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Background Note

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The 'mainstreaming' approach to climate change adaptation: insights from Ethiopia's water sector

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There is scientific agreement in the latest report from the Inter-governmental Panel on Climate Change (IPCC): anthropogenic climate change is already occurring and even if greenhouse gas concentrations are stabilised, global warming and sea level rises will continue for centuries – the result of climatic processes and feedbacks (Solomon et al., 2007).

These changes in the Earth's physical systems are likely to have a major impact on biological and socio-economic systems, and the poorer developing countries are at greatest risk. Adaptation is, therefore, seen as an inevitable and necessary response.

Vulnerability to climate change and other climate hazards is largely determined by social and economic factors such as income, access to education and healthcare, and the availability of economic opportunities. In sub-Saharan Africa socio-economic vulnerability often coincides with bio-physical vulnerability; a large proportion of the population (the rural poor) depends on climate-sensitive rain-fed agriculture for subsistence and income and have limited livelihood options (Eriksen and Næss, 2003).

In many cases adaptation implies tackling pre-existing development issues that contribute to vulnerability (Metz and Kok, 2008). At the same time, long-term climate change is likely to compound existing vulnerabilities to both climatic and socio-economic stresses, contributing to poverty, undermining economic growth and posing a significant challenge to the sustained achievement of the Millennium Development Goals (MDGs). It is argued, therefore, that climate change adaptation should be integrated with the sustainable development agenda (Eriksen and Næss, 2003; Olhoff and Schaer, 2010).

'Mainstreaming' is one development-orientated approach to climate change adaptation. It has become increasingly popular in international donor circles over the past five to ten years and is being adopted by developing country governments for long-term strategic planning. In many developing countries, however, the process of mainstreaming is in its earliest stages and there is very little accepted doctrine on how the process should occur.

This Background Note uses Ethiopia and its water sector – including both water supply and water management – as a case study to highlight issues associated with 'mainstreaming adaptation' in practice. It is based on the MSc dissertation of author Naomi Oates (Oates, 2010) drawing on primary evidence gathered in May and June 2010 in Addis Ababa, Ethiopia, including interviews with stakeholders in government, non-governmental organisations and donor organisations.

What is mainstreaming?

Mainstreaming is not a new concept, but it has become increasingly popular since the late 1990s as a means to (more effectively) tackle development issues such as gender inequality, environmental degradation and HIV/AIDS in the developing world. The idea was that these cross-cutting issues should influence the 'mainstream' activities of development, rather than being addressed in separate initiatives (Elsey et al., 2005). More recently, the mainstreaming approach has been adopted in the context of climate change. The concept of mainstreaming, however, is poorly defined and not easily translated into practice (Boxes 1 and 2).

In the context of climate change, mainstreaming has been described as an 'holistic' or 'development-first' approach, whereby adaptation and mitigation objectives are integrated within development agendas. In

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Box 1: Relevant lessons from gender and HIV/AIDS mainstreaming

Conceptual confusion: Mainstreaming is often poorly defined and the term is used interchangeably with others such as 'integration' or 'multi-sectoral response'. This leaves the concept open to interpretation, which can lead to confusion, manipulation or inaction. Greater conceptual clarity is needed to provide a solid basis for effective policy and action.

Reductionism: HIV/AIDS is often seen as a 'health' issue and not as directly relevant to the work of key sectors such as agriculture. HIV/AIDS is addressed, therefore, by adding components to programmes whilst mainstream development activities remain largely unchanged. Similarly, climate change is often categorised as an 'environmental' issue.

Focal points: Ministry staff with responsibility for the gender mainstreaming process (focal points) rarely have adequate training or support and their presence can serve to devolve responsibility from others. If focal points are to be used in mainstreaming climate change they need to be situated in key ministry divisions, have influence over sector budgeting/ resource allocation, and receive on-going technical and personal support from the highest levels.

Implementation: Implementation of gender mainstreaming has focused largely on strategic level change. Yet the completion of this process is not necessarily a precondition for success in mainstreaming at the operational level, which appears to be lagging behind in both the gender and climate change context.

Performance: Whilst gender concerns are addressed in most ministries' policies this does not necessarily translate into action. The use of key indicators to monitor progress and performance can be a means to close the gap between policy and practice. However, for climate change adaptation these indicators will be very difficult to define. Not only are future climate risks uncertain, but adaptation is a broad concept and activities will be highly context specific.

Source: Summarised from Elsey et al. (2005) and Mehra and Gupta (2006).

Box 2: Adaptation funding and the principle of additionality

In the era of sector-wide approaches (SWAps), where donors support central government budgets, cross-cutting issues such as gender or climate change should be addressed through routine sector planning and budgeting (Elsey et al., 2005) to ensure they are incorporated into the 'mainstream' of development. However, international funding mechanisms for adaptation are geared towards providing financial resources that are 'additional' to existing development aid budgets (Brown and Bird, 2009). This principal of additionality could conflict with the mainstreaming approach as it distinguishes between 'adaptation' and 'development', thereby hindering conceptual integration. Certainly, in most developing countries poverty reduction and adaptation remain largely separate strategies (Prowse et al., 2009). There is a risk that 'additional' funding creates incentives for recipient countries to design 'additional' projects or programmes for adaptation, rather than addressing climate change through existing sustainable development and poverty reduction initiatives.

other words, climate change risks are not addressed through separate initiatives but inform ongoing development policy-making, planning and activities across all sectors (Klein et al., 2007; Olhoff and Schaer, 2010).

Strategic level mainstreaming, as defined by Care (2009), means addressing the organisational environment in which policies and programmes are planned and implemented. This can include activities such as building staff awareness and capacity, putting appropriate institutions or mechanisms in place and identifying entry points for adaptation action (Olhoff and Schaer, 2010).

Meanwhile operational level mainstreaming has two objectives, namely 'climate proofing' and 'building adaptive capacity'. Climate proofing is a means to ensure that development interventions are resilient over the long term, reducing climate-related risks to 'acceptable levels' (Olhoff and Schaer, 2010). Building adaptive capacity implies enhancing (and not inadvertently constraining) the ability of individuals, communities or institutions to respond to climate change (Care, 2009). Box 3 provides an example of operational level mainstreaming in the Water Sanitation and Hygiene (WASH) sector.

Case study: Ethiopia

Vulnerability to climate variability and change

Ethiopia is one of the poorest and least developed nations in the world. It is also seen as one of the African countries most vulnerable to the impacts of climate change, with limited capacity to cope with short-term climatic shocks or adapt to longer-term trends (Conway et al., 2007).

Although Ethiopia's economy is no longer predominantly 'agricultural-based' in terms of agriculture's contribution to GDP and exports (Access Capital, 2010), agriculture remains Ethiopia's principle source of employment. The sector supports an estimated 85% of the population and is central to the livelihoods of the rural poor (Conway et al., 2007; Deressa, 2006). It remains, however, highly sensitive to temporal and spatial variations in precipitation, partly because of the dominance of rain-fed agriculture, with negative implications for both national food security and poverty reduction efforts (World Bank, 2006).

Although the precise impacts of future climate change in Ethiopia are uncertain (Box 4) there is a risk

Box 3: Technical choices for climate change adaptation in the water, sanitation and hygiene (WASH) sector

Mainstreaming adaptation is emerging as a key issue in the WASH literature, with a growing recognition that reducing vulnerability to climate risks over the longer term could contribute to health and development in the short to medium term, and that health and development, in turn, help to reduce vulnerability (WHO, 2009). It is argued that, despite uncertainties around climate change impacts, there is sufficient knowledge to plan for water supply technology choices that are robust to uncertainty. In practical terms, this means recognising a range of climate and hydrological scenarios, with a greater focus on the reliability of different water sources (Calow et al., forthcoming).

For example, WHO's (2009) evaluation of different water supply technology types under different climate scenarios found that utility piped water supply was 'potentially resilient to all expected climate change', whilst at the other end of the spectrum dug wells were 'potentially resilient to only a restricted number of climate changes'.

We should not, however, generalise from these preliminary findings. At the community level these technology options will need to be evaluated on a case-by-case basis, taking numerous socio-economic factors into account (such as economic cost or local capacity for infrastructure maintenance) in addition to climate risks, as these will also determine the viability and sustainability of WASH interventions (Calow et al., forthcoming).

Box 4: Historic and future climatic trends for Ethiopia

Warming has occurred across much of Ethiopia, particularly since the 1970s, at a variable rate but is broadly consistent with wider African and global trends. Many parts of Ethiopia experience high inter-annual and intra-seasonal rainfall variability which hampers the tracking of trends or changes that could be the result of anthropogenic climate change. Whilst some studies have identified downward trends in parts of the country, comprehensive analysis shows that the situation is not uniform and varies by region or time period. There is no strong evidence for consistent changes in seasonal and annual rainfall totals or the frequency and intensity of extreme events in Ethiopia.

Computer-based global climate models form the basis for descriptions of future climate conditions and risk assessment. However, the complex influences on Ethiopia's rainfall, such as tropical sea surface temperatures, the El Niño-Southern Oscillation and rugged topography, mean that climate models simulate quite different patterns of future rainfall response, which leads to high uncertainty about the nature of future rainfall-related risks.

Overall climate models simulate continued warming but very mixed patterns of rainfall change for Ethiopia. Warming occurs in all four seasons with annual warming by the 2020s 1.2°C higher than it is at present, with a range of 0.7-2.3°C (2050s 2.2°C, range 1.4-2.9°C). This warming will be associated with more frequent heat waves and may affect evaporation of precious soil moisture during crop growing seasons.

Some climate models project more rain, others less, but with a tendency for slightly wetter conditions. Overall, there are relatively small changes (~1%) in average annual rainfall by the 2020s and 2050s. The seasonal changes are slightly larger but still modest when averaged across all climate models.

In cases where uncertainty about future climate risks is very high, such as in Ethiopia (and many other parts of Africa), there is a strong case for using recent climate observations (in situ and remotely-sensed) as a guide to conditions during the next decade. This requires regular updating and comparison with climate model results.

Source: Summarised from Conway and Schipper (2011).

that rising temperatures and shifts in rainfall patterns will affect hydrological processes and, therefore, water availability in African River Basins (Boko et al., 2007; Goulden et al., 2009).

Climate change is also likely to exacerbate existing problems of water quality, such as the contamination of shallow groundwater sources due to intense rainfall events (Calow et al., forthcoming). Climatic variability is already a challenge to Ethiopia's water security, with knock on effects in water-related sectors such as energy and health (World Bank, 2006). There is, therefore, a need to consider climate risks in water resource management and planning, and to re-double efforts to extend access to reliable and safe water supplies to vulnerable populations.

In short, Ethiopia's legacy of variable and unpredictable rainfall is undermining national food and water security with implications for economic growth and poverty reduction efforts (Deressa, 2006; World Bank, 2006). It is the case, however, that linkages between climate and indicators of economic activity in Ethiopia are poorly understood and are changing over time (Conway and Schipper, 2011). The uncertainty and risks associated with future climate change represent an additional challenge for sustainable development. Not surprisingly climate risk reduction and adaptation to climate change have become important issues on Ethiopia's national policy agenda.

Institutional responses to climate change

Ethiopia's lead government agency for climate change is the Environmental Protection Authority (EPA), which is responsible for the coordination of national adaptation and mitigation activities and represents Ethiopia at the United Nations Framework Convention on Climate Change (UNFCCC). However, until the

Box 5: Water in Ethiopia's National Adaptation Programme of Action (NAPA)

The importance of water resources for adaptation is often acknowledged in NAPAs, but the links between water-related climate impacts and other development sectors are not well articulated (Björklund et al., 2009). Practical aspects regarding water management are often neglected. Ethiopia's NAPA identified 11 adaptation priorities, five of them water-related:

1. Development of small-scale irrigation and water harvesting schemes in arid, semi-arid, and dry sub-humid areas
2. Improving and enhancing rangeland resource management practices in pastoral areas
3. Promotion of on-farm and homestead forestry and agro-forestry practices in arid, semi-arid, and dry sub-humid areas
4. Community-based sustainable use and management of wetlands in selected areas
5. Realising food security through multi-purpose large-scale water development project in the Genale-Dawa Basin.

However, Ethiopia's NAPA document is not comprehensive in its treatment of climate risks for the water sector. Although the socio-economic impacts of droughts and floods are recognised, water insecurity is not listed as a major adverse impact of climate variability, and water supply and sanitation are not addressed (FDRE, 2007).

December 2009 negotiations in Copenhagen, these functions were under the remit of the National Meteorological Agency (NMA), which sits in the Ministry of Water and Energy (MoWE). The NMA now plays a purely analytical role in climate data collection, monitoring and prediction.

The reasons for this change in leadership are unclear. It may be that the NMA was seen as a technically-focused organisation whilst the EPA was thought to have greater capacity to address the wider political and socio-economic issues related to climate change. The original National Adaptation Programme for Action (NAPA) process was coordinated by the NMA and is still viewed by many as belonging to that department rather than the EPA (Oates, 2010). Such examples raise the issue of underlying political tensions between different government sectors over the 'ownership' of the climate change agenda, which are likely to hinder mainstreaming processes.

Ethiopia's national strategic framework for climate change

The government's NAPA was undertaken in 2007 by the NMA in consultation with other government ministries and stakeholder groups. The NAPA identifies the key regions, sectors and livelihoods that are most vulnerable to climate change and determines ten priority projects for immediate action (FDRE, 2007) (Box 5). In effect, the NAPA represented a first step in coordinating adaptation activities across government sectors, but was not intended to be a long-term strategy in itself. Ethiopia's NAPA projects are currently 'on hold' whilst international adaptation funding mechanisms are under negotiation. More recently the EPA has drafted a separate work programme for action on adaptation, compiled from contributions made by different ministries. This suggests that adaptation is, perhaps, being addressed in a fragmented manner.

The Government of Ethiopia is in the early stages of developing a new national strategic framework: Carbon Neutral Climate Resilience – Ethiopia (CNCR-E) to coordinate and mainstream climate change adaptation and mitigation across all sectors over several years. The framework has five main pillars: institutional arrangements, finance, sectoral action plans, international cooperation, and technology and innovation. Each ministry is expected to ask strategic questions about the implications of climate change for their sector and the ways in which the ministry will address these.

Current sector policies show little direct evidence that climate change issues have been addressed (Crick and Dougherty, 2006). The draft national Growth and Transformation Plan (GTP) for 2010-2015 discusses climate change adaptation and mitigation briefly as environmental priorities, but it is unclear to what extent these issues have informed priorities in other development sectors (FDRE, 2010). However, despite the lack of explicit linkages, many existing government policies, strategies and action plans may be directly or indirectly relevant to adaptation (FDRE, 2001a; Schipper, 2007a).

Mainstreaming adaptation in Ethiopia's water sector

A mainstreaming or 'development-first' approach to climate change adaptation seems appropriate for Ethiopia's water sector. First, it has been argued that effective water management is fundamental to mitigate the impacts of climate change, as water is the primary medium through which these changes will be experienced (Hedger and Cacouris, 2008; IUCN et al., 2009). The MoWE should, therefore, be an active player in the climate change agenda.

Second, Ethiopia's current water sector policies and strategies have the potential to address these climate risks. For example, objectives of the national 'general water resources management policy' include:

'Managing and combating drought as well as other associated slow-onset disasters through, interalia, efficient allocation, redistribution, transfer, storage and efficient use of water resources' and 'Combating

and regulating floods through sustainable mitigation, prevention, rehabilitation and other practical measures' (FDRE, 2001b: 5).

Third, Ethiopia's water sector is still relatively underdeveloped, which can be seen as both a cause and effect of vulnerability to climate variability and change (World Bank, 2006; Hedger and Cacouris, 2008). There are many opportunities to reduce vulnerability simply by investing in the development of infrastructure and institutions for water management (Hedger and Cacouris, 2008; IUCN et al., 2009).

Lastly, there is a need to tackle the underlying socio-economic causes of vulnerability to water-related climate hazards and to 'climate proof' developments to cope with current climate variability, regardless of future change (Schipper, 2007b).

In Ethiopia there are initial signs of progress in addressing climate risks and adapting to climate change in the water sector. The MoWE is in the preliminary stages of developing a sector strategy to mainstream adaptation and mitigation into its projects and programmes. There has also been a shift towards an integrated approach to water management, which could help to incorporate adaptation needs into development planning (see Nicol and Kaur, 2009). More generally, there is a relatively high level of awareness of, and interest in, climate change issues within the Ethiopian government as a result of the Prime Minister's involvement in international negotiations as the African Union's representative.

There are, however, several factors that hinder the mainstreaming process. Whilst historic climatic trends inform Ethiopia's water sector strategies and programmes to some extent, future climate projections and socio-economic scenarios are rarely incorporated into these designs (Oates, 2010; Conway and Schipper, 2011). These observations are supported by research conducted by Tearfund which found that in most developing countries 'climate risk considerations are not being factored into water sectoral planning and implementation in a systematic way' and that 'institutional structures ... are currently inadequate' (Hedger and Cacouris, 2008: 4).

Communication mechanisms between ministries with a stake in water resource management seem fairly underdeveloped and institutions for effective water governance are relatively weak (Oates, 2010; Tafesse, 2009). These capacity constraints make it difficult to coordinate and implement water sector development activities or initiate adaptation mainstreaming. Like many other African countries, Ethiopia has recognised that it is likely to need additional external financial and technical assistance to tackle climate change effectively (Brown and Bird, 2009).

Table 1 overleaf draws on the available literature on adapting to climate change in the water sector to identify the possible characteristics of 'effective mainstreaming' and summarises Ethiopia's progress and key challenges to date in meeting these requirements.

Institutional challenges

Climate change is a difficult issue for national governments to tackle, given the cross-sectoral nature of the problem. To integrate climate change adaptation in a sustainable development agenda a government must involve all sectors and ministries, while considering private, public and/or international stakeholder interests. This requires good communication, cooperation and coordination between different stakeholder groups and compromises between numerous and sometimes conflicting objectives. At the same time, there is no obvious lead agency or 'home' for climate change within existing government institutions (Schipper, 2007a).

Why not water?

It is reasonable to argue that water resources and their management are central to climate change adaptation and should be a focus of the mainstreaming process. Furthermore, 'the systemic nature of water' (IUCN et al., 2009: 12) means decision-makers need to think (and act) beyond traditional sectoral boundaries. Ethiopia's CNCR-E framework could provide opportunities to address water management in such an integrated manner, but research suggests that Ethiopia's water sector is not the focal point for national adaptation efforts and is unlikely to be in the near future (Oates, 2010).

Environment or development?

The recent designation of the Environmental Protection Authority (EPA) as Ethiopia's lead agency for climate change is perhaps best explained by the fact that climate change in Ethiopia is characterised as an environmental issue, particularly by donor organisations (Schipper, 2007b). Yet reducing climate change to an 'environmental' issue is problematic if the broader development implications of climate risks are not fully recognised. There is a danger that climate change will become an 'additional component' to development programmes, failing to integrate into on-going development processes.

Ethiopia's population, however, is highly dependent on the agricultural sector for employment and livelihoods and the sector is, therefore, a priority for both development and adaptation efforts, with a particular focus on food security and disaster risk reduction (FDRE, 2007, 2010). Certainly the Ministry of Agriculture and Rural Development (MoARD) has engaged with climate change issues (Oates, 2010).

This would suggest that adaptation should be addressed through existing food security and dis-

Table 1: Mainstreaming adaptation effectively in the water sector

Strategic level requirements	Progress and challenges for Ethiopia (challenges are italicised)
Clearly defined institutional responsibilities	• A lead national authority has been designated • The Ministry of Water and Energy (MoWE) is responsible for developing water sector strategy for mainstreaming
Effective communication and coordination (C&C) • e.g. lower administrative levels are regularly informed about decisions made in central government • e.g. key stakeholders participate in planning processes	• C&C should improve with the new Carbon Neutral Climate Resilience – Ethiopia (CNCR-E) national strategy • Key ministries and stakeholders were involved in the National Adaptation Programme of Action process • Fora have been set up to bring together stakeholders from government, civil society, non-governmental organisations and the private sector • *However, communication and coordination mechanisms between ministries with a stake in water management are underdeveloped*
An inter-sectoral approach to water management (IWRM) • e.g. IWRM framework guides river basin development	• Attempts are being made to adopt an IWRM approach, e.g. River Basin Master Plans • *Not all elements of water management are under the control of the MoWE and different aspects of water management tend to be treated as separate issues. e.g. small-scale irrigation development falls under the remit of Ministry of Agriculture and Rural Development whilst large-scale irrigation and Water supply and Sanitary Health (WASH) are under the MoWE*
Flexible and adaptable decision-making processes • e.g. project managers have the ability to address and incorporate changes as they occur	• *River Basin Master Plans are not regularly updated* • *Engagement with climate change issues has been slow in the water sector and planning for adaptation appears to be fairly 'top-down' at present*
Awareness and understanding of climate change issues • e.g. knowledge of the socio-economic risks that climate change poses for the water sector	• Awareness is fairly good at high levels of government due to the Prime Minister's heavy involvement in UN Framework Convention on Climate Change negotiations, although there is limited detailed understanding of risks and uncertainty • *Awareness and understanding are often poorer at lower administrative levels*
Capacity • e.g. staff able to address climate change in every-day work	• *There is a need for carefully designed and targeted capacity support that fits the needs of existing delivery systems*
Operational level requirements	**Progress and challenges for Ethiopia**
Effective management of water supply and demand • e.g. evaluate water storage options • e.g. research/use appropriate irrigation technologies	• Relevant research is being conducted by some non-governmental institutions • *Institutions and infrastructure for water management are under-developed* • *Demand is increasing, with increasing incidences of 'economic' water scarcity*
Improved hydrological monitoring and forecasting • e.g. flood early warning systems	• *There is a general need to build capacity of the National Meteorological Agency and other relevant institutions through the design of effective inputs*
Incorporation of climate risks into planning processes • e.g. climate trends or scenarios considered in project design • e.g. project impacts on local coping capacities assessed	• Historic climate trends are considered in project design and planning, *but the impacts of future climate variability and change are not addressed on a regular basis* • *Underlying social causes of vulnerability are not always recognised*

Source: Summarised from Oates (2010).

aster risk reduction (DRR) frameworks, which guide mainstream development activities, rather than as a separate strategy (Schipper, 2007a).

The literature identifies conceptual overlaps between DRR, climate change adaptation and development, highlighting the need for integrated policy responses, as Schipper and Pelling (2006) pointed out: 'National disaster risk management institutions and frameworks are well placed to provide a structure for climate change adaptation work.'

However, there are many issues to be resolved if the DRR, development and climate change agendas are to be merged (Schipper and Pelling, 2006). For example, DRR in Ethiopia has tended to focus on short-term ex-post 'disaster relief', while climate change is a long-term problem requiring ex-ante intervention (Conway and Schipper, 2011). In fact there is a general need in sub-Saharan Africa for a conceptual shift to think of vulnerability in socio-economic (rather than bio-physical) terms in order to develop effective strategies for long-term livelihood security (Schipper, 2007b).

There are some signs of change. Ethiopia's Food Security Strategy states the need to address 'the root causes of food insecurity' which includes 'building the resource base of chronic food deficit households' (FDRE, 2002: 7). Social protection initiatives such as

Ethiopia's Productive Safety Net Programme (PSNP) also tackle underlying causes of vulnerability and are potential entry points for mainstreaming adaptation to climate change over the long term (Conway and Schipper, 2011).

However, it is unclear whether subsuming the climate change agenda under DRR or food security at this stage would be wise. In Ethiopia's case it remains to be seen whether the new CNCR-E programme will be an effective means to coordinate the mainstreaming process across government.

Conclusion

This Background Note has highlighted challenges and opportunities in mainstreaming climate change adaptation in development policy and practice. Although the focus is on Ethiopia's water sector, several issues are of broader relevance.

Mainstreaming in theory and in practice

1. Mainstreaming is a relatively simple concept, but is often poorly defined and, therefore, difficult to implement. The development of appropriate indicators for monitoring progress and performance could help to provide a solid basis for action and accountability, and is a necessary precondition for the effective use of climate finance. However, this will be particularly challenging in the context of adaptation, where indicators and activities are highly context-specific.
2. Climate finance is intended to be 'new' and 'additional' to existing development aid budgets to ensure that developing countries receive the assistance they need to respond to climate change. However, this could create incentives to address adaptation as an 'additional' environmental component in development programmes. Mainstreaming should mean that climate change issues influence core development activities and are accounted for in routine sector planning and budgeting activities.
3. In many countries climate change adaptation and poverty reduction remain separate strategies and there is a danger that adaptation is being addressed in a fragmented manner. There is a need to build on existing initiatives such as the NAPAs and national (and sectoral) development plans, and to consolidate donor and government efforts, rather than creating new projects or programmes.

Adaptation in Africa's water sector

4. Many sub-Saharan African countries are highly vulnerable to climate change, but there is uncertainty as to how the water sector will be affected. Decision-making making processes, therefore, need to be flexible to incorporate new information, react to changing circumstances and learn from experience.
5. Responsibilities for water resource management and development are often split across government ministries. Coupled with poor coordination and communication, this can mean that the water sector lacks influence over other sectors (such as agriculture), making it difficult to address climate change in an holistic manner.
6. The integrated water resources management (IWRM) approach could be a useful tool to mainstream climate change considerations into water sector development and planning. However, IWRM is itself ambitious and needs to be adapted to suit individual country needs.
7. Finally, the capacity constraints faced by the water sector need to be addressed if countries such as Ethiopia are to mainstream climate change adaptation effectively over the long term. The provision of external (and adequate) financial assistance and carefully designed technical support will be a key determinant of success.

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