WASH & climate change adaptation training module: factsheets

A training module prepared by the IRC International Water and Sanitation Centre for UNICEF and the National Water Resources Institute, Kaduna[1]

[1] Prepared by John Butterworth and Sabine Guendel. The training module is based upon many existing resources and especially the work of Charles Batchelor and co-authors (2011) and other resources that are referenced in the text.

Introduction

This training module was developed as part of an initiative to promote the mainstreaming of climate change adaptation in the WASH sector in Nigeria through building the capacity of WASH sector professionals. It draws upon international and local resources and examples, and was compiled by the IRC International Water and Sanitation Centre for UNICEF and the National Water Resources Institute, Kaduna.

Purpose and scope of the training module

The purpose of the training module is to provide a selection of accessible resources that can be adapted and used in the delivery of training courses in climate change adaptation for WASH sector professionals working at state and local government levels. Ultimately this aims to influence the way that the WASH sector addresses the challenges posed by climate change through more and better activities that improve climate resilience. The training module will support the mainstreaming of climate change adaptation in WASH sector programmes through such capacity building efforts.

Through a mixture of learning about climate change concepts and linkages with WASH, practical tools for planning climate change adaptation, and international and Nigerian examples, the course aims to support users in finding entry points to climate change adaptation. It ultimately aims to influence the way that the WASH sector addresses the challenges posed by climate change through both more and more effective activities on this issue.

The training module covers rural and urban issues, sanitation and water supply, water resources management and cross-cutting (e.g. gender and equity) issues. It also takes a wider approach to managing sources of uncertainty and risk in the WASH sector – of which climate change is one – and the approaches and tools introduced have potentially wider applicability, especially scenario-based planning. The need to mainstream and integrate other approaches such as Disaster Risk Reduction is also addressed.

The training module is intended to be used in the delivery of short courses for WASH professionals, particularly staff at state and local government levels in the planning and design of water and sanitation projects and programmes, and the delivery of water and sanitation services. Participants might for example be drawn from Ministries, state water supply agencies, WASH units, RBDAs and other related agencies, and Non-Governmental Organisations. Such courses are intended to help participants to find practical entry points to address climate change risks in their own work. The modules will support a short course of about 30 hours duration although this is flexible depending on which modules and exercises the trainer decides to include.

Factsheets

These factsheets are accompanied by a facilitator's guide and the two resources are intended to be used together. The factsheets provide essential information for trainees. The facilitators guide

provides additional information for trainers. Presentations and links to documents, films and other resources are also provided in the factsheets and facilitators guide.

	Factsheet/session title
Session 1	• *Climate change: a source of risk and uncertainty in WASH service delivery*
Session 2	• *Mainstreaming climate change adaptation*
Session 3	• *Scenario-based planning*
Session 4	• *Community-based adaptation*
Session 5	• *Climate screening and proofing*
Session 6	• *Integrated Water Resources Management*
Session 7	• *Emergencies and Disaster Risk Reduction*
Session 8	• *Costs, benefits and financing*

FACTSHEET 1: CLIMATE CHANGE - A SOURCE OF RISK AND UNCERTAINTY IN WASH SERVICE DELIVERY

Fact Sheet 1 considers the impacts of climate change on the WASH sector and explains the importance of understanding uncertainty and vulnerability in this context.

Why should WASH sector professionals be involved in climate change adaptation?

- Because climate change threatens achievements already made in WASH service provision and sustainability, and is changing the context (on both supply and demand sides) in which we need to extend water and sanitation services.
- Because climate change impacts affect people and regions differently: poor people, including children and women tend to suffer first and hardest. Addressing vulnerability is critical to poverty reduction.
- Because successful climate change adaptation can only be achieved through cross-sector approaches, and with many impacts likely to be felt via water, the water and sanitation sector is particularly important.

What are the predicted effects of climate change?

The Intergovernmental Panel on Climate Change, a UN-linked scientific body, assembles knowledge on climate assessment. The opening statement of the last IPCC technical report on climate and water asserts that: 'Observational records and climate projections provide abundant evidence that freshwater resources are vulnerable and have the potential to be strongly impacted by climate change, with wide-ranging consequences for human societies and ecosystems'[i]. The main findings of the report[ii] are that:

- Precipitation will increase in high latitudes and parts of the tropics, and decrease in some subtropical and lower mid-latitude regions.
- Annual average river runoff and water availability are projected to increase in high latitudes and in some wet tropical areas, and decrease over some dry regions at mid-latitudes and in the dry tropics.
- Increased precipitation and variability intensity will increase the risks of flooding and drought in many areas.
- Water supplies stored in glaciers and snow covers are projected to decline as will dry-season river flows based on snow melt.
- Higher water temperatures and changes in extremes, including floods and droughts, are projected to affect water quality and exacerbate many forms of water pollution.
- Global mean sea level has been rising.

- Climate change challenges the traditional assumption that past hydrological experience provides a good guide to future conditions.

There is growing recognition that climate change impacts on both the supply and demand sides of WASH systems. Water is vital because it is "the predicted to be the primary medium through which early climate change impacts will be felt by people, ecosystems and economies"[iii]. WASH service providers are encouraged to prepare for the widely anticipated consequences of floods and droughts, or risk compromising access to safe drinking water and adequate sanitation for a substantial number of people in developing and developed countries, with cascading effects on human health, the environment and development[iv]. Both observational records and climate projections provide strong evidence that freshwater resources are vulnerable, and have the potential to be strongly impacted. However, impacts on water resources and water-dependent services have yet to be adequately addressed in either scientific analyses or water policy[v].

Why are there so many uncertainties and how can we deal with them?

There is no escaping the fact that uncertainty and climate change go hand-in-hand. Despite decades of ever more exacting science on different aspects of global warming, there remains great uncertainty on just how much warming will occur and, more specifically, on rates of atmospheric warming over different land surfaces.

There is even more uncertainty in the global climate and modelling systems that are used to predict the effects of greenhouse gas emissions on rainfall and other climate variables at various spatial and temporal scales. This uncertainty is linked to inadequacies in the way these models describe complex physical processes, to problems of scale, and to the quality of information used to develop or drive these models. It is also highly unlikely that some uncertainties will ever be reduced because of, for example, the lack of observations of past changes relevant to some aspects of both climate forcing and climate change[vi].

The way in which changes in future rainfall amount and intensity affect surface runoff and groundwater recharge depends on simultaneous changes in evaporation, but as importantly, on changes in a multitude of additional factors that include: land use and land cover, cropping intensity of rain-fed and irrigated crops, and groundwater levels. The local water balance (how rainfall at a particular place becomes divided between surface runoff and infiltration, and then between evaporation and groundwater recharge) is very sensitive, not only to changes in climate, but to changes in soil properties, agricultural practices or land use. It has to be recognised that change in agricultural practices, and associated change in the patterns of demand for and use of water, may be induced by climate change and/or a wide range of semi-dependent causal factors such as increasing demand for agricultural commodities.

To make the situation even more complicated, there is the potential for all kinds of feedback loops that have the potential to exacerbate (or possibly reduce) potential climate change impacts. Such feedback loops from (mal) adaptation measures to climate change are not fully considered in current predictions[vii]. As a consequence, the prediction with any certainty of the impact of climate change on, for example, the frequency and intensity of extreme events (e.g.

flooding) in space and time becomes both complex and incredibly difficult. It is, therefore, highly unlikely that reliable predictions of changes in water supply and demand will be available in the foreseeable future, particularly at the scales at which WASH planning generally takes place.

It has been argued in open meetings that uncertainty linked to science is relatively small compared to uncertainty linked to the wider political economy. Various sources of uncertainty are listed below[viii]:

- Uncertainty linked to knowledge (e.g. scientific understanding).
- Uncertainty linked to societal and bio-physical systems (e.g. the complex feedback loops and/or delays that might exacerbate or reduce the impacts of climate change).
- Uncertainty linked to system behaviour and, more specifically, the ability of systems to adapt and cope with (or even prosper from) climate change impacts.
- Uncertainty in the perceptions (or mental models) that institutions or people have of climate change. These are and will continue to be diverse, ambiguous and difficult to reconcile.
- Uncertainty in the potential impacts of policy, frameworks, methods and tools aimed at practical adaptation.

Like many important decisions, policy choices about climate change have to be made in the absence of "perfect knowledge". Even if the remaining uncertainties were substantially resolved, the wide variety of interests, cultures and beliefs in society would make consensus about such choices difficult to achieve. However, the potential impacts of climate change are sufficiently serious that important decisions will need to be made.

Important questions which need to be addressed by WASH sector professionals include:

- What population groups, sectors and regions are most vulnerable to the impacts of climate change or current climate variability? Why are they at greatest risk (e.g. poor development, poverty, degraded natural resources)?
- Will climate change exacerbate existing vulnerabilities? What are the links between the impacts of climate change and vulnerability?

What is the situation in Nigeria?

Nigeria's key vulnerabilities to climate change, as stated by Nigeria's First National Communication (FNC) on climate change are:

- Heavy dependence of the economy and of individual livelihoods on rain-fed agriculture that is highly susceptible to fluctuations in rainfall and water supply;
- Exposure of northern Nigeria to accelerated desertification linked to increasing drought with resulting impacts on the local population and the natural resource base;
- Exposure of the nation's 850 km coastline to the threats of increased sea level rise and storm surge risk which could impact communities, infrastructure, coastal oil installations, endemic species of flora and fauna and spawning grounds for fish;

- Sensitivity of other sectors of the economy to climate variability such as Nigeria's electrical supply, which is heavily dependent on hydropower and thus is affected by fluctuations in rainfall;
- The pressure of high population growth in Nigeria which reduces resilience to a number of climate impacts;
- A lack of defined policies, low political will and limited financial resources to address the need for early action on climate change; and
- Limited organizational and technical capacity to respond.

What can the WASH sector do to address the uncertainties?

Doing better: Improving access to water and sanitation

Access to water and sanitation is low in Nigeria (urban and rural sanitation and urban water actually show a declining trend in the proportion of people using safe facilities, while rural water shows only slow improvement). This puts at risk a huge number of people, who are less able to cope when other problems come along. With poorer health, less time available and less income that would be the case if everyone had water and sanitation, people are less able to cope with the negative impacts of climate change such as poor crop yields due to a shorter rainy season, the loss of livestock during a drought, or the damage in a flood to crops and infrastructure. Providing water and sanitation services for everyone is therefore an essential focus of the climate change adaptation effort. It helps to build resilience.

Although it may sometimes be blamed, climate change is not the reason for the current low water and sanitation coverage – rather the governance, capacity, management and financing issues that hamper development of new services and cause existing systems to fall into disrepair – but it is important to recognise that climate change is and will be an additional stressor in this system. **The main implication is that for people to cope with climate change, the water and sanitation sector needs to be successful in improving access and ultimately provide universal services.** The water and sanitation sector needs to solve its problems and do its core business better. Climate change adaptation funding could help to an extent since this ought to be available for water and sanitation investments (and there is a funding gap) and initiatives. But only if the water and sanitation sector can convince that it can make wise use of such financing and effectively turn money spent into services delivered and reduced vulnerability. Climate change adaptation might also potentially be a driver of some new innovation in the way services are provided.

Doing some things differently: adapting the way we do water and sanitation

Although it is not the only source of uncertainty about the future in which the water and sanitation sector will operate (other sources include population changes, economic growth and political stability for example) it seems clear that climate change is going to have some severe impacts on the water and sanitation sector. **A second implication of climate change is therefore that the water and sanitation sector will need to do some things differently**.

Some impacts are more certain than others and the adaptation measures more obvious. Infrastructure in flood-prone areas needs to be better protected. Households and communities that depend upon groundwater need to be encouraged to deepen wells during dry periods and droughts, and to improve well protection and lifting capacity to ensure they can cope with greater variations and lower groundwater levels. Unsafe water sources could provide more safe supplies if protection of wells were improved or household water treatment solutions more widely available and used. Additional infrastructure will be needed to augment supplies in small towns and urban areas and demand management measures adopted to make water resources go further. Planning and service delivery agencies need to think about the potential for climate change to further spur urbanization and their ability to cope in proving water and removing waste to cope with additional population growth. Communities need to be protected from rising sea-levels and associated flooding and sea-water intrusion. Organisations need to be able to respond to emergencies to provide safe water and sanitation facilities during times of crisis.

While some 'no regrets' expenditure can be identified (things that make sense to do even if climate change risks do not materialize as we expect) a major challenge is that given the uncertainty of climate change and its impacts, we can't be sure exactly what justifies investment and in which locations. For this reason, building adaptive capacity within the water and sanitation sector is important. Many things will have to be decided as we go along, based upon good monitoring, research on building climate resilience, and the engagement of stakeholders – especially impacted communities – in WASH decision making and planning.

Adaptation to climate change is a key strategy

Adaptation is a broad concept covering actions by individuals, communities, private companies and public bodies such as governments. Successful adaptation can reduce vulnerability by building on and strengthening existing coping mechanisms and assets, targeting climate change vulnerability with specific measures, and integrating vulnerability reduction into wider policies[ix].

Adaptation has been approached from both top-down and bottom-up perspectives, with considerable overlaps between the two. The former relies on climatic and applied modelling to predict secondary impacts (e.g. on crops or water availability) from a projected change in climate. Although fairly technical, these are applicable to wide areas and can indicate where broader adaptation measures may be necessary, such as drought-resilient crop varieties or expanded irrigation systems.

Bottom-up approaches assess vulnerability and adaptive capacity to current climate variations and future climate trends at the local level. Climate variability is a reality that humans have always been exposed to and have developed different ways of dealing with. Existing coping mechanisms are used as a platform for fostering resilience to future changes. While they can incorporate modelling projections, they draw primarily on local knowledge and can more effectively target the poorest and most vulnerable in developing appropriate adaptation responses (See factsheet 4 for more discussion of community-based adaptation.)

Box 1 WASH sector professionals and practitioners have been slow in tackling the issue of climate change. Why does this disconnection exist?

The WASH Sector is busy working on "more immediate challenges". Many WASH professionals and practitioners continue to struggle with the more immediate challenges of improving WASH services provisioning. The current low levels in water provisioning take place under conditions of a rapidly increasing demand for WASH services linked to population growth, increasing inter-sectoral competition for limited water resources, and slippage of WASH service levels due to factors such as inadequate operation and maintenance (O&M).

Climate change is regarded as "somebody else's problem". There seems to have been a gradual shift from WASH professionals and practitioners doubting that climate change poses a risk to WASH services delivery, to taking the stance that climate change is a potential hazard, but is "somebody else's problem". This view is reinforced by the fact that WASH professionals and practitioners tend to be excluded from climate change research and in the development of, for example, National Adaptation Programmes of Action (NAPA), which are usually under the remit of national ministries or departments of environment.

Governance constraints. Governance systems in the WASH sector are based primarily around allocation of funds followed by engineering works that are planned using standard specifications and procedures. These standard procedures, in particular, often put severe constraints on WASH professionals and practitioners who might want to adopt a more evidence-based and/or adaptive approach to WASH services delivery.

Lack of political will. There is a tendency now for politicians (and even WASH professionals) to blame the problems of WASH services delivery on climate change, often with no clear justification. Similarly, climate change has also become a convenient "scapegoat" for WASH services providers in explaining poor services delivery. Paradoxically, these same politicians often lack the will to approve expenditure on climate change adaptation.

Not sure what to do. As mentioned above, WASH professionals and practitioners tend to focus their energies in responding to the more "traditional" challenges of WASH services. At times, taking on new responsibilities and delving into new analytical terrain are feared to cause delays in meeting their immediate targets. As a result, they are not sure what they can do or how to contribute to climate adaptation without compromising other activities. This TOP was prompted in part by the lack of practical "what to do" guidelines targeted specifically at WASH sector practitioners.

Wait and see. Finally, there appears to be a large percentage of WASH professionals and practitioners who assume a "wait and see" attitude in responding to the links between climate change and WASH services. Put another way, whilst they do not deny the potential risks posed by climate change, they fail to recognise the imperatives for taking immediate action or modifying existing procedures. This general attitude may be attributed to a range of factors including confusing messages and signals from international meetings (e.g. the Copenhagen COP15 and Cancun COP16 meetings), lack of awareness of what may be done, resistance to change and/or uncertainty linked to the professional risk of being an early adopter of new analysis and ways of working. Media portrayal and reporting that question the veracity of the IPCC process and findings also prompt many WASH practitioners to adopt a "wait and see" strategy, which is deemed as the most "sensible thing to do".

Source: Batchelor *et al.* (2011)

Furthermore the current debate distinguishes between "high-regret", "low- regret" and "no-regret adaptation (see Session 8 for definitions). Commonly these distinctions refer to the economic costs involved in the adaptation strategy. However of equal importance should be ethical, socio-economic, cultural and environmental criteria.

An equity and gender issue

Some people are more vulnerable than others to the likely impacts of climate change. Vulnerability can be influenced by place, position and practices. Some communities and households are more vulnerable than others because of where they live. It is common that poorer communities may be found, sometime without legal tenure, close to rivers prone to bursting their banks, on hillsides prone to landslides or in coastal areas prone to flooding. Other communities, households or individuals are more vulnerable than others because of their more disadvantaged place in society. The poor have fewer resources and assets that might be used to protect themselves, building better shelter for example, or to cope after changes in climate that might impact on farming incomes or climate-related disasters. Youth are affected[x], and the disabled are similarly vulnerable. Practices, like collecting water, often have strong gender dimensions. When collecting water gets harder, for example due to climate change leading to the drying of up of the closest water sources, it is likely to be women that will disproportionately bear the costs of additional time and drudgery in fetching water. Where climate changes results in a reduction in the quality of access to water and sanitation services, it is also likely to be women and children that bear a larger share of the resulting disease burden, with young children and pregnant and lactating mothers especially vulnerable.

Key definitions

Adaptation: Policies, actions and other initiatives designed to limit the potential adverse impacts arising from climate variability and change (including extreme events), thereby maximising positive consequences (Batchelor *et al*., 2011).

Climate: Average weather and its variability over a period of time, ranging from months to millions of years. The World Meteorological Organization standard is a 30-year average. "Climate is what you expect, weather is what you get."

Climate change: A change in the climate's mean and variability for an extended period of decades, or more.

Climate resilience: The ability of a social or natural system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity of selforganisation and the capacity to adapt to stress and change (Batchelor *et al*., 2011).

Uncertainty: An expression of the degree to which a value (e.g. the future state of the climate system) is unknown. Uncertainty can result from lack of information or from disagreement over what is known or even knowable. Uncertainty may arise from many sources, such as quantifiable

errors in data, or projections of human behaviour. Uncertainty can be represented by quantitative measures or by qualitative statements (Batchelor *et al*., 2011).

Vulnerability: The extent to which a natural or human system is susceptible to sustaining damage resulting from climate variability and change, despite human actions to moderate or offset such damage. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity (Batchelor *et al*., 2011).

Read

Batchelor, C. Smits, S. and James, A.J., 2011. *Adaptation of WASH services delivery to climate change and other sources of risk and uncertainty.* Thematic Overview Paper 24. The Hague: IRC International Water and Sanitation Centre [online] Available at www.irc.nl/top24

- This factsheet is partly based of the text of this more comprehensive document.

Mitchell, T., and Tanner, T. 2006 *Adapting to climate change: Challenges and opportunities for the development community.* Institute of Development Studies [online] Available at www.tearfund.org/webdocs/website/Campaigning/policy%20and%20research/Adapting%20to%20climate%20change%20discussion%20paper.pdf (Accessed 11 Nov 2012)

Watch

The climate science (7 mins) http://www.youtube.com/watch?v=jSkE7Wt14m4

- A brief podcasted introduction to the science of climate change and global warming from the UK climate impacts programme

Climate change in Northern Nigeria (29 mins) http://www.youtube.com/watch?v=-8sU9MmnwV0

- A film on climate change impacts in the drier north of Nigeria produced by the Building Nigeria's Response to Climate Change (BNRCC; www.nigeriaclimatechange.org) project (Nigeria Environmental Study/Action Team, NEST, www.nestinteractive.org).

Water Runs Deep: Climate Change in Nigeria's South (31 mins) http://www.youtube.com/watch?v=Y3DBu5uKYuo

- This film, also produced by the BNRCC project, highlights issues and climate change impacts cross the coastal and wetter south of Nigeria including flooding, deforestation, storms, loss of coastal lands and property, and migration. How climate change combines with other drivers is one key issue that emerges.

Gathering Rain (IRIN/UNEP) http://www.irinnews.org/film/

- An excellent series of 8 films illustrating the vulnerability of individuals and communities living in widely different African environments to the impacts of climate change. Some are finding ways to cope and adapt.

- Harvesting Rain tells a story of how of the burden of water collection on women and how harvesting water from a rock catchment is helping this community in Kenya (Chapter 1, 3 mins)
- Farmers tilling the fertile land around Chokwe in southern Mozambique are always vulnerable to floods, but have learned to be better prepared after the devastating 2001 flood to keep their harvests safe (Escaping floods, Chapter 2, 2 mins).
- Disease is affecting new communities, and especially children, due to temperatures changes in this story from highland Kenya (Highland Malaria, Chapter 4, 3 mins)
- Coastal Erosion (Chapter 5, 2 mins) captures the vulnerability that comes with living near the sea in Senegal as sea levels rise.
- Flooding Rivers (Chapter 7, 3 mins) have displaced people and farming from near the Zambezi river, who find it hard to adapt in this story from Mozambique.
- Shifting sands (Chapter 18, 7 mins) tells the story of vulnerable communities in Madagascar where the encroachment of sand dunes and saline intrusion is making growing food and finding scarce water harder.

The Water Channel (www.thewaterchannel.tv)

- This channel (type climate change in the search bar) carries lots of climate change related videos such as 'hotspots: Africa speaks up on climate change' which includes Nigeria (www.thewaterchannel.tv/en/videos/categories/viewvideo/262/climate-change/hotspots-africa-speaks-up-on-climate-change)

Websites

Africa Adaptation Programme http://www.undp-aap.org/countries/nigeria

Other references and notes

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[i] Bates, B.C., Z.W. Kundzewicz, S. Wu and J.P. Palutikof (Eds.) 2008. *Climate Change and Water*. Technical Paper of the Intergovernmental Panel on Climate Change, IPCC Secretariat, Geneva [online] Available at http://www.ipcc.ch/pdf/technical-papers/climate-change-water-en.pdf (Accessed 12 Nov 2012)

[ii] Summarised by Batchelor, C., Schouten, T., Smits, S., Moriarty, P., and J. Butterworth (2009) *Climate change and WASH services delivery: Is improved WASH governance the key to effective mitigation and adaptation?* Perspective paper, prepared for the 5th World Water Forum. IRC International Water and Sanitation Centre, the Hague, the Netherlands [online] Available at www.irc.nl/page/46949 (Accessed 12 Nov 2012)

[iii] Calow, R., Bonsor, H., Jones, L., O'Meally, S., MacDonald, A., & Kaur, N. (2011) *Climate change, water resources and WASH: A scoping study.* ODI Working Paper 337. Overseas Development Institute, London.

[iv] Sinisi, L. and Aertgeerts,R. eds., 2010. *Guidance on water supply and sanitation in extreme weather events*. Copenhagen: WHO Regional Office for Europe. [online] Available at: www.unece.org/env/water/whmop2/WHO_Guidance_EWE_Final_draft_web_opt.pdf (Accessed 11 Nov 2012).

[v] See Calow *et al.* (2011) *Op. Cit*.

[vi] Royal Society, 2010. Climate change: A Summary of the Science. [online] UK: The Royal Science (Published September 2010) Available at: <http://royalsociety.org/climatechange- summary-of-science/> (Accessed 3 July 2011).

[vii] Bates *et al.* (2008). Op. Cit.

[viii] Based on Pahl-Wostl, C., Möltgen, J., Sendzimir, J. and Kabat, P. (n.d.). *New Methods for adaptive water management uncertainty– The NeWater Project*. [online] Available at www.newater.info/ (Accessed September 2009).

[ix] Mitchell, T., Tanner, T., & Wilkinson, E. (2006) *Overcoming the barriers: Mainstreaming climate change adaptation in developing countries.* Tearfund Climate Change Briefing Paper 1 [online] Available at www.tearfund.org/webdocs/website/Campaigning/Policy%20and%20research/Overcoming%20the%20barriers%20briefing%20paper.pdf (Accessed 11 Dec 2012)

[x] Pereznieto, P (2011) Exploring the Impact of Macro-Level Shocks on Youth: 3F Crisis and Climate Change in Ghana, Mozambique and Vietnam. Overseas Development Institute [online] Available at http://www.odi.org.uk/sites/odi.org.uk/files/odi-assets/publications-opinion-files/7175.pdf

FACTSHEET 2: MAINSTREAMING CLIMATE CHANGE ADAPTATION

This factsheet explores the concept of mainstreaming climate change adaptation into the WASH sector. It looks at mainstreaming definitions and concepts and points out some generic and more specific entry points.

Why should climate change mainstreaming be of interest to WASH sector professionals?

- The WASH sector has not generally been very influential in the development of climate change adaptation strategies and responses, neither at global nor national levels.
- The cross-cutting nature of climate policy and the different challenges posed by mitigation and adaptation require cross-sectoral responses.
- Stand-alone initiatives will not be sufficient to deal with climate change challenges.

What is meant by "mainstreaming"?

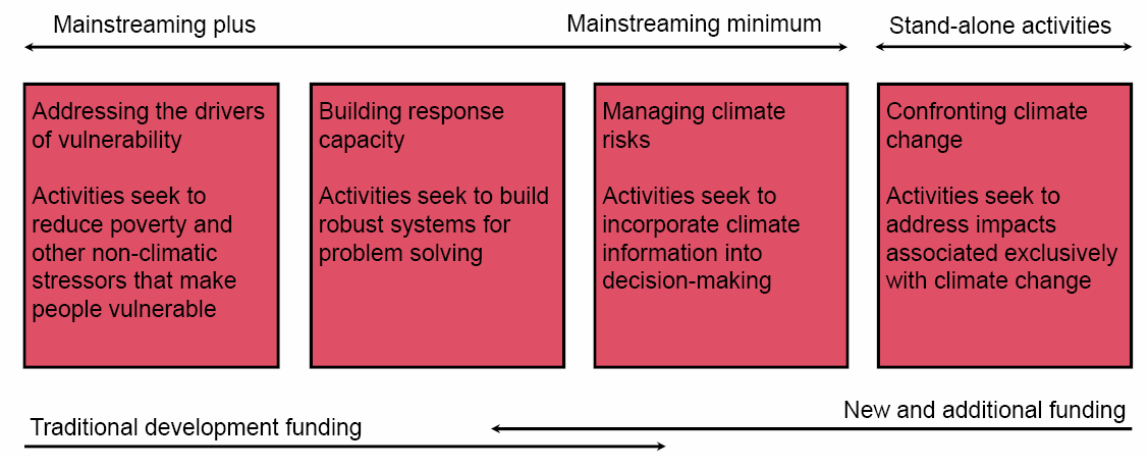
One definition of mainstreaming is "the integration of policies and measures to address climate change into ongoing sectoral planning and management, so as to ensure the long-term viability and sustainability of sectoral and development investments"[i]. The Intergovernmental Panel on Climate Change (IPCC) defined mainstreaming to mean that "development policies, programmes and/or individual actions that otherwise would not have taken climate change mitigation into consideration explicitly include these when making development choices"[ii].

Figure 1 illustrates some different understandings of mainstreaming and the resulting actions. This can be understood as an adaptation continuum where an initial, minimal step of mainstreaming merely seeks to address climate change impacts through stand-alone activities. At the other extreme, decision makers attempt to address all the drivers of vulnerability, thus simultaneously reducing poverty and other non-climatic stressors that contribute to vulnerability. Examples would be the climate-proofing of WASH infrastructure in a specific region (stand-alone activity) compared to the implementation of a policy of providing affordable access to drinking water to all members of society (addressing drivers of vulnerability).

The distinction between these different levels of mainstreaming is not only relevant for the planning and implementation of activities but also for funding. Whereas stand-alone activities directed at reducing climate change impacts will require additional and new funding, approaches to address vulnerabilities can to some extent draw on existing development funds (see also factsheet 8 on climate change financing).

Improving resilience involves moving away from simply coping with impacts and managing risks to making informed investments towards facilitating long-term resilience[iii]. This might involve for example, developing practical measures that increase storage capacity (e.g. by constructing more reservoirs or water storage tanks) or it could involve improvements in disaster preparedness.

Figure 1 Mainstreaming continuum



Source: Klein (2009)

The description of different mainstreaming activities can be further developed to distinguish three key mainstreaming stages or approaches (Table 1).

Table 1: Mainstreaming stages or approaches

Stage in mainstreaming cycle	Description
Stage 1: Climate-proofing approach	WASH "hardware" investment will be protected from the negative impacts of climate change, e.g. dams will be improved, water pipes protected from flood damage, etc.
Stage 2: Climate resilient development approach	Recognising that in a development deficient situation many people will not have access to or benefit from improved WASH hardware, other mainstreaming activities are required. These aim to increase adaptive capacity of marginalised individuals and groups through improved access to information, capacity building, etc. ('software')
Stage 3: Transformational change	Taking into account potential complex system changes and impacts, at a later stage the WASH sector might be required to engage in transformational changes, which go beyond the described adaptations of hard and software above.

These different approaches all need to be considered in the development of a mainstreaming approach for the WASH sector.

Moving from concepts to action

UNDP-UNEP[iv] define three core components for the mainstreaming approach to climate change adaptation, which is based on the overall poverty-environment mainstreaming framework developed in 2009.

- *Finding entry points for mainstreaming climate change adaptation.* Finding the entry points and making the case is concerned with setting the stage for mainstreaming. Adaptation-specific activities include understanding the linkages between climate change, development and poverty as well as the governmental, political and institutional contexts relevant to adaptation (in the context of WASH this would refer to WASH policies, plans and programmes; current level of mainstreaming; roles and mandates; coordination mechanisms). Adaptation mainstreaming also requires specific awareness raising and partnerships, in particular among climate specialists, planners and financiers as well as between different sectors and levels of implementation.
- *Mainstreaming into policy processes (ongoing WASH policies).*Mainstreaming into policy processes focuses on integrating issues into an ongoing policy process, based on country-specific evidence. Complementary to country-specific evidence developed as part of a poverty-environment mainstreaming effort are, for example, impact, vulnerability and adaptation assessments; socio-economic analysis of the costs and benefits of adaptation options; and the lessons drawn from adaptation demonstration projects. Based on this evidence, policy documents (in our case from the WASH sector) and measures need to be analysed in light of climate change, be climate-proofed and include additional priority interventions as appropriate.

Box 1 Review of WASH policies in Nigeria

A review of WASH policies in Nigeria noted that the main existing WASH policies are dated, and both water and sanitation policies are now being reviewed. This provides an opportunity to address major gaps relating to climate change issues in the major 2000 and 2004 sector policies.

Sanitation: A 'one national policy on sanitation' is now being developed to replace the existing fragmented policies on sanitation, and this benefits from the currently higher profile of sanitation than was the case in the past. Recommendations to the working group engaged in national sanitation policy development are:

- To specifically recognise that current low rates of sanitation coverage and poor hygiene behavior's place citizens, make citizens more vulnerable to the impacts of climate change, and that improving sanitation and hygiene is an important contribution to climate change adaptation and the climate resilience of communities.
- Disaster risk reduction measures need to be mainstreamed within the sanitation sub-sector.
- To recognise that climate change impacts on temperature and rainfall have the potential to modify patterns of water-related and vector-borne disease.

- Sanitation programmes and projects should introduce 'climate screening' to promote the consideration of strategies and options that maximize climate resilience.

Water: The existing water policies are silent on the issue of climate change, a matter which could be addressed when updated policies are prepared. Specific recommendations relating to water supply and water resources management are:

- To specifically recognise that current low rates of water supply coverage (like low sanitation coverage), make citizens more vulnerable to the impacts of climate change, and that improving water supply is an important contribution to climate change adaptation and the climate resilience of communities.
- Disaster risk reduction measures need to be mainstreamed within the water supply sub-sector.
- Water supply programmes and projects should introduce 'climate screening' to promote the consideration of strategies and options that maximize climate resilience.
- The introduction of Integrated Water Resources Management should include practical implementation down to local levels with appropriate linkages established between service delivery in water and sanitation and water resources management.

The review identified a strong commitment to inter-ministerial and multi-stakeholder involvement in climate change adaptation policy, which has to be cross-cutting in nature. The Ministry of Water Resources and the Ministry of Health have climate change focal persons in place to liaise on climate issues with the Federal Ministry of Environment and other stakeholders. Continued engagement in climate change policy development and the implementation of the NASPA should be encouraged building upon the draft NASPA document which substantially addresses WASH issues. The WASH sector should also examine opportunities to make more use of dedicated climate change adaptation financing, both domestic and external.

Source: Butterworth (2012)[v]

- *Meeting implementation challenge (budgeting and financing, implementation and m&e):* Meeting the implementation challenge aims at ensuring mainstreaming into budgeting and financing, implementation and monitoring. Adaptation mainstreaming requires investing in climate change monitoring and forecasting (both science and policy related) as part of broader national monitoring efforts. Budgeting and financing adaptation means both integrating adaptation into national systems and leveraging special funding sources and modalities. Policy measures at different levels include both general measures revisited with a climate lens and adaptation-specific measures. Factsheet 8 of this training module will focus specifically on financing aspects.

The water sector as a whole needs to play a more central role in climate change adaptation, particularly at the national level. This, however, is both stating the obvious and glossing over the less than impressive outcomes of attempts during the last twenty-five years to improve WASH sector governance and introduce reforms that shift sector governance to more integrated and adaptive approaches to WASH services delivery. There are optimists who believe that the spectre of climate change might provide the necessary stimulus that kick starts significant changes in improving water governance and, just as importantly, the better alignment of policies

across all the sectors that have a significant stake to safe drinking water, adequate sanitation, human health, the environment and development[vi].

International climate change architecture and entry points for mainstreaming

In order identify potential entry points for mainstreaming it is also important to be familiar with the international climate change architecture. The UN Framework Convention on Climate Change (UNFCCC) was agreed in 1992 to set "an overall framework for intergovernmental efforts to tackle the challenge posed by climate change." The UNFCC focuses on Mitigation, Finance, Technology and Adaptation.

The principal institutional innovations of the UNFCCC and the wider international climate architecture include:

- The IPCC – a broadly accepted arbiter for assessing the nature and extent of 'dangerous anthropogenic interference with the climate system', which was set up by the UN Environment Programme and the World Meteorological Organisation in 1988.
- Various instruments for restraining emissions under the Kyoto Protocol, including binding targets, and a cap and trade emissions trading scheme for some developed countries.
- Mechanisms for trading emissions and encouraging abatement in countries that have not accepted binding targets, notably Kyoto's Clean Development Mechanism.
- More or less standardised methodologies for countries to report their attempts to reduce emissions.

The UNFCCC webpages[vii] on adaptation highlight the range of issues that are being addressed by Parties under the various Convention bodies, including:

- The Cancun Adaptation Framework, which resulted from negotiations on enhanced action on adaptation as part of the Bali Action Plan under the Ad-hoc Working Group on Long-Term Cooperative Action under the Convention (AWG-LCA).
- Nairobi work programme on impacts, vulnerability and adaptation to climate change, development and transfer of technologies, research and systematic observation under the Subsidiary Body for Scientific and Technological Advice (SBSTA).[viii]
- Issues related to implementing, including national adaptation programmes of action (NAPAs), and supporting adaptation through finance, technology and capacity-building under the Subsidiary Body for Implementation (SBI).

The NAPAs are key documents which should enable each country to identify relevant entry points for mainstreaming. In the case of Nigeria we need to consider the NASPA-CCA as a starting point.

Key definitions

Mainstreaming: development policies, programmes and/or individual actions that otherwise would not have taken climate change mitigation into consideration explicitly include these when making development choices"[ix].

Read

World Bank (2010). Mainstreaming Adaptation to Climate Change in Agriculture and Natural Resources Management Projects, Guidance Note 1: Engaging Key National Institutions in the Adaptation Agenda

- This note illustrates ways to identify institutional counterparts that, depending on the circumstances, are most likely to effectively take the lead on mainstreaming adaptation to climate variability and climate change in national planning or on implementing adaptation measures. It also provides a range of specific suggestions and information to help engage counterparts in the adaptation agenda.

Huxtable, J. and Yen, N.T. (2009) Mainstreaming Climate Change Adaptation: A Practitioner's Handbook. CARE International, Vietnam

Venton, P. (2010) How to integrate climate change adaptation into national-level policy and planning in the water sector: a practical guide for developing country governments. Tearfund.

Other references and notes

[i] Klein, R. (2009) *Impacts, adaptation, vulnerability and development: Key insights and challenges.* Stockholm Environment Institute.

[ii] IPCC (2007) *Fourth Assessment Report: Climate Change 2007, Section 12.2.4.6 – Mainstreaming climate change into development choices: Setting priorities*. Intergovernmental Panel on Climate Change.

[iii] Burke and Kuylenstierna (2009).

[iv] UNDP-UNEP (2011)

[v] Butterworth J, 2012. Review of Nigerian WASH policies with respect to climate change adaptation. Consultancy report to UNICEF for assignment on 'Mainstreaming climate change aspects into WASH sector programmes and policies'.

[vi] Batchelor, C. Smits, S. and James, A.J., 2011. *Adaptation of WASH services delivery to climate change and other sources of risk and uncertainty.* Thematic Overview Paper 24. The Hague: IRC International Water and Sanitation Centre [online] Available at www.irc.nl/top24

[vii] See http://unfccc.int/adaptation/nairobi_work_programme/items/3633.php

[viii] Further information on the programme can be found at www.unwater.org/downloads/unw_ccpol_web.pdf

[ix] IPCC (2007) Op. Cit.

FACTSHEET 3: SCENARIO-BASED PLANNING

This factsheet introduces scenario-based planning, a practical approach that you can use to improve and adapt your existing WASH planning to take account of climate change and other sources of risk and uncertainty.

Why should scenario-based planning be of interest to WASH sector professionals?

- Traditional planning approaches tend to assume that existing trends (e.g. in climate, population growth) will continue into the future, and they focus on finding one best solution to a problem in order to achieve an objective (such as 100% population with access to improved water or sanitation). But we don't know the context or environment that we will be operating in in the future. Extrapolating current trends is too simplistic and unlikely to capture the emerging risks presented by climate change or many possible solutions.
- Scenario based planning pays more attention to thinking about the future (visioning), about what the environment/context might be in which we need to realise our goals (scenario-building) and thinking about strategies (strategy development) and building capacity to realise the objective under different circumstances (e.g. more climate resilient strategies).
- The methodology can easily be used for a full multi-stakeholder planning exercise, or more flexibly to make small adjustments and introduce new ways of thinking into existing planning processes.

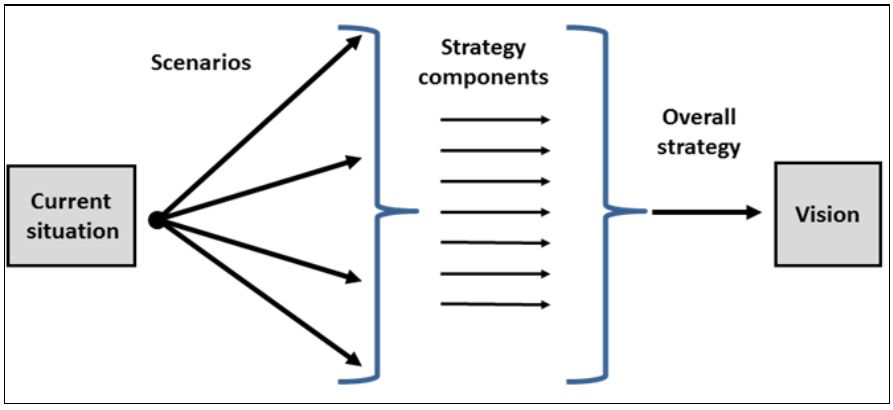


Figure 1 Strategy development based on visioning and scenario building
Source: Batchelor et al. (2011).

What are the key elements and tools?

Figure 1 provides a schematic overview of the concept of strategy development based on visioning and scenario building. At its simplest, the approach involves three phases. First, stakeholders develop a shared vision of the water services and environment that they would like to achieve at some specified time in the future. Second, stakeholders develop a set of plausible (although not necessarily equally likely) scenarios that describe different futures. Third, an

overall strategy is developed that integrates various components with the potential to achieve a shared vision regardless of which scenario, over time, turns out to be closest to reality.

Other important activities are more detailed planning to put strategies into effect, monitoring and learning that leads to a refinement over time of strategies and plan, and if required, updating of visions and scenarios.

Visioning

To meaningfully take account of climate change, it is necessary to have a more medium to long-term (5-25 years) planning horizon than the more short-term thinking that characterises much investment and operational planning in the WASH sector (often annual plans). Visioning is an approach to taking this longer view, and is also useful in engaging a broader group of stakeholders in joint efforts to address challenging and difficult problems like climate change adaptation.

The aim of a visioning process is to develop a consensus amongst a group of stakeholders and a commitment to work constructively towards the achievement of a shared vision. Visioning gives stakeholders an opportunity to discuss their concerns and fears with other stakeholders. Concerns can include risks and uncertainties such as climate change or any other factor that has the potential to impact on WASH services delivery. Typically, visioning comes at the beginning of a planning process. This is the time stakeholders should decide whether or not to mainstream consideration of risks, vulnerability and uncertainty into the planning process.

Visioning helps us to think beyond the day-to-day realities of problem solving and to imagine an achievable medium to long-term future for which we can plan - typically 5-15 years ahead at the community level, and 10-25 years ahead at the district or city level. To be useful as part of a wider planning process, a vision must be realistic and achievable, and grounded in the realities of trends in WASH services delivery and the successes (or failures) of on-going WASH projects or programmes. An example of a vision from Nigeria is included in Box 1.

Box 1 Vision2020 vision for water supply and sanitation, Nigeria

The vision established by the **Vision2020** process was:

Sustainable and equitable access to safe, adequate and improved Water Supply and Sanitation for all; ensuring the socioeconomic development of the country with a view to placing Nigeria amongst the top twenty economies in the world by the year 2020.

This was accompanied to a series of quantified targets:

- Increase national improved water supply coverage from: 47% to 50% by 2011; 50% to 75% by 2015; and 75% to 100% by 2020.
- Increase Urban improved water supply coverage and the minimum basic human water requirements respectively, from: (a) 65 to 70% & 60 to 80 l/c/d by 2011; (b) 70 to 85% & 80 to 100 l/c/d by 2015; and (c) 85 to 100% & 100 to 120 l/c/d by 2020.

- Increase Small Town improved water supply coverage and minimum basic human water requirement respectively, from: (a) 65 to 70% & 20 –30 l/c/d by 2011; (b) 70 to 85% & 30- 60 l/c/d by 2015; (c) 85 to 100% & 60 to 90 l/c/d by 2020.
- Increase Rural improved water supply coverage and minimum basic human water requirements respectively, from: (a) 30 to 40% & 20 to 30 l/c/d by 2011; (b) 40 to 70% & 30 to 45 l/c/d by 2015; and (c) 70 to 100% & 45 to 60 l/c/d by 2020.
- Increase national improved sanitation coverage from: 30% to 35% by 2011; 35% to 65% by 2015; and 65% to 100% by 2020.
- Increase Urban improved sanitation coverage from: (a) 35% to 40% by 2011; (b) 40% to 70% by 2015; and (c) 70% to 100% by 2020
- Increase Small Town (Semi Urban) improved sanitation coverage from: (a) 35% to 40% by 2011; (b) 40% to 70% by 2015; and (c) 70% to 100%. By 2020.
- Increase Rural improved sanitation coverage from: (a) 25% to 30% by 2011; (b) 30 to 50% by 2015; and (c) 50 to 100% by 2020

Source: Vision 2020 National Technical Working Group on Water and Sanitation (2009)

Developing visions is invariably a political process. As a consequence, facilitation is needed to reconcile diverse and, at times, conflicting views on the relative importance of, for example, environmental sustainability, economic growth and provision of WASH services to the poor and the marginalised. This said, it is often easier to achieve consensus amongst a diverse group of stakeholders on the components of a vision than it is on the strategies and plans for achieving a shared vision. Or put another way, strategies and plans are often more politically contentious than visions.

Box 2 Steps in a visioning process

Step 1: Form a multi-stakeholder group or consultation platform associated with the planning process if one does not exist as yet.
Step 2: Agree on the scope of the vision over the area of interest and timeframe for which a vision is to be developed. In most cases, the area of interest is framed by institutional boundaries (e.g. a district or an urban area). The time frame will often be the same as the one(s) used by the district or urban authorities for other planning processes.
Step 3: Review existing visions that relate to the water and other sectors.
Step 4: Identify main issues that are to be included in the group's vision. Some of these will be directly related to the water sector (e.g. increasing water demand, climate change), while others may indirectly be linked (e.g. economic growth, energy costs). Existing visions may also be used to stimulate discussions during this step.
Step 5: Develop an outline vision for the area of interest over the agreed timeframe. The vision is best described using a concise mixture of descriptive narrative and numerical targets. Testing whether a vision is Specific, Measurable, Achievable, Realistic, and Time-bound (SMART) helps ensure that it more than a "wish list".
Step 6: Check for mutual consistency or alignment with other visions if relevant, check that the draft vision is consistent with visions at higher or lower spatial or administrative scales. A realistic vision statement must be aligned to the general trajectory of government policy.
Step 7: Assess the probability of achieving the vision. The aim here is to assess the viability of different strategies and the risks and uncertainties relating to achieving the vision under different

scenarios. If this analysis shows that there is a low probability of achieving the vision under some or all of the scenarios, the vision should be modified.
Step 8: Wider consultation processes, including the wide dissemination of information on a group's vision to interested parties at higher levels (e.g. national government officers, academics, relevant national NGOs). Elicit comments and feedback. Finalise the vision by taking account of constructive comments.

Scenario building

Nothing is more obvious than the unpredictability of the future[i]. In planning processes, the sector is continuously confronted with the dilemma that all reliable knowledge stems from the past, whilst all decisions that need to be made are for the future. Arguably, uncertainty in the WASH sector has now become so pronounced as to render futile, if not counterproductive, planning processes that are based on probabilities and the extrapolation of current trends. Or put another way, unique forecasts of factors influencing the provision of and demand for WASH services delivery can and should no longer be relied upon.

So, what can we do? One option is to use scenarios and scenario building as an integral part of planning processes. The main purpose of scenario building is to help make it possible to identify, evaluate and take explicit account of a whole range of uncertain factors that might either support or derail strategies and plans that are aimed at achieving a shared vision.

Scenario building is essentially a team exercise that can help a group of stakeholders to come to terms with uncertainty and risk in a planning process. In particular, scenarios can be used to identify the most uncertain and most important factors that are outside the direct control of stakeholders. Experience has shown that it is these uncontrollable factors that are more likely to disrupt plans rather than factors that, although very important, are predictable and under the control of stakeholders tasked with implementing strategies and plans.

Scenario building forces stakeholders to confront key beliefs and challenge conventional wisdom. It forces stakeholders to think creatively and systematically engage with a multitude of inter-sectoral issues and factors that, in the future, may have an increasingly important impact on the WASH sector (e.g. peak oil[ii], increased demand for agricultural commodities, climate change).

Whilst scenario building is used routinely throughout the fields of industry, commerce and government, its use in the WASH sector is still relatively limited. In these other sectors, scenario building is no longer regarded as gimmick but as a methodology that is taken very seriously, the result being that scenario building is an integral part of planning processes and time and other resources are routinely allocated to develop the skills required to construct and use scenarios effectively.

Scenario building can be a very creative and enjoyable process that inspires stakeholders to think seriously about uncertainty and risk and to recognise that increasingly the future rarely resembles the past. Adaptation to change is feasible if the change processes are slow and predictable (i.e. based on current trends or frequencies of occurrence). However, problems really start to kick in when change is rapid and unpredictable. This is when scenario building shows its real worth to a strategy development and/or planning process.

Box 3 Steps in a scenario building process

Step 1: Brainstorming factors that will affect achieving a shared vision. Some possible factors relevant to Nigeria might be:

- Climate change impacts (temperatures, rainfall, storms and droughts, sea level)
- Economic growth
- Levels of taxation
- Government spending on WASH
- Levels of corruption
- Engagement of development partners
- Etc.

Step 2: Separate the factors into local and external factors. *Local factors* are those that can be controlled or mitigated in some way by the stakeholders themselves (e.g. lack of skill or capacity can be overcome by organising a capacity building programme). *External factors* are those that are outside the control of the stakeholders (e.g. climate change, global economic trends).

Step 3: Rank external factors according to importance and uncertainty. Using the matrix classify external factors according to their level of importance and uncertainty. Permutations of factors in the upper-right quadrant (i.e. the more important and more uncertain factors) will be central to building scenarios. On the basis of discussion, it is preferable to limit these more important, more uncertain factors to a manageable number (e.g. two or three), as this reduces the number of possible permutations that will be used in building scenarios.

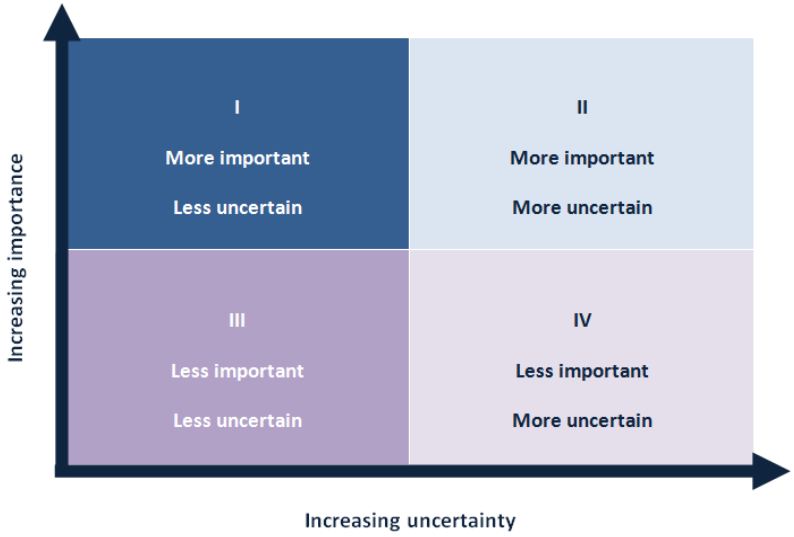


Figure ? Matrix for prioritising external factors according to importance and uncertainty
Source: Schwartz (1991).

Step 4: Agree on the states of external factors. Discuss and set different future states for each of the "more important, more uncertain" external factors that were selected in Step 3. These states should be the realistic upper and lower limits of these factors at a specified time in the future. The values can be set on the basis of stakeholder perception, expert opinion, rigorous statistical analysis or a combination of all three. In most cases, there is merit in adopting upper

and lower limits of states that have wider government, scientific and/or public recognition[1].
Step 5: Create outline scenarios. Outline scenarios are created by taking all possible combinations of the states of the selected more important and more uncertain external factors.
Step 6: Create narrative scenarios by adding a background story to each of the outline scenarios based partly on the less important and less uncertain external factors that were identified in Step 3. The background story should also use information on the area or domain of interest.
Step 7: Name the scenarios. Step 8: Test and evaluate the scenarios.

Stakeholders should be encouraged to think about a 'worst case' scenario – as a way of trying to get to grips with the sort of 'black swan' (unlikely but high-impact) event that can completely disrupt a strategy.

Strategy development

Strategy development aims to develop robust and adaptable strategies that have the potential to achieve a shared vision under a whole range of different scenarios (i.e. different futures). The approach helps stakeholders think creatively about important and uncertain factors over which they have no or very limited control. The net result being that stakeholders are less likely to fear or ignore these factors, and are more likely to consider how they could thrive in a range of future settings, some of which may be strikingly different to anything that they have ever experienced.

The high level of attention that strategy development (based on visioning and scenario building) gives to uncertainty, risk and change makes it entirely consistent with principles of adaptive management. Adaptive management is based on the recognition that in a complex and rapidly changing situation there can never be sufficient information to reach a settled "optimum" decision. Hence, the emphasis is on flexible planning backed by strong monitoring and information management systems that allow constant adaptation and the upgrading of plans and activities.

Box 4 Steps in a strategy development process

Step 1: Identify components of an overall strategy. Brainstorm and list practical options and opportunities that could become components of an overall strategy and that will have the potential to achieve the common vision.
Step 2: Evaluate each strategy component to assess the social, technical, political, economic and environmental viability and acceptability of each strategy component, especially those that are new to the stakeholders.
Step 3: Identify specific risks and constraints that could influence the potential for strategy components to achieve the vision (or parts of the vision).
Step 4: Link strategy components to relevant parts of the vision. Using a disaggregated form of the vision as a starting point, link and group strategy components to relevant parts of the vision.
Step 5: Evaluate the utility of strategy components against the disaggregated vision under all scenarios. For each part of the disaggregated vision, assess whether the linked group of strategy

[1] Some examples include economic growth forecasts made by the Organisation for Economic Co-operation and Development (OECD) and climate change forecasts detailed by the Intergovernmental Panel on Climate Change (IPCC).

components has the potential to achieve this part of the vision under all the scenarios.
Step 6: Refine strategy components. If analysis indicates that groups of strategy components are not able to achieve parts of the vision under all scenarios, try refining the group of strategy components or consider adding strategies that are linked specifically to achieving the part of the vision under certain scenarios.
Step 7: Combine strategy elements to produce versions of an overall strategy. By the end of this step a number of different overall strategies will have been outlined and the relative costs, benefits, merits and trade-offs of the strategies will have been tabulated.
Step 8: Select and refine an overall strategy.
Step 9: Start the planning process.

How can scenario-based planning be practically applied?

Most WASH professionals will not be in the position to undertake a full scenario-based planning exercise leading to the development of a strategic plan for climate change adaptation in WASH. Such an activity could be very relevant for policy makers and planners at the national and state levels, but what about WASH professionals involved in operational planning at the state and local levels, and those working in projects and programmes that are already underway and have existing planning processes and plans? If you don't have the opportunity to fully develop a long-term strategic plan some options and ideas for embedding scenario-based planning ideas are:

- Use visioning process ideas to strengthen objective formulation at the proposal stage in your projects and programmes.
- Introduce staff to scenario-based planning ideas and use examples to introduce and discuss the idea that traditional planning (a single designed solution based on evidence from the past that is extrapolated) is unlikely to be provide robust solutions.
- Be clear about your strategies, and introduce climate screening to test whether existing strategies provide sufficient climate resilience and identify alternative options.

Key definitions

Strategy: A strategy is a medium to long-term planning framework within which specific activities are described and plans implemented. Over time, an effective strategy should lead to a vision being achieved.

Scenario: A plausible and internally-consistent description of a possible future situation, a story about the way an area or domain of interest might turn out at some specified time in the future. Scenario building or development is the process of developing scenarios.

Vision: A concise description of a desired future state. Visioning is the process of developing a vision.

Adaptive management: In complex and rapidly changing situations there is never sufficient information to reach a settled "optimum" decision. Flexible planning backed by strong monitoring and information management allows constant adaptation of plans and activities

Further reading

Batchelor, C. Smits, S. and James, A.J., 2011. *Adaptation of WASH services delivery to climate change and other sources of risk and uncertainty* (Thematic Overview Paper 24). The Hague: IRC International Water and Sanitation [online] Available at www.irc.nl/top24

- This factsheet is based upon the text of this much more comprehensive paper which provides more guidance on scenario-based planning with examples and an introduction to several other useful tools.

Butterworth, J., McIntyre, P. & da Silva Wells, C. (Eds.) 2011. *SWITCH in the city: putting urban water management to the test*. The Hague: IRC International Water and Sanitation Centre [online] Available at www.irc.nl/page/66812

- This book focused on urban water management includes guidelines on visioning, scenario building and strategy development and examples from cities (also written by Charles Batchelor).

Smits, S., Dietvorst, C., Verhoeven, J. and Butterworth, J. 2011. *Scanning the 2020 horizon: An analysis of trends and scenarios in the water, sanitation and hygiene sector*. Occasional Paper Series 45. IRC International Water and Sanitation Centre, The Hague, The Netherlands [online] Available at

- This paper was produced, examining trends and possible scenarios for the future, as part of IRC's own five year planning.

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[i] Ratcliffe, J.S., 2008. Scenario Building: A Suitable Method for Strategic Construction Industry Planning?. [online] Dublin: Dublin Institute of Technology. Available at: http//arrow.dit.ie/cgi/viewcontent.cgi?article=1016&context=futuresacart&seiredir=1#search=%22well-crafted+set+of+scenarios+lure+decision+makers+outside+the+comfort+and+familiarity+of+their+traditional+mind+sets%22 [Accessed 4 July 2011].

[ii] Peak oil is the point in time when the maximum rate of global petroleum production is reached, after which the rate of production enters its terminal decline. The concept has declined in importance since the discovery of shale gas in the US and elsewhere.

FACTSHEET 4: COMMUNITY-BASED ADAPTATION

This factsheet introduces the basic principles of community-based adaptation and its role in mainstreaming climate change adaptation in the WASH sector. Benefits and constraints are discussed, and examples given of community-based adaptation in Nigeria and elsewhere.

Why should community-based adaptation be of interest to WASH sector professionals?

- To cope with uncertainties and long-term impacts of climate change it is important to empower local people to adapt to emerging challenges.
- Top-down approaches allow for limited flexibility, but this is a pre-requisite for adaptation in an uncertain environment.
- Community-based adaption can take into account the different needs and opportunities of children, women and other groups within society.

What is community based adaptation to climate change?

Community-based adaptation to climate change means a community-led process, based on communities' priorities, needs, knowledge, and capacities, which should empower people to plan for and cope with the impacts of climate change[i].

Community-based adaptation recognises that environmental knowledge and resilience to climate impacts lie within societies and cultures. It recognises the different situations of children, women and other vulnerable groups in society and builds on their specific needs and assets. The focus of community-based adaption should therefore be on empowering communities and individuals within communities to take action on vulnerability to climate change, based on their own decision-making processes[ii].

In Nigeria, the BNRCC project[iii] has supported Community-based adaptation as one of the keystones of adaptation policy recognising that the basis for resilience to climate change impacts lies with both local/traditional knowledge and scientific knowledge. Community-based adaptation serves to integrate local knowledge with scientific knowledge, ensures people's right to participate in decisions that affect their lives, and thus builds adaptive capacity, all of which can reduce vulnerability.

It is important to note here that community-based adaptation goes beyond the development of technological solutions to climate change. Its main aim is to empower people, build adaptive capacities and reduce vulnerabilities.

Box 1 Examples of community based adaptation in WASH sector

The Community Based Water Resources Management (CBWRM) approach is a specific example of a similar approach that will support climate change adaptation (see factsheet 6 on IWRM)

Strengths of top-down and bottom-up approaches

Adaptation has been approached from both top-down and bottom-up perspectives. The former relies on climatic and applied modelling to predict secondary impacts (water availability, water quality etc.) from a projected change in climate. Such studies are applicable to wide areas and can indicate where broader adaptation measures may be necessary, such as improved borehole technologies or water storage systems[iv].

Climate variability is a reality that humans have always been exposed to and have developed different ways of dealing with. Bottom-up approaches assess vulnerability and adaptive capacity to current climate variations and future climate trends at the local level. Existing coping mechanisms are used as a platform for fostering resilience to future changes. While they can incorporate modelling projections, these draw primarily on local knowledge and can more effectively target the poorest and most vulnerable in developing appropriate adaptation responses[v].

In order to cope with uncertainties and long-term impacts of climate change one strategy therefore is for the WASH sector to empower local people to adapt to emerging challenges and to support them in influencing WASH planning and programming based on their perceived needs and requirements. "Community-based adaptation can reach the poor by targeting the communities most vulnerable to climate change and developing appropriate adaptation options with them, building on information about community capacity, knowledge and practices used to cope with climate hazards"[vi].

Applying community-based adaptation in the WASH sector

Let us think about the intended introduction in rural areas of a new, more climate-resistant WASH technology such as deeper boreholes fitted with solar pumps. Questions which need to be considered when taking a community based approach could include the following, and which we may overlook by taking a conventional top-down approach, are:

- Do the affected communities have existing access to the technology?
- Can the community afford the technology? And who can afford the water supplies it will provide?
- What are the specific circumstances and perceptions about the technology of children, women and other groups within the communities?
- Are people receptive to the idea and motivated to make the necessary changes?
- Do people possess the necessary skills, knowledge or awareness to want to adapt and be able to do so?
- What other stresses are people in the area subject to?
- How are the potential adaptation choices of people affected by the social, economic, political, and environmental circumstances in which they live?

Box 2. Communities as active agents in Climate Change Adaptation

All over Nigeria, communities are actively engaged in climate change adaptation activities in their attempts to relate to their changing environment. For example, between 2008 and 2011, the BNRCC Project carried out a number of pilot projects involving support of climate change adaptation initiatives in communities across the major ecological zones of the country. These include communities in Kwaikong and Dashe (Plateau State), Falgore (Kano State), Daudu (Benue State), Bebi, Wula, Esuk Idebe, Akwa Esuk Agoi Ibam and Iko Esai (Cross River State), Gorori (Jigawa), Bursali and Billeri (Bauchi State), Tosha (Yobe State), and Sansan (Borno State). In these communities, people were engaged in a wide range of climate change adaptation activities, including water harvesting, construction of earth dams, dry season irrigation, adoption of improved seeds and early maturing crops, use of fuel efficient woodstoves, bee keeping, snail farming, tree planting, use of simple weather forecasting tools, erosion control, sand dune stabilization, establishment of fodder production farms, and fish farming.

Source: BNRCC project. Find more details at www.nigeriaclimatechange.org and www.nestinteractive.org

Boxes 2 and 3 give some examples of community-based adaptation initiatives in Nigeria, which go beyond technology development and aim at empowerment and reducing vulnerability. These are important objectives of such an approach. These are just a few examples, which should make us aware of the importance of empowerment, adaptive capacity and vulnerabilities. Such initiatives should be encouraged and deserve support.

Box 3. Community Led Climate Adaptation Programme for Sustainable Livelihoods in Coastal Areas

The Nigerian coast is one of the low-lying lagoonal Western African coasts, and likely to experience severe impacts from flooding as a result of climate change and rising sea levels. Southwest Nigeria is subject to coastal flooding, erosion and coastal submergence. Communities are often submerged with floodwater for a period of 3-4 weeks annually during which socio-economic activities, including the movement of people, fishing and marketing activities are suspended, and infrastructure is damaged. This obviously affects people's livelihoods and food security.

The ACCCA project took livelihoods as an entry point to enhancing the capacity of fishing households and communities in Nigeria's low-lying southwest coastal region to effectively adapt to the increasing impacts of climate change.

Through an examination of fishing households' and communities' vulnerabilities to historical, present and future climate change, the project aimed to enable livelihood groups to share their experiences and concerns, and to effectively contribute to decision-making that addresses vulnerability reduction and strengthens adaptive capacities. Outputs were the promotion of self-help livelihood groups to implement indigenous climate change adaptation options and poverty alleviation strategies, and communications to influential decision-makers.

Source: Advancing Capacity to Support Climate Change Adaptation project at www.acccaproject.org/

Women and children have an important role to play in the context of community-based adaptation as they are characterised by specific vulnerabilities and needs, but also offer specific insights and local knowledge which may be overlooked by top-down initiatives.

Advantages and constraints of community-based adaptation approaches

The advantages of community-based adaptation, as illustrated above, are better tailored interventions that consider the needs of different social groups within communities. Community-based adaptation should be more sustainable as it builds capacities and empowers people to cope with future challenges.

Constraints are the high cost of local level initiatives. Many of these projects have remained little islands, or islands of success when projects have gone well, struggling to be scaled up to a regional or national level. Often there is no communication link between these initiatives and higher level policy formulation, which limits the potential for mainstreaming.

Ideas for action

To reduce the vulnerability of livelihoods to climate change risks, community-based adaptation initiatives should[vii]:

- Begin with a thorough understanding of local livelihoods, so protecting assets vulnerable to current and future climate risks can be a core project activity.
- Help communities develop an understanding of the main climate risks and how they impact on livelihoods (through a learning-by-doing approach).
- Emphasise active participation of community members in all stages of the project (design, implementation, monitoring).
- Build on existing social institutions to carry out activities.
- Encourage the strong participation of women, recognising their role as community resource managers, while also acknowledging their specific vulnerability to climate risks.
- Enhance local technical, financial and managerial skills.
- Invest in long-term resilience-building efforts, which also meet immediate development needs.
- Advocate a policy framework that decentralises natural resource management.
- Recognise that current coping strategies may not be sustainable.

Key definitions

Adaptive Capacity: the inherent ability of a system or an individual to adjust in response to actual or expected climate hazards.

Empowerment: actions that make (someone) stronger and more confident, especially in controlling their life and claiming their rights[viii].

Vulnerability is a combination of exposure to external shocks (e.g. a flood) and stresses (e.g. a gradual temperature increase), and the ability to cope with the resulting impacts. It is dependent

on a wide variety of institutional, economic and environmental factors, not all of which are linked directly with the climate[ix].

Read

Mitchell, T., and Tanner, T. 2006 ***Adapting to climate change: Challenges and opportunities for the development community.*** Institute of Development Studies [online] Available at www.tearfund.org/webdocs/website/Campaigning/policy%20and%20research/Adapting%20to%20climate%20change%20discussion%20paper.pdf (Accessed 11 Nov 2012)

Calow, R., Bonsor, H., Jones, L., O'Meally, S., MacDonald, A., & Kaur, N. (2011) ***Climate change, water resources and WASH: A scoping study.*** ODI Working Paper 337. Overseas Development Institute, London

- This paper includes several examples of community-based adaptation in WASH.

CRiSTAL is a risk screening tool (standing for Community-Based Risk Screening Tool – Adaptation and Livelihoods) that could be applied to WASH projects www.cristaltool.org

Watch

Gathering Rain (IRIN/UNEP) http://www.irinnews.org/film/

- Several of the Gathering Rain films (see factsheet 1 for more description) illustrate community-based adaptation including 'harvesting rain' and 'escaping floods'.

Other references and notes

[i] IIED (2009) Participatory Learning and Action No 60

[ii] Mitchell and Tanner (2006)

[iii] BNRCC (2011)

[iv] Mitchell and Tanner (2006)

[v] Mitchell and Tanner (2006) Op. Cit.

[vi] Huq (2008) Community-based adaptation. In *Tiempo*, Issue 68, July 2008 (Special issue on community-based adaptation)

[vii] Adapted from Mitchell and Tanner (2006). Op. Cit.

[viii] Taken from http://oxforddictionaries.com

[ix] Mitchell and Tanner (2006). Op Cit.

FACTSHEET 5: CLIMATE SCREENING AND PROOFING

This factsheet introduces ideas on climate screening and proofing of WASH technologies, systems and services covering both rural and urban water supply and sanitation. These ideas are situated in the Nigerian context. Links provided to several much more comprehensive resources.

Why should climate screening and proofing be of interest to WASH sector professionals?

- the underlying technologies and systems that deliver WASH services have different vulnerabilities to climate change that can be matched to adaptation responses.
- climate screening and proofing can be undertaken within existing planning frameworks for WASH projects and programmes.
- existing tools such as water safety planning can be adapted to consider climate change risks.

Box 1. Water and sanitation as a cause of climate change

Although our focus on water and sanitation services is on adaptation to climate change, the water and sanitation sector also has a role to play in mitigation. Water and sanitation systems that involve pumping are likely to emit greenhouse gases and options to reduce energy consumption will help. Modified sewerage for example has lower pumping requirements. A study in South Africa concluded that "use of on-site sanitation systems where possible was likely to produce less greenhouse gas than sewerage and wastewater treatment, mainly because of lower energy requirements". Recycling water also has benefits in terms of the carbon footprint.

Waste (solid and wastewater combined) accounts for less than 5% of global emissions including more damaging methane and nitrous oxides. Although emissions from conventional sewerage and sewage treatment have been estimated, greenhouse gas emissions from septic tanks, latrines and open-air defecation remain largely unquantified.

Emissions from wastewater are expected to rise by almost 50% up to 2020 under a business as usual approach, with the primary contributors being in developing countries.

Source: WHO/DFID (2009)

What is climate screening and proofing?

WASH and water resources management investments can be 'screened' for climate risks in the same way that environmental impact assessment is built into development and planning. Screening aims to[i]:

- raise the profile of adaptation to climate change in project planning;

- ascertain the extent to which existing development projects already consider climate risks or address vulnerability to climate variability and change;
- reduce the risk of 'underperformance' of investments and guide project managers to options that minimise risks; and
- identify opportunities and strategies for incorporating climate change into future projects.

Decision-support tools are available on-line that can be used to climate screen investments. For example, the World Bank's climate portal allows you to select a country on a map, like Nigeria, and then to view historical climate data, see predicted impacts under different scenarios and view data on vulnerability. But whilst useful as a training tool, it is unlikely that such tools will yet provide sufficiently detailed and local information for screening specific projects and programmes.

Some practical approaches to climate screening in WASH include[ii]:

- Wider use of scenario-based planning (see factsheet 3): "In view of the 'data gap' … and difficulties in downscaling climate projections at the basin scale and below, scenario-based approaches which consider a range of different climate futures are recommended"
- Extending existing planning approaches, such as Water Safety Planning (see Box 1), to include screening for climate change risks and impacts.
- Improving technology choice: more robust strategies can include less reliance on a single type of approach or source of failure i.e. conjunctive use of a more diverse mix of water supply types, building in redundancy and greater storage capacity, and better protection measures to reduce contamination and flood damage.

Box 1 Water safety planning

Water safety planning is a widely accepted approach to improving both rural and urban water supplies. It focuses on identifying health risks, and specifically on water quality issues, and taking preventative measures to make sure drinking water supplies are safe. It compliments water quality testing which is important but has its limitations in preventing the consumption of contamination water.

Key steps, in this case for small community supplies, are to:

1. Engage the community and assemble a team to develop the water safety plan (WSP)
2. Describe the community water supply
3. Identify and assess hazards, hazardous events, risks and existing control measures
4. Develop and implement an incremental improvement plan
5. Monitor control measures and verify the effectiveness of the WSP
6. Document, review and improve all aspects of WSP implementation

The approach could be extended to take account of other risks in delivering safe and sustainable water supplies, such as those related to climate change.

Source: WHO (2012)[iii]

A major challenge, however, "is the gap in knowledge in terms of both observational data and in understanding how climate change will affect the hydrological cycle and water-dependent services at the temporal and spatial scales relevant to decision making. Data gaps are especially acute in the poorest (and therefore most vulnerable) countries, particularly in relation to groundwater systems and the monitoring of WASH access and use."[iv] As in many other African countries, in Nigeria groundwater is the most extensive resource for water supply, and WASH sector monitoring is poorly developed. Investments in basic monitoring – in hydrological and meteorological observation and monitoring access to water and sanitation services – are all important for the climate change response to provide the accurate, accessible and up-to-date data that is needed at appropriate scales for planning.

Rural water supply

Table 1 illustrates some possible climate change related risks, impacts and responses for rural and small town water supply systems. Rural water supply across Nigeria is largely dependent upon groundwater, a natural source of stored water that is often not fully exploited.

"Most improved water supplies in rural Africa depend on groundwater. As rainfall and surface waters become less reliable, the demand on groundwater-based supplies is likely to increase further. Unlike surface water, groundwater is less responsive to short-term climatic variability and will be buffered to the effects of climate change in the near-term as a result of the storage capacity of the aquifer. The potential long-term impact of climate change on the availability of groundwater is, however, largely unknown, not least because of the complexity of recharge processes in Africa, which are poorly constrained at present, even without the complications of climate change."[v] Reductions in rainfall would be expected to reduce groundwater recharge and availability, but changes in rainfall intensity and distribution are likely to be even more important. Small reductions in rainfall but with increased rainfall intensity, as predicted in Nigeria, might well lead to increased groundwater recharge.

Table 1 Summary of climate risks, impacts and responses associated with different types of rural and small town water supply technologies

Technology	Description	Climate risks	Possible impacts	Responses
Rainwater harvesting	Rainwater collection and storage in tanks – household or community level	There may be fewer rainy days and longer drought periods. Rainfall events may be more intense	More storage may be required to bridge low rainfall periods. Danger of damage and contamination from flooding	Build in redundancy for potential reduced rainfall and longer dry seasons Ensure protection against flooding
Reticulated schemes from small rivers and dams	Pumped schemes to villages and small towns based on small dams or river abstraction	Changed seasonality of runoff, peak flows and sediment load	Lower and less certain flows. Possible increased sedimentation Dams may be filled with sediment – possibility of failure	Design to a higher capacity Build in mechanisms for dealing with increased sedimentation Conjunctive use of surface and

				groundwater to increase adaptability to change.
Shallow family wells	Wells less than 10 m deep – dug by hand and often unlined	More intense rainfall, longer dry season	Increased contamination of sources More likely that sources will fail	Should generally not be promoted in isolation as improved water supplies, but as part of a package and a step on the Self Supply ladder
Improved hand dug wells	Hand dug wells often > 10 m deep lined with concrete and capped at the surface	More intense rainfall, longer dry season	Increased risk of contamination More likely that sources will fail	Hand dug wells should be tested at the peak of a normal dry season. They should be sited in productive parts of the aquifer and deep enough to intersect groundwater below 10 m There should be an emphasis on casing out shallow layers and runoff
Protected spring supplies	Perennial springs where the source is protected and piped to a standpipe	Longer dry season – more intense rainfall	Possibility of contamination – particularly in urban or peri-urban settings Springs may be less reliable in longer dry seasons	More thorough investigation of seasonal spring flow and contamination pressures in catchment. Build in greater redundancy

Source: Bonsor *et al*., 2010

Nigerian conditions seem to fit well with the assertion that "for most areas the key determinants of water security will continue to be access rather than water availability". Water resources are not adequately developed and there is much uptapped potential. "Extending access, and ensuring that targeting and technology decisions are informed by an understanding of groundwater conditions, will become increasingly important."… "With extended dry periods, more intense rainfall and higher evaporative demand highly likely by 2050 …, it is increasingly important that development of water-supply technology now uses sources (e.g. deeper hand-wells and boreholes) which access natural water storage ... Surface water and very shallow groundwater resources are likely to be more vulnerable to climate change. As a result, sources which exploit these resources require greater site investigation and built in redundancy to ensure they are sustainable"[vi].

"Given the uncertainties surrounding the impacts of climate change on water, planning around technology choice should be 'robust of uncertainty', i.e. appropriate to a range of different rainfall and runoff conditions. This implies a greater focus on the reliability of different sources - for example siting boreholes and deeper wells in more productive aquifers, favouring development of larger springs, and the strengthening of sanitary protection measures. However, the use of more vulnerable sources, such as shallow wells, should not be ruled out completely, particularly if they form part of a suite of water supply options available for households, and

communities, across seasons."[vii] Such sources for example might even help households and communities build up their resources and livelihoods during periods with better conditions (the rainy season and good rainfall years), helping them to cope during periods of drought.

Urban water supply

The issues in urban areas are different owing to the more dense settlement of people, often in flood-prone zones, and the different types of water supply and sanitation systems. Large scale reticulated water supply systems are found in cities of course, and more people supplied by surface water reservoirs, although the reach and reliability of these systems is limited in Nigeria. Just like in rural areas, most people rely upon groundwater in urban Nigeria.

Box 1 Top 10 cities at greatest risk from sea level rise and storm surges

1. Manila, Philippines
2. Alexandria, Egypt
3. Lagos, Nigeria
4. Monrovia, Liberia
5. Aden, Yemen
6. Karachi, Pakistan
7. Jakarta, Indonesia
8. Port Said, Egypt
9. Khulna, Bangladesh
10. Kolkata, India

Source: Center for Global Development

Cities are often located in coastal areas (like Lagos) and along the banks of flood-prone rivers, which makes them vulnerable to sea level rise and flooding. Lagos has been ranked as the 3rd most vulnerable city to sea level rise. Cities are also prone to localised flooding during intense rainfall events given the predominance of impermeable surfaces. Cities are already hotter than rural areas – due to the heat island effect – making rising temperatures a concern.
Water supplies (both quality and quantity) in Nigerian cities may most obviously be affected by climate change in the following ways:

- Sea level rise reducing availability of potable water through salt-water intrusion into aquifers and estuaries,
- Changes in river flows including potentially lower baseflows during the driest part of the year, changes in turbidity (and other pollution) associated with high river flows and floods with implications for water treatment processes and costs,
- Changes in groundwater recharge associated with variations in rainfall amount, distribution and intensity, and
- Flooding and damage of water supply infrastructure located on floodplains

Table 2 Water supply technology resilience

Technology	Resilience	Key issues
Tubewells	High	Motorized pumping may pose challenge in drying environments
Dug wells	Low	Problems with water quality; securing year-round supply already problematic in some areas
Protected springs	Low–medium	Water quality threats from increased rainfall and reduced flow in drying environments
Household roof	Low	Reduced frequency but more intense rain and drying

rainwater		environments pose threats
Treatment processes	Medium	Processes are resilient, but climate change may increase performance requirements
Piped water	Low	High inherent vulnerability, with critical points where damage may lead to impacts on large populations

Source: WHO/DFID (2009)

Compared to other countries, Nigeria has 'exceptionally high shares of urban households using wells'. A study[viii] based on USAID's Demographic and Health Surveys reported that the share of urban households using primarily well water increased from 27 % in 1999, to 47% in 2003, to 59% in 2008. In 2008, only 20% households depended on piped water and 21% on other sources compared to the 59% using wells. Dependence on wells was found to be similar across wealth groups. Urban water supplies are therefore expected to be vulnerable to any impacts on groundwater recharge, with the same risks as in rural areas, combined with higher risks of groundwater pollution.

Where supplies depend on surface water: "In the long term, change to surface water availability will be entirely dependent on how changes in rainfall patterns and increased evaporative demand translate to shifts in soil moisture deficits and surface water run-off. At present, quantifying such changes is beyond present prediction capabilities, but it is highly likely that surface water resources will become increasingly unreliable."[ix]

Sanitation

Sanitation systems may affected by climate change either directly (e.g. less water available for water-bourne sewerage for example) or indirectly (e.g. less capacity of the environment to absorb wastewater[x]. Conventional sewerage has high water requirements, and sewers are at risk of flood damage (Table 3). Where combined sewers also carry stormwater there is an increased risk of pollution associated with increased climate change related flooding. Key recommended policy objectives in dense urban areas relying on sewerage are to make greater use of modified systems, and to ensure separation of stormwater and wastewater. Pit latrines are considered relatively adaptable although rising groundwater levels could be a risk in some places.

Table 3 Sanitation technology resilience

Technology	Resilience	Issues
Pit latrines	High	Many adaptations possible; flooding represents a particular challenge
Septic tanks	Low–medium	Vulnerable to flooding and drying environments
Modified Sewerage	Medium	Less vulnerable than conventional sewerage to reduced water quantity, but flooding a threat
Conventional Sewerage	Low–medium	Risk from reduced water availability and flooding of combined sewers
Sewage treatment	Low–medium	Vulnerable to increases and decreases in water; treatment requirements may increase as carrying capacity is reduced

Source: WHO/DFID (2009)

In Nigeria, only a small proportion (estimates are in range 10-16%) of the population have access to individual sewer connections. More people rely upon household-managed sanitation, and the majority use shared facilities.

Key definitions

Climate proofing: integrating climate change risks and opportunities into the design, operation, and management of infrastructure such as water and sanitation systems

Climate screening: is a process-based approach that could be applied to WASH sector investments. If used effectively, screening aims to: (i) raise the profile of adaptation to climate change in project planning; (ii) ascertain the extent to which existing development projects already consider climate risks or address vulnerability to climate variability and change; (iii) reduce the risk of 'underperformance' of investments and guide project managers to options that minimise risks; and (iv) identify opportunities and strategies for incorporating climate change into future projects.[xi]

Water safety planning: defined by WHO as "A comprehensive risk assessment and risk management approach that encompasses all steps in the water supply, from catchment to consumer"[xii] although typically the approach focuses on health risks.

Read

WHO & DFID (2009) Vision 2030: *The resilience of water supply and sanitation in the face of climate change*

- Summary and policy implications: provides a concise summary of issues with clear recommendations. Some regional analysis and conclusions included.
- Technology fact sheets: a set of fact sheets are included for different generic types of water and sanitation systems that summarise vulnerabilities, impacts and possible adaptation methods

Bonsor, H.C., MacDonald, A.M. & Calow, *R.C. Potential impact of climate change on improved and unimproved water supplies in Africa* (2010) pp.25-49 in Sustainable Water (Eds. R.E. Hester & R.M. Harrison) Royal Society of Chemistry [online] Available at http://nora.nerc.ac.uk/10995/1/Bonsor_et_al_CCafrica_RSCchapter.pdf (accessed 20 Nov 2012)

Calow, R., Bonsor, H., Jones, L., O'Meally, S., MacDonald, A., & Kaur, N. (2011) *Climate change, water resources and WASH: A scoping study.* ODI Working Paper 337. Overseas Development Institute, London.

Loftus, A. 2011. *Adapting urban water systems to climate change: a handbook for decision makers at the local level.* Freiburg: ICLEI [online] Available at www.adaptationhandbook.org

- This handbook aims to support cities in grappling with climate change and includes useful tools (including scenario-based planning) and examples from cities around the world.

Other references and links

[i] Calow *et al*. (2011) *Op Cit*.

[ii] Calow *et al.* (2011) *Op Cit.*

[iii] WHO (2102) *Water safety planning for small community water supplies: step-by-step risk management guidance for drinking-water supplies in small communities* [online] Available at http://whqlibdoc.who.int/publications/2012/9789241548427_eng.pdf

[iv] Calow *et al*. (2011) *Op Cit.*

[v] Bonsor *et al*. (2010) *Op. Cit.*

[vi] Calow et al. (2011) *Op Cit.*

[vii] Calow *et al*. (2011) *Op Cit.*

[viii] Grönwall, J.T., Mulenga, M., McGranahan, G. 2010. *Groundwater, self-supply and poor urban dwellers: A review with case studies of Bangalore and Lusaka* (Human settlements working paper series). London: IIED [online] Available at http://pubs.iied.org/pdfs/10584IIED.pdf

[ix] Bonsor *et al*. (2010) *Op. Cit.*

[x] WHO/DFID (2009). *Op Cit.*

[xi] Calow *et al*. (2011) *Op Cit.*

[xii] WHO (2012). *Op Cit.*

FACTSHEET 6: INTEGRATED WATER RESOURCES MANAGEMENT (IWRM) AND WASH

This factsheet makes links between Water Resources Management and WASH, and considers how the ideas encapsulated in Integrated Water Resources Management (IWRM) may be useful in the helping the WASH sector in Nigeria adapt to climate change.

Why should IWRM be of interest to WASH sector professionals?

- Water resources shortages and droughts (both surface and groundwater) can severely compromise urban and rural water supplies.
- Localised (due to drainage problems e.g. within poorly drained cities) and riverine flooding (due to high river flows and levels) can cause major damage to WASH infrastructure and pollution
- Integrated Water Resources Management provides a policy and management framework to allocate scarce resources between different users such as domestic water supply (in urban and rural areas), industry, agriculture etc. and manage risks such as flooding.

What is Integrated Water Resources Management (IWRM)

IWRM seeks to operationalise the famous 'Dublin principles', where "water is a public good with both social and economic values and... good water resources management requires both a broad holistic perspective and the appropriate involvement of users at all levels"[i]. Definitions of IWRM stress that it is an approach to:

- improve efficiency in water use (the economic rationale),
- promote equity in access to water (the social or developmental rationale) and
- achieve sustainability (the environmental rationale).

'Integrated' management aims to address the trade-offs between these different objectives and to minimise the negative impacts that might be created by the actions of one particular sub-sector, stakeholder or time, on others. IWRM seeks to avoid inefficiencies and conflicts that are a feature of less-integrated approaches, and implies a move away from traditional sub-sector foci that address domestic water supply, wastewater, irrigation, industry and the environment separately (often within different agencies or government departments) to a more holistic approach. An emphasis on stakeholder participation and on management of water resources at the river basin level are further features.

Box 1 IWRM implementation in Nigeria

- Key organisation are the 12 River Basin Development Authorities (RBDAs).
- Reforms have been planned to replace RBDAs with Basin Irrigation Development Authorities and River Basin Management Commissions

- The Hadejia Jama'are Komadugu Yobe River Basin which feeds the declining Lake Chad is a well-known example.
- The newly established **Nigerian Integrated Water Resources Commission** has been created to improved management of inter-State water resources (www.niwrmc.gov.ng/index/)
- Other key supporting agencies are the Nigeria Hydrological Services Agency (NIHSA) that collects and makes available hydrological data and the National Water Resources Institute (NWRI) focused on capacity building.

Criticism of the standard IWRM package

Over recent years there has been considerable criticism of the IWRM approach and especially where it has been applied as a more-or-less standard blueprint with little apparent regards for different contexts and levels of capacity. Emphasis has been generally given to policy and institutional reforms at the national and river basin level with a specific focus on managing demand, i.e. better management and sharing of the water resource between users. Shah and Van Koppen[ii] describe this package as: the development of a national water policy; a water law and regulatory framework; recognition of the river basin as the unit of water planning and management and subsequent creation of river basin organisations; development of water resource and service pricing mechanisms; creation of water rights by instituting a system of water withdrawal permits; and promotion of participatory water resources management.

From the perspective of the WASH sector in Nigeria and other low-income countries some of the most important concerns with this kind of approach are a tendency of IWRM implementation to:

- focus on demand side measures with insufficient emphasis put on supply and the development of water resources e.g. new storage, groundwater exploitation
- involve legal reform leading to centralised introduction of individual water permits that is out of touch with cultural, social and infrastructural realities, while existing water management arrangements at the local level are ignored or undermined
- give little attention to concerns of people, especially the poor and marginalised with the services (whether Water Supply, Sanitation and Hygiene (WASH), irrigation or ecosystem) that people rely on rarely at the centre
- proceed in parallel with weak linkages to development at other scales. Hydrological boundaries of water management intercept many other boundaries and units, such as administrative boundaries of local governments. Often the scale of river basins in far above the level of local water conflicts.

It has been suggested by Shah and van Koppen that IWRM principles work best where primary water-diverting structures are large and few in number, most water users are supplied by organised service providers, and capital accumulation in terms of infrastructural creation is already high, i.e. mainly in the formal economies in developed countries and emerging economies.

Table 1. Summary of common criticisms of IWRM and possible ways out

IWRM criticisms/problems	Solutions or ways forward

- Vagueness of IWRM concept.
- No agreement on fundamental issues such as aspects to be integrated, how, by whom, or even if such integration in a wider sense is practically possible.
- IWRM is not sufficiently people-centred.
- IWRM does not adequately incorporate adaptive management principles.
- Concept is unwieldy.
- Packages of IWRM reforms do not include local IWRM
- River Basin Organisations, or catchment agencies may struggle to establish legitimacy.
- RBOs or catchment agencies often lack the capacity to fulfil even basic functions.
- IWRM activities ignore politics.
- Levels of participation in IWRM are low.

- IWRM should be considered more as a philosophy than as a 'package of reforms'.
- IWRM principles should be built into projects and programmes.
- Local laws and customary institutions should be an entry point for IWRM.
- Better linkages should be built with local government and its planning processes.
- IWRM should be built from bottom up.
- IWRM reforms need to build upon existing mechanisms for participation and organisation of stakeholders around water management, even if this means building upon 'sectorality', rather than a complete overhaul.
- 'Light' approaches that aim to apply IWRM principles at all stages of the project cycle (e.g. visioning, assessment, planning, implementation, monitoring and evaluating, etc) are more likely to be good entry points.
- Supporting the existing local arrangements should be encouraged as a form of local IWRM in itself and is more likely to succeed than starting from scratch at the catchment level.
- Although local IWRM initiatives often have limited scope, they can still contribute to the development of IWRM at basin scale and, as such, serve as important entry points for applying the IWRM framework.
- Forging better links between the water, sanitation and hygiene (WASH) sub-sector and IWRM is another way to strengthen grassroots participation in IWRM.
- Responding to wider 'domestic' needs of many consumers, such as for small-scale productive uses of water, is another way to implement IWRM.

Local IWRM and community-based water resources management

Challenging the river basin as the only management unit, Lenton and Muller contend that IWRM can be applied at a variety of scales, from the village level to the basin, national and transboundary levels, as water stress manifests itself at all levels, and often needs to be addressed through a combination of bottom-up and top-down measures. Actions at one scale should reinforce and complement those at other scales. However, IWRM reforms have tended to

focus on the higher levels of scale, on policy and legislation reforms at national level and the establishment of river basin organisations.

It is argued that IWRM can be made more practical through more local and bottom-up approaches. 'Light' IWRM is more opportunistic, adaptive and incremental in nature and clearly focused on sustainable service delivery working communities, local governments and other local agencies. As local governments have mandates in relation to both direct services provision (water supply, sanitation, storm-water, solid waste), and broader development and spatial planning, they are a crucial entity in IWRM. Yet, in practice, very few local governments actively apply IWRM principles in their work.

'Light' approaches aim to apply IWRM principles within sub-sectoral projects and programmes at all stages of the project cycle (e.g. visioning, assessment, planning, implementation, monitoring and evaluating, etc). The idea is that if sub-sector actors apply good IWRM practice at their own level, in their own work, it can lead to the emergence of better local-level water resources management, and be an important first step in the process of IWRM. Such approaches operate in an alternative manner: focusing at the more local level, as opposed to the river basin or national level; seeking integration from within sectors, as opposed to establishing intersectoral mechanisms; and building upon existing institutions and participation mechanisms, as opposed to establishing new multi-sectoral institutions.

The advantage of this approach is that it can build upon the mobilising capacity of each of the sectors, and ensure if not integration, then at least sectoral participation. In addition, the application of the principles is often in the interest of the sectors themselves. The disadvantage of the approach is that it cannot address the really hard issues of cross-sectoral and large-scale upstream-downstream conflict and competition and the real costs in time and other resources of intersectoral working. There is no 'stick' to enforce compliance with the principles and the approach is therefore complementary and not a wholesale replacement for larger-scale allocation and management of water.

Box 1 Promoting groundwater monitoring in Jigawa State

Jigawa state is "highly threatened by desert encroachment where indiscriminate tree felling, grazing of cattle and unregulated water borehole drilling practices are causing concern over the effects on groundwater resources". The Ministry of Water Resources, State Water Board, Small Town Water Supply and Sanitation Agency (STOWA), Rural Water Supply/Sanitation Agency (RUWASSA) and LG WASH departments are the government institutions coordinating water supply and sanitation services. But these agencies "have limited knowledge and no equipment for groundwater monitoring and there is no reliable data on groundwater levels. The community residents have little or no knowledge on sustainable practices in water and environmental resources management". WaterAid have supported an initiative to train community stakeholders and staff from the relevant agencies in groundwater monitoring and water safety planning and installed groundwater data loggers at two observation wells. It is hoped this will be a first step to promoting community based water resources management (CBWRM).
Source: Ubylil Resources, 2011. Final training workshop report on community based water resources management for Jigawa State partners. WaterAid.

Key definitions

Integrated Water Resources Management (IWRM): A process that encourages the cross-sectoral management of water, land and associated resources. IWRM is based on the Dublin Principles, which acknowledge the vulnerability of water resources, the need for a participatory approach, the importance of women in the role of water management and the economic value of water (The Institution of Civil Engineers, Oxfam GB, WaterAid. 2011).

Community-Based Water Resource Management (CBWRM): A strategy that enables local water users to be involved in and responsible for the management of their water resources (The Institution of Civil Engineers, Oxfam GB, WaterAid. 2011).

Light Integrated Water Resource Management (Light IWRM): A type of IWRM that focuses specifically on the implementation of effective water resource management on a day to day basis, with a high level of involvement from governments and water companies at the local level to bridge the gap between the lowest level of private and state regulating authorities and community-based institutions (The Institution of Civil Engineers, Oxfam GB, WaterAid. 2011).

Read

The Institution of Civil Engineers, Oxfam GB, WaterAid. 2011. *Managing water locally. An essential dimension of community water development.* [online] Available at http://www.wateraid.org/documents/managing_water_locally.pdf

- Presents new thinking on how community-based institutions can be involved in monitoring rainfall, groundwater fluctuations, and collective abstraction, as well as bargaining over water allocation and establishing operating principles for water usage, to complement broader water resource management frameworks, where they exist. Includes community-based water resources management examples from West Africa.

Cap-Net, 2009. *IWRM as a tool for adaptation to climate change: training manual and facilitators guide* [online] Available at http://www.cap-net.org/node/1628

Butterworth, J., Warner, J., Moriarty, P., Smits, S. and Batchelor, C. 2010. Finding practical approaches to Integrated Water Resources Management. *Water Alternatives* 3(1): 68-81 [online] Available at www.water-alternatives.org

- This factsheet is partially-based upon this paper. The same journal special issues includes related papers and examples.

Moriarty, P., Butterworth, J., and Batchelor, C. 2004. *Integrated Water Resources Management and the domestic water supply and sanitation sub-sector*. IRC Thematic Overview Paper [online] Available at www.irc.nl/content/view/full/10431

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[i] Lenton, R. and Muller, M. 2009. *Integrated water resources management in practice. Better water management for development*. London: Earthscan.

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FACTSHEET 7: EMERGENCIES AND DISASTER RISK REDUCTION

This factsheet provides an introduction to disasters and emergencies in Nigeria, and how they may be linked to or exacerbated by the impacts of climate change. The key elements of Disaster Risk Reduction (DRR), which can form a starting point and vital component of Climate Change Adaptation, are also summarised and links given to relevant resources.

Why should emergencies and Disaster Risk Reduction be of interest to WASH sector professionals?

- Extreme events (including floods and droughts) may be more common in future due to the effects of climate change.
- Floods and droughts compromise water supplies, damaging infrastructure or depleting the water resources upon which supplies depend.
- Good WASH services and institutions make a vital contribution to reducing the vulnerability of people when disaster strikes. WASH has a key role to play both in disaster preparedness and response.
- Disaster Risk Reduction is recognized as a key climate change adaptation strategy[i].

Disasters and climate change

The number of reported natural disasters is increasing. More people are affected by such events. The estimate financial damages of such disasters has also risen: "Between 2000 and 2008, on average around 400 disasters occurred per year, with on average 215 million affected persons per year, and causing total damage of well over 100 billion USD per year"[ii]. As well as climate change, drivers include population growth, urbanization and environmental degradation.

A recent IPCC report[iii] on extreme events and disasters identified evidence of changes in some extremes including an increase in warm days and nights, an increase in heavy rainfall events, more intense and longer droughts in some places (e.g. West Africa) but less severe in others, and limited to medium evidence of changes in flood magnitude and frequency (compounded by problems of data availability and agreement). It was found likely that there has been an increase in coastal high water levels due to sea level rise. The report also notes that changes in tropical cyclone activity are of low confidence.

A disaster occurs when a vulnerable community are exposed to either a 'natural' (e.g. earthquake, flood, drought, cyclone, wild fire, extreme temperatures etc.) or 'man-made' (e.g. conflict, industrial accident, severe pollution) hazard. Hazard and vulnerability increase the risk of disaster, while the capacity of society reduces the risk.

Disaster Risk Reduction aims to bring down the hazard threat, decrease vulnerability or strengthen capacity or some combination of these three. The idea is that disasters are not inevitable and only worthy of an emergency response, but that risks can be reduced. Disaster

Risk Reduction is "an approach where the likelihood and potential impact of disaster events are assessed by identifying and analyzing hazards, the vulnerability of communities to these hazards, and their capacities to deal with events".[iv]

Like water and climate change, the field of disaster risk management has its own institutions at international and national levels. At international level there is the United Nations Office for Disaster Risk Reduction (UNISDR)[v]. In Nigeria, the lead agency is the National Emergency Management Agency (NEMA) and the State Emergency Management Agencies (SEMA). Just like with climate change adaptation there is a need to mainstream Disaster Risk Reduction (DRR) within sectors, and WASH is a key sector, since it is within the sectors where most capacities exist and most money is spent to develop plans, build infrastructure and maintain services.

Disasters in Nigeria

Although there are other risks such as conflict and violence, many professionals believe that most current disasters are weather related (including floods and droughts) and climate change is often perceived to be making things worse. Floods are common and cause significant damage. Problems due to inadequate drainage in urban areas and people living in flood-prone urban and rural areas along the major rivers.

Already, in many instances in Nigeria the causes of such events are more frequently linked by both professionals and the media to climate change. Sometimes this may be justified, but sometimes climate change may only be a minor driver and this can be a convenient excuse and risks hiding other failures such as institutions failures and human errors. Given that disasters are linked to extreme and rare events for which there is little data, it can be difficult to identify clear trends in their frequency.

A major risk always is outbreak of cholera and other disease caused by poor water and sanitation. Preparedness involves better coverage of water and sanitation, avoiding open defecation, encouraging behaviour change including hand washing. Disaster response includes making available water treatment products, safe water supplies and sanitation facilities as well as vector control in areas where malaria and rift valley fever are endemic).

In relation to floods the water sector has role to play in prevention, warning and response. Dams can help to reduce flood risks, but if not probably managed and maintained they may also lead to catastrophic flooding. Monitoring river water levels is an important component in flood warning.

Multiple causes of floods, including failure of dams, were highlighted in an assessment of the 2010 floods (Box 1). Capacity building at various levels was identified as an important response including federal and state officials and universities, and with issues including damage and loss assessment, financing, hydrological monitoring and dam safety.

Box 1 Assessment of 2010 floods

All States of Nigeria were hit by floods in 2010 with Bayelsa, Jigawa, Kebbi and Sokoto States being the most affected according to NEMA. The number of people affected in these states ranged between 27,000 and 70,000, with an nationally estimated 270,000 overall affected people and damages amounting to ₦ 5.8 billion. NEMA responded with (i) rapid assessments in affected States, (ii) search and rescue operations, (iii) provision of relief materials (₦ 1.2 billion), (iv)

activation of the International Charter, Space and Major Disaster, and (v) coordination between key stakeholders to facilitate dialogue and collaboration on a continuing basis. Reasons varied from localised rainfall, discharge from upstream areas of the Niger River and its tributaries, as well as releases from collapsed dams in parts of the country.

- Sokoto and Kebbi State: Localised intensive rainfall combined with failure of one dam (due to about a 1 in 10 year event) and then another, and limited response capacities to affect almost 300,000 people (state figures higher than national). Bridges, roads and houses were damaged and almost 400, 000 hectares of agricultural land flooded.
- Lagos and Ogun State: Localised intensive rainfall in coastal and upstream areas of the Ogun River basin, combined with release of water from Oyan dam and limited drainage capacities in downstream areas, affected informal settlements in low-lying wetland and riverside areas. This affected some 70,000 people making some homeless, damaging houses, schools, bridges and other public infrastructure.
- Bayelsa State: Excess water draining from the entire Niger Basin particularly impacted riverside communities in the Delta. They are chronically exposed to river and ocean surge flooding.

Source: Draft aide memoire on Flood Assessment and Disaster Risk Management, World Bank Mission December 12-22, 2010

Disaster Risk Reduction (DRR)

DRR has a role to play in all phases of the emergency management cycle (emergency relief, recovery, development):

- Emergency relief: given limited time and capacity the focus is 'life-and-limb' saving measures, keeping critical services running and protecting these from further hazard events
- Recovery: improving conditions, consolidating and securing critical services and beginning consolidation of less critical services
- Development: looks at all services, with a more forward-looking perspective based on better assessment and analysis

At each of these stages, DRR measures can include prevention, mitigation and preparedness:

- Prevention: measures to completely avoid the damage and disruption caused by a hazard to society
- Mitigation: measures to reduce the impact of a hazard to society. There may be some disruption but less than otherwise would be the case
- Preparedness: measures to provide warning for hazard events that may occur, to cope and to deal with the potential effects, and to get ready for the next phase in emergency management cycle.

Integrating Disaster Risk Reduction, Climate Change Adaptation and Poverty Reduction

The Global WASH Cluster say "that for DRR to be fully effective Climate Change has to be integrated into the DRR approach"[vi]. Climate change will bring new hazards to different areas due to changes in the spread of infections or the path of cyclones for example. Hazards and

hazard events like floods may also become more frequent or larger in magnitude. The added pressure of climate change will "increase the vulnerability, and decrease the capacity of communities with regards to dealing with disasters"[vii].

A new handbook on this subject says that "International Non-Governmental Organizations (INGOs), government departments and local actors are convinced that integrating DRR, CCA and PR is important, but find it difficult to apply this in practice."[viii] While there is "compelling evidence that integration works" it is not always easy to achieve. "In many areas, however, successful integration has not been started or encounters problems. Various attempts have been made to share integration experiences and to document and publish 'best practices'. However, these are hard to apply in different settings and do not sufficiently help address the barriers that exist between the three realms."

'Resilience' is a concept that can bring various actors involved in DRR, CCA and PR together, and offers opportunities to 'work across silos' by sharing different analytical approaches. The prevailing definition of 'resilience' is: 'The capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach or maintain an acceptable level of functioning and structure. This is determined by the degree to which the social system is capable of organizing itself to increase its capacity for learning from past disasters for better future protection and to improve risk reduction measures'[ix]

Although the concept of 'resilience' makes sense to most stakeholders facing disasters, three main challenges remain in integrating DRR, CCA and PR:

- The distinct conceptual frameworks used by DRR, CCA and PR, and the assumptions, values, and worldviews behind them, cause confusion and ineffective interaction or cooperation
- The lack of scaled integration of the diverse actors and the different institutional policy frameworks pose a 'governance' challenge: how to proceed in this political arena?
- The dire need for guidelines and training materials to enable local actors to analyze the risks to be addressed, define appropriate action and decide on courses to take.

It is confusing for local communities living in multi-risk environments to engage with different organizations each working separately either on DRR, on CCA or on PR, without proper coordination. A project like building a water reservoir may be funded under each of the three headings – as Climate Change Adaptation (storage for future scarcity), as Disaster Risk Reduction (to counter effects of drought) and as Poverty Reduction (for irrigated agricultural production).

The key need is to invest in communication and coordination across sectors at different levels (e.g. federal, state and local): "Integrating DRR, CCA and PR cannot be done according to a standard recipe. … Enhancing these capacities can be done by networking and dialogue, and by encouraging the various actors to reflect on and improve their response capacity by learning from real-life processes and programming in other areas." Local governments, NGOs, professional associations and networks all have roles to play.

Box 2 Flood early warning messages not heeded

WARRI, 13 September 2011 (IRIN) - Nigeria's Emergency Management Agency (NEMA) has accused state governments of overlooking early warning messages in the wake of flooding across the country that has killed an estimated 140 people and displaced tens of thousands.

In early 2011 the Nigerian Meteorological Agency (NIMET) predicted heavy rainfall. Based on this, NEMA sent out early warning messages via radio in May 2011 to governments and citizens in seven states, including Kano in the north. "We advertised… for both government and people to start cleaning up drainage ditches, and we formally wrote to state governments, including Kano State, to prepare for the expected flooding this year," said NEMA coordinator Musatafa Suleiman.

The Nigeria Red Cross also put out early warnings based on information it received from Africa's climate prediction centre, African Centre of Meteorological Application for Development.

But according to Suleiman, "few states adhered to the early warning messages and started clearing their drainage systems or canals for easy passage of floodwater."

NEMA is trying to improve its information-gathering and dissemination so it can play a stronger early warning role in future.

But local authorities need to shift from a reactive to a proactive role to fund and map out clearer emergency preparedness plans from now on, said Umar Maigari, disaster management coordinator for the Nigeria Red Cross in Bauchi State in northern Nigeria. Several states have no emergency preparedness measures at all, and those that do, are poorly funded.

Fact box on 2011 floods

- 140 people killed by floods in Nigeria this year (NEMA).
- Over 100 killed in Ibadan in August.
- 25 killed by floods in Lagos State in July.
- Heavy flooding in August in Kano, Katsina, Sokoto and Jigawa states displaced tens of thousands.

Top preparedness priorities are to clear drainage ditches and move communities in flood-plains to new locations, according to NEMA. Particularly at risk in most states are densely populated, low-income areas of cities, where refuse dumping and inappropriate construction of roads and buildings have blocked drains, Charles Oji, a town planner in Warri (a major city in Delta State), told IRIN.

Abiola Ajimobi, governor of Oyo State in the southwest, gave a seven-day demolition notice on 1 September to house-owners living on drainage paths in the capital, Ibadan. Residents told IRIN they were not given enough notice of the move.

It is not too late to strategize preparedness activities for the 2012 rainy season, said NEMA's Suleiman. Very little progress has been made in these areas since 2010, when heavy rains hit the north, displacing two million people after local authorities were forced to open flood-gates on swollen rivers.

NIMET head Anthony Anuforom anticipates parts of Bauchi, Oyo and Cross Rivers states may experience more flooding in the next few weeks.

Source: www.irinnews.org/Report/93711/NIGERIA-Flood-early-warning-messages-not-heeded

Box 3: Some identified capacity gaps

- Although there is a lot of effort at the federal level through NEMA, DRR is yet to be seen as national priority and decision makers lack or have limited knowledge on disaster reduction issues. For example, the "Nigeria Vision 2020" mentions very briefly disaster emergency needs and does not mention DRR or disaster prevention. State Emergency Management Agencies are focused primarily on emergency preparedness and response, and there is little recognition of the importance of disaster risk reduction mechanisms.
- relatively small budget allocation to meet needs at federal level with focus on disaster response (NEMA is partly funded through the Ecological Fund) and no dedicated budgets at state level.
- national platforms for sharing and coordination on DRR exist but are not functioning properly, and there are no DRR platforms at state level.
- no coordinated monitoring of floods or established early warning systems for flood disaster reduction.
- a lack of systematised comprehensive risk identification or risk assessment activities.

Source: Mamadou Dia, A., Wernerman, J., Grigoryan, A., Becchi, G., & Jung, C. (2012) *National Capacity Assessment Report Part 1: Disaster Risk Reduction Capacity Assessment* (Draft). Federal Republic of Nigeria, Abuja.

Key definitions

Disaster Risk Reduction: an approach where the likelihood and potential impact of disaster events are assessed by identifying and analyzing hazards, the vulnerability of communities to these hazards, and their capacities to deal with events (Global WASH Cluster, 2011).

Extremes: a climate or weather event at the upper or lower ends of the range of observed values (IPCC, 2012).

Exposure: The presence of people, livelihoods, environmental services and resources, infrastructure, or econonomic, social or cultural assets in places that could be aversely affected (IPCC, 2012).

Further reading

Global WASH Cluster (2011) ***Disaster Risk Reduction and Water, Sanitation and Hygiene: A guideline for field practitioners planning and implementing WASH interventions.*** Global WASH Cluster, New York [online] Available at www.washcluster.info (Accessed 16 Nov 2012)

- An accessible and comprehensive guide that has been widely quoted in this factsheet. The essential resource for more information.

Watch

- Two films from Bolivia and Ethiopia produced by the Resilience Consortium

[i] UNICEF, 2011. Programme Guidance Note on Disaster Risk Reduction (February 10, 2011)

[ii] Global WASH Cluster (2011). *Op. Cit*.

[iii] IPCC (2012) *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change (Eds. Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley). Cambridge University Press, Cambridge, UK [online] Available at http://www.ipcc-wg2.gov/SREX/images/uploads/SREX-All_FINAL.pdf (Accessed 13 Nov 2012)

[iv] Global WASH Cluster (2011). *Op. Cit*.

[v] http://www.unisdr.org/

[vi] Global WASH Cluster (2011). Op. Cit.

[vii] Global WASH Cluster (2011). Op. Cit.

[viii] Resilience Consortium. *Handbook resilience: Integrating Climate Change Adaptation, Disaster Risk Reduction and Poverty Reduction* (forthcoming)

[ix] UNISDR (2004)

FACTSHEET 8: COSTS, BENEFITS AND FINANCING

This factsheet outlines the costs and benefits of climate change adaptation in the WASH sector and provides information on finance mechanisms that can be accessed to finance adaptation measures. It also highlights some of the key challenges involved in climate change financing.

Why should climate change financing be of interest to WASH sector professionals?

- Climate change adaptation will be costly: water and sanitation has been is identified globally as the third most-costly sector for adaptation.
- There is already an existing shortfall in funding for the WASH sector and this will be further exacerbated by the costs of climate change impacts and adaptation.
- Climate change adaptation has additional financing streams, and there is an excellent economic case to be made for WASH: the benefits of good water and sanitation services far outweigh the costs.

Box 1: Water is central to costs of climate change

Existing studies on the additional costs of adaptation in the water sector estimate the costs as up to $20 billion/year in developing countries. A study commissioned by the UNFCCC to assess additional costs for adaptation in the water sector put the figure at $9 – 11 billion in 2030[i]. The World Bank Economics of Adaptation to Climate Change study estimates $13.7 billion in drier scenarios, and $19.2 billion in wetter scenarios for 'Water Supply and Flood Management'[ii]. This represents the third most costly sector for adapting to climate change. Infrastructure and Coastal Zones represent the highest costs, and these sectors in turn are also water-related. Other sectors identified in the study include Agriculture, Forestry and Fisheries; Human Health, and Extreme Weather Events, also all in some way related to water.

Source: http://www.stakeholderforum.org/fileadmin/files/wccstatement.pdf

Assessing the economic impact of climate change

Although there is widespread agreement on the need for adaptation measures to limit the risks posed by climate change, there is no clear consensus globally on how much adaptation will cost or how it is going to be financed. Some of the estimates, and why they vary so much are summarised in Boxes 1-3.

Box 2: Costs of climate change adaptation

A recent World Bank report suggested that the price of adaptation in developing countries alone will be $70–100 billion a year between 2010 and 2050, while other studies suggest these figures are too low.

The overall bill for adaptation will depend on the severity of climatic changes and the range of measures chosen. The most expensive adaptation measures involve modifying infrastructure and improving coastal and flood protection, so costs will be highest not necessarily where vulnerability is greatest but in regions with a lot of infrastructure that needs to be climate-proofed. Lower-cost measures that can be used as part of an adaptation response include changing behaviours, shifting farming practices and making regulatory reforms. Costs will be lower if countries plan ahead – for example building roads with drainage systems that can cope with severe rain, rather than retro-fitting these features later on.

Developed countries will need to fund their own climate change adaptation measures from government funds or private investments. Companies will have to adapt their activities, whilst governments will have a role in protecting national infrastructure, setting guidelines and providing social protection. Some costs will also be borne by individuals and households, such as purchasing flood insurance or adjusting heating or cooling in the home.

Source: http://www.guardian.co.uk/environment/2012/feb/28/financing-climate-change-adaptation

A recent study[iii] identified the following key issues with regard to the economic impact of climate change in Africa and the costs and befits of adaptation:

- "The economic impacts of climate change in Africa are likely to be significantly higher than in many other world regions and they could be significant in the short-term, with estimates that the costs could be equivalent to 1.5-3% of GDP/year by 2030. Impacts (and benefits) will be unevenly distributed across countries and between sectors.
- Adaptation can reduce these costs, but it cannot remove them completely, particularly under a business as usual [emissions] scenario. Global mitigation is needed as well as African adaptation.
- A number of estimates of the costs of adaptation for Africa are available. These include estimates by the UNFCCC, World Bank and others. These estimates include different categories of adaptation, including capacity building and immediate priorities, enhancing climate resilience in new investment (anticipatory adaptation) and social adaptation to protect livelihoods. There are also major financing needs to enhance the capacity to cope with the current climate adequately (the adaptation deficit), which are essential in enhancing resilience for the future, although these needs are associated more closely with development than future climate change.
- The various studies provide a large range of estimates due to differences in approach but also due to what is included or excluded in the analysis. [see Box 3]
- There is a large range ($5-30 billion a year) around these numbers. Estimates at the lower end of the range only include immediate needs. Estimates in the central and upper range include social adaptation and some accelerated development. A key conclusion is that the numbers are defined by the categories of adaptation and development included.
- The cost of adaptation is likely to increase in future years. Adding the adaptation components together leads to a range of estimates that vary from $10-60 billion a year. Again the variation

depends on what is included, notably in relation to the categories of capacity building, enhancing climate resilience, social adaptation and accelerated development."

Box 3: Variation in annual estimates of adaptation costs

Inclusion of infrastructure for flood protection increases overall climate change adaptation costs significantly. The World Bank (2010) estimates that with flood protection and water supply considerations the costs reach between $6.2-7.1 billion annually by 2050. In comparison Kirshen[iv]/UNFCCC (2007) estimate costs between $4.5-4.7 billion annually, not including flood protection.

Source: Watkiss *et al.* (2010)

WASH as a vital investment

WASH is costly. There have been a number of studies that estimate the costs of meeting the target under Millennium Development Goal 7 to halve the proportion of people without access to safe drinking water and basic sanitation by 2015 - it has been estimated that it will require at least $10 billion a year through to 2015[v]. In Nigeria alone there is an estimated US$2.5 billion annual investment required to meet the MDG targets[vi].

But WASH makes good economic sense.

- An economic study conducted for Nigeria has shown that impacts resulting from poor sanitation and hygiene cost the economy of Nigeria 444 Billion Naira (US$ 2,978 million) per year, or the equivalent of 1.3% of annual Gross Domestic Product (GDP)[vii].
- A recent global study, which took into consideration health improvements and time savings, estimated the benefit-cost ratio of investments in water supply and sanitation for Nigeria. The economic benefits are estimated to be at least 3.1 times the costs for water supply and at least 2.8 times the costs for sanitation, under the most conservative cost assumptions (WHO 2012).

The case for investment in WASH becomes even more compelling when one considers that these results underestimate economic benefit since they do not take into account a range of other health and non-health benefits that are associated with improved water and sanitation.

Access to potable water and adequate sanitation in Nigeria is only 58% and 31% respectively[viii]. This shows the clear need for further investment but there is a huge investment gap. Out of the calculated US$2.5 billion annual investment required to meet the MDG targets, only about $550 million is being injected by the Government due to limited resources and competing needs. Government efforts are being complemented by an average annual fund injection of about US$100 million from development partners and donors in loans and grants[ix].

Financing adaptation to climate change

There is a need for new and additional financial resources for the WASH sector to address the current adaptation deficit as well as preparing for future adaptation needs. Some of these

resources may come from existing WASH sector funds (government and ODA), however, there is a growing recognition that climate change adaptation funding should not compete with ongoing development funding needs and sources. This is known as the "additionality" principle. Additional funding may come from government, ODA, UNFCCC, and the private sector.

There is a long list of existing bilateral and multilateral/ multi-donor funds of which the majority are not specifically established to fund adaptation. However, the Climate Funds Update database also lists five multilateral funds that are solely earmarked for adaptation initiatives (Adaptation Fund[x], Least Developed Country Fund, Pilot Program for Climate Resilience, Special Climate Change Fund, and Strategic Priority on Adaptation). The African Development Bank provides funding through the Climate Investment Funds to African nations and an additional African fund is proposed[xi]. Apart from these international funds there are national initiatives to set up climate adaptation funds (including in Nigeria see Box 4) and there are also private sector funds available, although these are mainly focused on mitigation.

Box 4 Climate change funding in Nigeria

Efforts made by government and partners include:

- Trying to access Kyoto Protocol Adaptation Fund with 2 projects (one on water, one on resilience and conflicts) about to be submitted.
- A National Climate Change Trust Fund is under construction (discussing governance, finance, focus areas, disbursement mechanisms etc.).
- The Ecological Fund is managed from the Presidents Office. It has a broader focus but includes funding CCA.

Box 5 Actions to address climate change financing in Nigeria

A recent study conducted by BNRCC points out that the existing funding mechanisms for climate change adaptation in Nigeria are inadequate. To mobilise additional and substantive financial resources it suggests to:

- Situate climate change adaptation financing within the broader context of national development financing and development goals of Vision 20:2020.
- Undertake a detailed financial needs assessment to properly determine the economic costs of climate change adaptation in Nigeria.
- Review all multilateral mechanisms to finance climate change adaptation, and determine what capacities must be put in place to access and manage these funds.
- Revise the National Fiscal Policy to incorporate the cost of climate change adaptation.
- Develop an innovative, non-debt creating national financing mechanism to support adaptation, raise the necessary funds, and manage those funds well.
- Ensure climate financing policies and resource allocations are responsive to real needs.

Source: BNRCC (2012)

- There is a clear need for additional funds and the recognition of existing adaptation deficits. This does not exclude the possibility of using existing funds in a different and more climate smart way, but … this alone will not be sufficient to achieve sustainable WASH services in the light of climate change.
- We can distinguish between high-regret, low-regret and no-regret adaptation strategies and given the overall shortage of funding it would be recommendable to focus on the latter two categories. Low-regret adaptation options are those where moderate levels of investment increase the capacity to cope with future climate risks. Typically, these involve over-specifying components in new builds or refurbishment projects. For instance, installing larger diameter drains at the time of construction or refurbishment is likely to be a relatively low-cost option compared to having to increase specifications at a later date due to increases in rainfall intensity.
- there is sometimes an assumption that the availability of adequate funding for developing counties for climate change adaptation results in adequate adaptation. However, here we need to be more critical. This assumption ignores the deficit in "absorptive capacity" of many developing countries and vulnerable groups within these countries to actually access and put to good use the money available.

Key definitions

Adaptation benefits: Avoided damage costs or accrued benefits following the adoption and implementation of adaptation measures (IPCC 2007).

Adaptation costs: Costs of planning, preparing for, facilitating and implementing adaptation measures, including transition costs (IPCC 2007).

Adaptation deficit: Failure to adapt adequately to existing climate risks largely accounts for the adaptation deficit. Controlling and eliminating this deficit in the course of development is a necessary, but not sufficient, step in the longer-term project of adapting to climate change. Development decisions that do not properly consider current climate risks add to the costs and increase the deficit. As climate change accelerates, the adaptation deficit has the potential to rise much higher unless a serious adaptation program is implemented.

High-regret adaptation: Involves decisions on large-scale planning and investments with high irreversibility. In view of the considerable consequences at stake, the significant investment costs and the long-lived nature of the infrastructure, uncertainties in future climate projections play a crucial role when making decisions about whether to implement high-regret adaptation measures.[xii]

Low-regret adaptation: Low-regret adaptation options are those where moderate levels of investment increase the capacity to cope with future climate risks. Typically, these involve over-specifying components in new builds or refurbishment projects.

No-regret adaptation: Adaptation options (or measures) that would be justified under all plausible future scenarios, including the absence of manmade climate change.

Read

Climate Funds Update (http://www.climatefundsupdate.org/)

- A very good overview, updated bi-monthly, of the growing number of international climate finance initiatives designed to help developing countries address the challenges of climate change. Includes information on where and by whom climate change funds are being developed, the scale of proposed and actual financing and what the funds support across focuses and regions and particular projects.

OECD (2012) Financing climate change action
http://www.oecd.org/env/climatechange/49096643.pdf

UNFCCC (2009) Potential costs and benefits of adaptation options: A review of existing literature
http://unfccc.int/resource/docs/2009/tp/02.pdf

Watch

- This is an introductory video to the Climate Funds Update providing information on search functions and filters to access the information contained in the database at www.youtube.com/watch?v=FrEBR2lbAqo&feature=player_embedded

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[i] UNFCCC (2007) Investments and Financial Flows to Address Climate Change [online] Available at www.un.org/ga/president/62/ThematicDebates/gpicc/iffacc.pdf

[ii] The Cost to Developing Countries of Adapting to Climate Change, New Methods and Estimates, The Global Report of the Economics of Adaptation to Climate Change Study [online] Available at http://siteresources.worldbank.org/INTCC/Resources/Executivesummary.pdf

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[ix] SWA (2012b) Op Cit.

[x] http://www.adaptation-fund.org/about

[xi] http://www.afdb.org/en/topics-and-sectors/initiatives-partnerships/climate-investment-funds-cif

[xii] From http://climatechange.worldbank.org/content/adaptation-guidance-notes-key-words-and-definitions