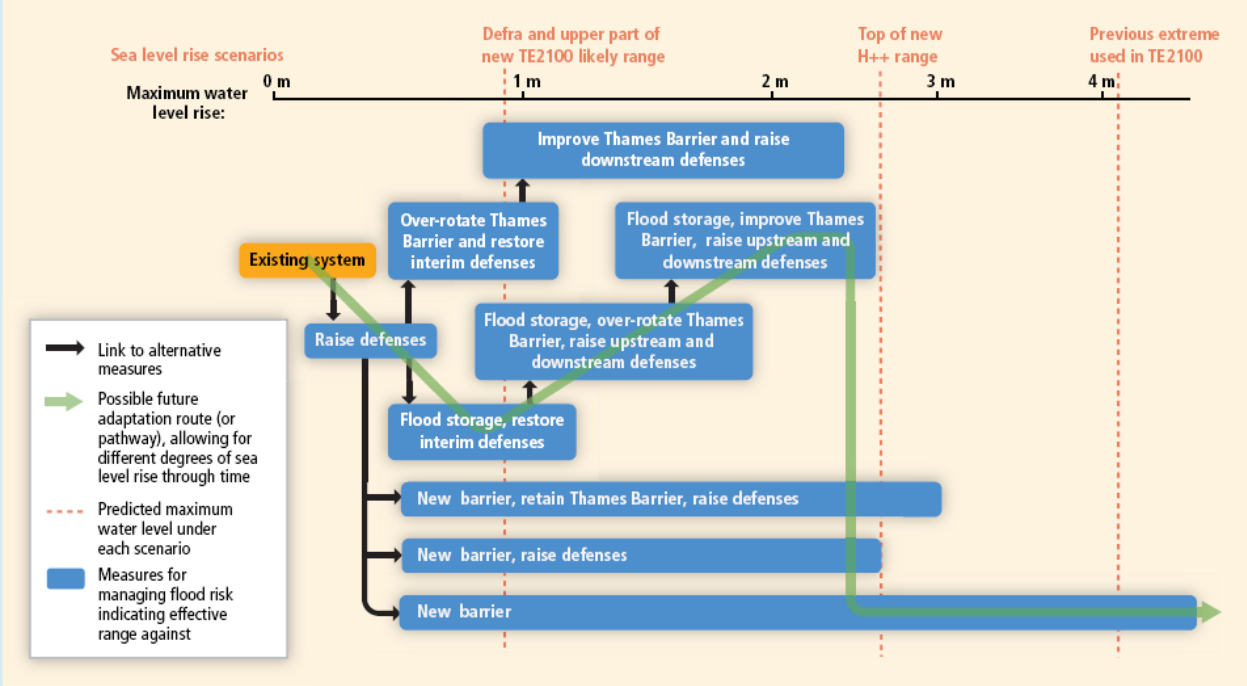
To prepare for the possibility of hotter summers and more intense heat waves, for example, the city has worked with other organizations to identify populations at risk and to update emergency response plans. The plan also calls for attracting new ideas and expects that new knowledge from research into how to eliminate "urban heat islands" will lead to new initiatives. The city also used satellite imagery to identify hot spots and to target policy interventions. The city also identified the link between heat, smog, and respiratory illnesses. The Climate Action Plan calls for lower emissions from power plans and transportation that cause smog.

Chicago's Climate Action Plan is expected to evolve as new information emerges. Progress is continually monitored against the goals and the results can inform changes to goals, targets and indicators. The plan recognizes that it represents a snapshot in time. It is also aware that strategies may become obsolete and that new technologies may be brought to bear on expected and future challenges. Having flexibility as an integral part of the climate action plan helps policymakers avoid path dependence and lowers the cost of policy changes and adjustments in response to unexpected events and new information. From the outset the plan recognizes that the current steps outlined for organizations and individuals will need to be modified as new technologies and threats are identified. For this purpose, the city created a Green Steering Committee was to continue the process of understanding current and future threats and to inform future policy actions.

B.3. The Thames Estuary protection plan in London

The plan to protect the Thames Estuary in London offers a more direct example of iterative and flexible adaptation policy to meet the uncertain long-term risks from climate change. The plan was developed by Britain's Environment Agency as a way to deal with sea level rise and the flooding threat that it poses to London. Since engineering projects that protect the city require lead times for planning and construction measured in dozens of years, the acceleration of sea level rise presents a difficult policy challenge. The plan addresses this with an iterative approach that builds upon the existing system incrementally, selectively raising defences and taking other measures to raise the protection standards of the current system (see figure IV.3). If sea level rise accelerates, the plan calls for measures that are more substantial in the longer term, including the construction of a new barrier or a coastal barrage. The plan will be adjusted based on careful monitoring of the drivers of risk to prevent the need for emergency measures (Wong, and others, 2014 Box 5-1). Already, the newly revised estimates of the speed of melting of the West Antarctic ice sheet highlighted above has implications for the options under the plan.

Figure IV.3: Adaptation measures and pathways in the Thames Estuary 2100 plan



Source: Replicated from (Wong, and others, 2014 Box 5-1). Each measure is drawn according to the range of sea level rise over which it is considered effective. The black arrows point to alternative measures that may be applied once a measure is no longer effective. The red dotted lines show three sea level scenarios used in the analysis. The green line shows an example of a possible adaptation pathway as sea level increase forecasts change. Note that the recent revised Gillis (2016) forecast of sea level rise (three feet) is within the likely range of 0.9 meters that is used in this analysis.

B.4. Iterative processes

Flexibility and iterative learning are not only relevant to policymaking processes. They are also part of the solutions that should be encouraged by adaptation strategies to strengthen the capacity of individuals and communities to adapt. Policies that distort relative prices for fertilizers and seeds, for example, can have the unintended consequence of promoting a single agricultural activity that may not be well suited as the climate changes, or that may not offer sufficient income diversification to reduce livelihood risks. Rather, the role of public policies in promoting flexibility and iterative learning by individuals, farmers in this example, can include reducing and removing barriers to economic activity and providing more information to help in production and marketing decisions. Improving access to accurate weather report, and longer term climate trends in a way that is easily understood and relevant to farmers can serve as substantial support to the capacity of individuals to make appropriate decisions. Chapter III in

this publication discusses how technical assessments are being designed to inform individual farmers and how they benefit from that information.[5]

In the context of climate change and uncertainty, improving food security entails flexible and adaptive cropping systems. First, as temperatures increase and growing seasons change, one evident adaptation option would be changing planting periods – early sowing for instance – especially for cereals and oilseeds (Deressa, and others, 2009). According to a simulation prepared for the Fifth Assessment Report (Porter, and others, 2014), based on several studies and data sources, changes in planting periods can increase yields by a median benefit of 3 to 17 per cent. These benefits can be maximized when machinery and other techniques, such as seeding transplanting, are used concomitantly. The effectiveness of this adaptation option will depend on specific local climatic conditions and changes. Decisions on planting schedules can sometimes be more effective if the farming decisions integrate available climate forecasts.

Another possible response to potential changes in ecosystems could be changing the location of agricultural, livestock, and fishery activities. High altitude areas are likely becoming more suitable for agriculture, as declines in frost frequency will allow for longer growing seasons. Conversely, in tropical areas the length of the growing season will be reduced by higher temperatures, limiting the suitability of current crops (Porter, and others, 2014). Changing work schedules, types of livestock and crops (Coles and Scott, 2009), require high monetary and new management practices, but can be efficient options to adapt to changing ecosystems.

C. Good development using low regret policy options

Low- or no-regrets interventions and actions are those that can be justified from an economic, social, and environmental perspective even if the climate hazard does not occur. As figure IV.3 illustrates, some problems require long-term horizons of analysis and planning, but decisions and actions in the presence of uncertainties must still be made in the present. At the same time, policy action must also identify transformative solutions that can change the underlying structural inequalities that perpetuate vulnerabilities of certain groups. Uncertainty presents particular problems in the assessment of options given that different climate scenarios imply different policy options. Making decisions under uncertain scenarios also increases the risk of path dependence and that adaptation policy will under- or over-invest depending on the realization of climate hazards. Without a flexible plan, there is a tendency to focus on middle ground, or average solutions that, as time progresses, prove to be either insufficient to address extreme shocks or inefficient if the shock does not materialize.

Because of this, policymakers must balance immediate responses that emerge from any current adaptation or resilience deficits, with longer-term strategies to build adaptive capacity in harmony with sustainable development (see table A-IV.1 in the appendix). Incorporating

[5] See also chapter V for a discussion on data and technology in support of adaptation.

uncertainties into the process for designing and implementing interventions requires proper timing and phasing by separating immediate actions from those that can be deferred or that may require additional information (Watkiss, 2015; Wong, and others, 2014). Immediate needs should avoid maladaptation and unintended consequences by prioritizing low- or no-regret interventions and by relying on existing processes and tools.

In the health sector, there are a vast number of examples of low regret actions, such as distributing mosquito nets, improving child nutrition, developing hygiene education campaigns, and improving water and sanitation facilities, among others. Early warning systems are another example, as they allow authorities the flexibility to act pre-emptively and adjust civil security plans to the expected weather, thereby reducing the number of lives at risk and/or resources used. Heat wave early warning systems are being increasingly implemented, mostly in high-income economies, but early warning systems are being developed as well for vector-borne and food-borne infections such as malaria and dengue in low- and middle-income countries.

5. Concluding remarks

A policy process based greater coherence across sectors, with the participation of relevant stakeholders, and that is capable to adjusting to new information and priorities should help to address the challenges of building resilience to climate change and ultimately of reducing underlying inequalities. Such a process is better able to identify vulnerable populations, particular intersecting vulnerabilities, and relevant actions. Sustainable development and resilience are multidimensional challenges that increase the need for substantive coordination and integration of policy interventions. Integrating and designing coherent policies can strengthen resilience to climate hazards for the most vulnerable, by addressing several crucial dimensions of their livelihoods, but also taking advantage of potential co-benefits, while avoiding unintended consequences and maladaptation.

As the most intense and direct effects of climate events are experienced at the local level, with a disproportionate impact on the poorest and marginalized groups, the success of interventions to build resilience depends on the participation of all stakeholders. A broader participation can help policymakers to identify development objectives and assess how to achieve them through building synergies and addressing the underlying causes of vulnerability. Climate hazards and its effects are also characterized by significant uncertainties, introducing new challenges for policymakers. They must fully embed uncertainty into their long-term plans, using iterative and adaptive processes. This requires a more flexible policy process, capable of incorporating new information and emerging knowledge to scope, assess, implement, and monitor policy interventions.

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