Climate Resilient
WASH Planning Module

Women and Child – Responsive
Climate-Resilient Integrated Planning

WASH Capacity-Building
for State Water, Women & Child,
Rural & Urban Development and
Health Department Officials

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INTRODUCTION AND OVERVIEW OF CLIMATE CHANGE

Session Overview

This session introduces the concepts of climate change and climate variability. It explores the effects of climate change, with particular emphasis on how climate change is affecting women and children in India.

Key Learning Objectives:

- Describe climate change, its causes and main effects
- Understand the impact of climate change in India
- Describe how climate change is affecting the sectors of Health, Nutrition, WASH, Education, Livelihoods and food security, Child Protection, and Natural resource management.
- Understand climate change related vulnerability of children and women.

Key Learning Points:

- Climate change presents one of the greatest development challenges of our time.
- Economic damage caused by extreme weather events has increased substantially over the last few decades in India.
- India has reasons to be concerned about the impacts of climate change.
- Climate change is affecting the sectors of Health, Nutrition, WASH, Education, Livelihoods and food security, Child Protection, and Natural resource management.
- While climate change affects everyone, it is not gender or age neutral. It magnifies existing inequalities, reinforcing the disparity for children and women in their vulnerability to climate change, and their capability to cope with it.
- The 2008 National Action Plan on Climate Change (NAPCC) drawn up by the Government of India fails to recognise the gender dimensions of climate change, either explicitly or implicitly.
- However, state Governments are now beginning to reflect greater gender sensitivity in their SAPCCs.

Session Content:

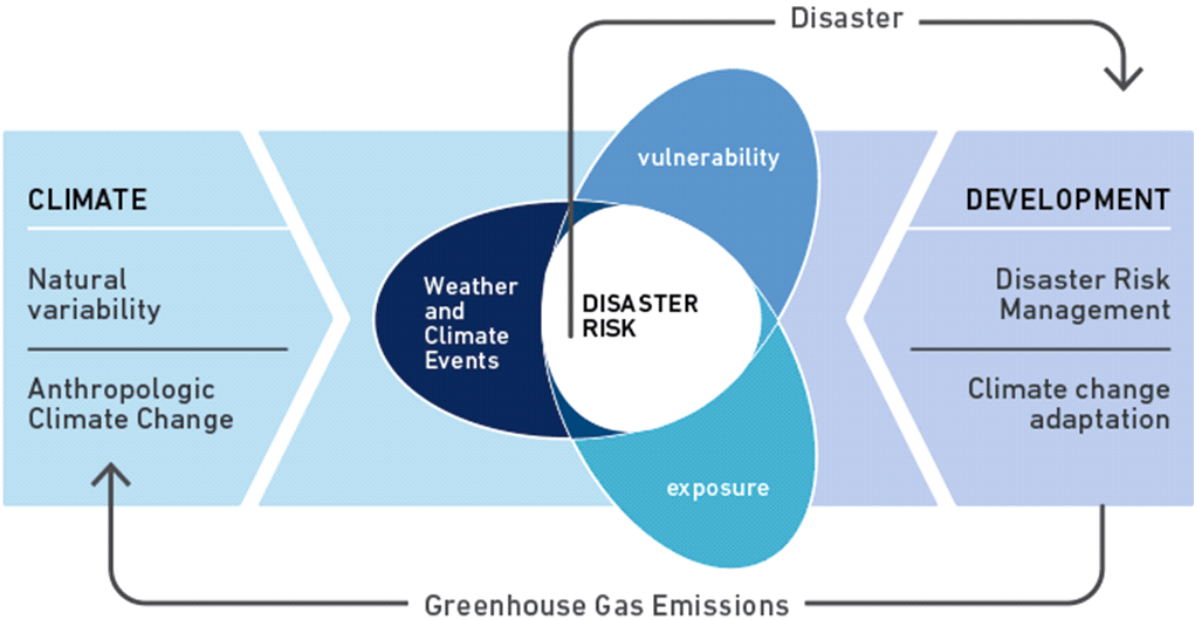
1.1 What is climate change?

The United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

Changes to the composition of the global atmosphere occurs when greenhouses gases (GHGs) are emitted into the atmosphere in greater volumes than occurs naturally from the planet's processes, and when the planet's processes to sequester or 'sink' GHGs (to prevent it reaching the atmosphere) are hampered. Emissions of GHGs from burning fossil fuels, and reduction of sinks through deforestation and cultivation of land are human activities that directly alter the composition of the global atmosphere. Indirect impacts are through feedback loops, where warming caused by these human activities reduces the ability of oceans to sequester due to increased surface temperatures, and reduced coverage of ice sheets (melted by warmer temperatures) increasing warming further through reduced surface area for reflecting back solar heat.

Climate change presents one of the greatest development challenges of our time, and it is now clear that the eradication of poverty and inequality cannot be achieved without also addressing the causes and consequences of climate change. At the global level this requires a twin-track approach, of both curbing the actions that are causing climate change, and learning to live with the now unavoidable climatic changes that are and will continue to unfold. To curb further climate change requires mitigation actions that reduce greenhouse gases (GHGs) in the atmosphere; primarily by reducing the volume of GHGs emitted into the atmosphere through the burning of fossil fuels. Large scale decarbonisation of economies is required in order to deliver the scale of mitigation required to slow down climate change, limiting global warming to "well below 2°C" as agreed last year in the UNFCCC Paris agreement; and crucially also to create space for some increase in emissions from developing countries in order to support poverty reduction and address global inequality.

Even with concerted action on mitigation, adapting to climate change is now unavoidable as significant changes are already locked into the climate system caused by the excess of GHGs built up in the atmosphere since industrialisation. Those climatic changes are undermining livelihoods, degrading vital natural resources, and putting lives at risks through increasing frequency and severity of climate-related disasters. In this way climate change is undermining development opportunities, setting back progress already made, and actually exacerbating poverty and inequality.



In addition to causing climate change, there are of course other negative consequences of burning fossil fuels and reducing sinks, such as air pollution, degraded land, and resource scarcity. Tackling the causes of climate change will have numerous co-benefits for everyone. For the purposes of climate change work it is important to focus on the causes and consequences of climate change as a political-economy problem not as an environmental problem. This is because climate change is not caused by 'natural' or environmental processes, but by human economic activities that fail to 'cost in' economic, social, cultural, and environmental losses caused by increased risk and instability, with particularly devastating consequences for the most vulnerable across the world.

1.2 India: Climate Change Background Context

In India, climate change is increasing the probability, frequency and intensity of extreme events, as well as spurring the emergence of new hazards and vulnerabilities with differential spatial and socioeconomic impacts. Monsoon seasons have become unpredictable and this is having a severe impact on rain-fed agriculture. The majority of Indian people depend on climate-sensitive sectors such as agriculture, forestry and fisheries for food and livelihoods. As such, the impacts of climate change are expected to reduce the resilience and coping capacities of poor and vulnerable communities even further.

India is highly vulnerable to changing trends of the climate. Agriculture production is impacted negatively due to high incidence of shifting cultivation. The high prevalence of natural disasters (floods, cyclones and droughts etc.) and changes in trends of meteorological parameters are likely to impact forests and livelihoods of dependent communities.

Between one quarter and one half of the urban population in India is poor. Large differentials exist within any urban population, not only in terms of the impacts of climate change, but also in relation to the potential to cope with these impacts and to recover afterwards – and this is influenced by age, gender and other factors. According to the Planning Commission of India, secondary cities in India (also known as Tier II cities, based on their population) are especially vulnerable to the impacts of climate change, because they are becoming hubs of livelihood opportunities, attracting rapid economic growth and high levels of migration from neighbouring areas. However, these cities are unprepared for the challenges posed by climate change, in combination with such socioeconomic trends. Urban poor are forced to live in slums built on marginal lands and often lack access to basic services, thereby increasing their vulnerability to the impacts of climate change and disaster events, such as heavy rain, water-logging and floods.

Economically, India has been a fastest growing country of the last decade; the gross domestic product (GDP) grew 7.6 % in 2015-16, up from 7.2 % a year ago. The recurrent disasters disrupt the lives and property of the people in the country and affect the economic growth adversely, which essentially requires preparedness to address the adverse impacts of disasters and climate change.

How Climate Change is Intensifying Disasters in India

There is considerable evidence that economic damage caused by extreme weather events has increased substantially over the last few decades. For a country like India, with over 70 percent of its population relying directly or indirectly on agriculture for their livelihoods, the impact of extreme weather events is critical. People often live in areas of high ecological vulnerability and relatively low levels of resource productivity and have limited and insecure rights over productive natural resources. These combined factors are significant forces contributing to vulnerability to natural disasters (Baumann et al., 2003).

Changes in the precipitation patterns and any intensification of the monsoons will contribute to flood disasters and land degradation and will thus have far-reaching consequences for the entire economy (Stern, 2006). In the last decade, India has been repeatedly battered by successive monsoons, flooding and droughts. For example, the state of Odisha has experienced floods in 49 of the last 100 years, droughts in 30 and cyclones in 11 years. The occurrence of droughts, floods and cyclones in a single year is not unusual. In addition, the number of villages in India experiencing drought is increasing (Tompkins, 2002). India's water supply depends not only on monsoon rains but also on glacial melt water from the

Hindu Kush and the Himalayas. Rising temperatures will cause snowlines to retreat further, increasing the risk of floods during the summer monsoon season (Greenpeace India, 2010).

Currently, as much as 68 percent of India is drought-prone and 12 percent (more than 40 million hectares) is flood-prone. India has a long coastline of about 7,516 kilometres of flat coastal terrain and shallow continental shelf with high population density and is extremely vulnerable to cyclones and its associated hazards like storm tide, high velocity wind and heavy rains. Although the frequency of tropical cyclones in the North Indian Ocean, including the Bay of Bengal and the Arabian Sea, is the lowest in the world (7 percent of the global total), their impact on the east coast of India is more devastating in relative terms (Mittal, 2010). About 8 percent of the area in the country is prone to cyclone related disasters. The number of storms with more than 100 millimetres of rainfall in a day is reported to have increased by 10 percent per decade (UNEP, 2009).

India has reasons to be concerned about the impacts of climate change. Its large population depends on climate-sensitive sectors like agriculture and forestry for livelihoods. Any adverse impact on water availability due to recession of glaciers, decrease in rainfall and increased flooding in certain pockets would threaten food security, cause degradation of natural ecosystems, including species that sustain the livelihoods of rural households, and adversely impact the coastal system due to sea level rise and increased frequency of extreme events. Apart from these, achievement of vital national development goals related to other systems such as habitats, health, energy demand, and infrastructure investments would be adversely affected.

Climate Projection

Climate change may further complicate the unsustainable consumption of groundwater for irrigation and other uses in some locations, such as the Indian states of Rajasthan, Punjab, and Haryana. By the 2070s, the top cities with the most people at risk (including all environmental and socioeconomic factors) to coastal flooding are expected to be Kolkata, Mumbai, etc. Scientists estimate that over 70,000 people will be displaced from the Sundarbans due to sea level rise by the year 2030.[1]

Unavoidable projected impacts

According to the IPCC scenarios there are several projected impacts that, even with adaptation, appear unavoidable. These include:

- Coral bleaching
- Species range shifts and possible extinctions
- Water scarcity and drought risk in some regions of the dry tropics and sub-tropics
- Increase risk of wildfires
- Coastal damage from floods combined with sea-level rise.

Source : https://www.wmo.int/pages/themes/climate/climate_projections.php

1 Gupta Joydeep, How climate change will impact South Asia – latest IPCC report published at the thirdpole.net understanding Asia water crisis on 2014 available at http://www.thethirdpole.net/how-climate-change-will-impact-south-asia-latest-ipcc-report/

1.3 Key sectors for mainstreaming CCA

1.3.1 Health

Disasters frequently cause the destruction of health facilities and the paralysis of health services through physical damage to buildings and equipment, the direct loss of health staff, and lack of awareness of procedures and resources to maintain operations in different circumstances, in which demand for healthcare is greater and more urgent. Secondary disasters can occur when people's health is negatively affected by overcrowding in temporary shelters, inadequate post-disaster responses in sanitation, water supply and quality, and solid waste disposal.

Climate change is increasing the number and intensity of extreme weather events, leading to more frequent destructive impacts such as those described above, as well as heat stress and pneumonia in unprecedented hot and cold spells. Changes in climate also act as a multiplier of existing health risks caused by climate-sensitive diseases. Water-borne diseases such as bacterial and parasitic infections are more likely as a result of more extensive and longer periods of flooding and drought.

Vector-borne and rodent-borne diseases such as malaria and dengue will increase in warmer, wetter conditions, and will affect new areas as global temperatures rise.

Climate change also causes various psychological impacts like acute or traumatic effects of extreme weather events; threats to emotional well-being; and chronic social and community effects of heat, drought, migrations, and climate-related conflicts.

Mainstreaming DRR and CCA in health and care means considering disaster and climate change risks and including various measures to address them, in health and care programming.

1.3.2 Nutrition

Climate change threatens to reverse improvements made in childhood nutrition whilst at the same time good nutrition and health is a vital component of a resilient population. Mapping how climate change is and will change local food and nutrition insecurity is also an important element the government will need to get to grips with.

Mainstreaming DRR and CCA would have to consider adaptation policies in the agriculture sector to include nutritional analysis and that meet the nutritional needs of children, to map climate change and food insecurity trends and hotspots, and develop an early warning system for early action in the near-term, and information to inform policy makers about longer term anticipated trends.

1.3.3 WASH

In places where water and sanitation services have not been constructed with resilience in mind, hazards can destroy or paralyze them. Earthquakes, landslides, floods and storms, for example, can damage wells, tanks, piped water distribution systems, and water tanks and disrupt solid waste collection systems. Floods can contaminate water sources and block distribution and collection networks. Droughts can cause water sources to dry up temporarily or even permanently, and prevent sewerage networks from functioning adequately.

All types of hazards can negatively affect hygiene practices that are dependent on a predictable supply of water and functioning sanitation services. In particular, in disaster situations when people are

displaced from their homes and congregate in shelters or informal camps, the health risks are exacerbated if they do not have adequate water and sanitation for domestic and personal hygiene purposes.

Climate change is already causing, and will continue to cause, massive changes to the global water cycle. These include: changing precipitation patterns resulting in longer and more widespread droughts; melting glaciers and increased flooding; sea-level rise and salinity ingress in groundwater; greater intensity and frequency of extreme events; less predictability in water availability, quality and security, etc.

These changes increase the likelihood of damage and disruption to drinking water and sanitation infrastructure and systems. Traditional hygiene practices may lose relevance or not be practical anymore in changing climatic conditions and with unpredictable water availability, for example. Climate-induced water stress is also expected to cause competition and tension between different types of water users (e.g., pastoralists, agriculturalists, industry), potentially leading to migration, conflict and displacement.Mainstreaming DRR and CCA in WASH means considering disaster and climate change risks and including various measures to address them, in WASH programming.

1.3.4 Education

High levels of disruption to education not just caused by specific disaster events, but by chronic conditions and the cumulative impacts of repeated small-scale disasters. Whilst culturally communities seem to value children's education more than ever before, when people are faced with limited options because of eroding viability of livelihoods and increased disaster impacts, it is often children and their education that suffers the most.

The education sector faces the challenges of how to deliver quality education in a context of increasingly unstable conditions with many disruptions; how to enable children to access education when rural livelihoods are so under threat and with high levels of migration to urban areas ill-equipped to meet their educational needs; and how to educate the children about disaster risk and climate change in a way that equips them to make appropriate choices about their lives and livelihoods in anticipation and in response to the changes they will be exposed to throughout their lives.

Mainstreaming DRR and CCA requires knowledge, requires being able to analyse information, and to be able to make forward-looking decisions. It requires incorporation of DRR, CCA and environmental education into the educational curriculum, having policies and measures to ensure resilience of resources and infrastructure to climate and non-climate disasters, such as floods, cyclones, and earthquakes to ensure minimum disruption to education services, for example, measures to retrofit schools unsafe for predictable flood, cyclone, and earthquake risks in both urban and rural locations.

1.3.5 Livelihoods and food security

Disasters and food insecurity are directly interconnected. Floods, cyclones and other hazards destroy agricultural, livestock and fishing infrastructure, assets, inputs and production capacity. They interrupt market access, trade and food supply, reduce income, deplete savings and erode livelihoods. Economic crises reduce real income, force the poor to sell their assets, decrease food consumption and reduce their dietary diversity. Disasters create poverty traps that increase the prevalence of food insecurity and malnutrition.

Climate change has profound and far-reaching effects on the environment, ecosystems, natural resources, economy and human life. Climate change is magnifying existing patterns of disaster risk and present scenarios that exceed the capacity of the humanitarian and development communities. The most severe consequences of climate change are likely to be on the food security and livelihoods of agriculture-dependent populations in vulnerable communities. Long-term changes in the patterns of temperature and precipitation include shifting production seasons, increasing the supply variability and risks in the fishing sector, and the emergence of new animal and plant diseases.

The multiple threats to food and nutritional security and the clear link between shocks and hunger reveal the fragility of current food production systems and their vulnerability to disruptions. In order to break this cycle, it is necessary to protect livelihoods from shocks, and to make food production systems more resilient and more capable of absorbing the impact of, and recovering from, disruptive events and to secure sustainable development gains.

Sustainable livelihoods programmes typically assess the barriers that people face in improving their livelihoods, and design programme interventions to overcome these. For example, when rising temperatures increase crop water demand and weather is ever more unpredictable, farmers struggle to know when to cultivate the land, sow, and harvest. Likewise, when violent conflict forces people to migrate, they do not have access to the resources they are normally used to.

Migration may also increase competition for natural resources such as water and pasture between migrants and host communities. Urban populations, especially vulnerable households, often face food access problems. While these types of impact are almost universal, strategies for implementing possible solutions need to be rooted in an understanding of how people sustain their livelihoods, and implemented alongside those that aim to overcome the barriers that prevent people from improving their livelihoods.

In relation to livelihoods and food and nutrition security, mainstreaming DRR and CCA means considering disaster and climate change risks and including measures to address these risks, in programming for livelihoods and food and nutrition security.

1.3.6 Child Protection

Climate change is increasing children's vulnerability by eroding people's livelihoods and ability to provide for their family's needs, and by increasing the physical, emotional, and psychological risks of disasters. For families who have lost or are losing everything they have few options, and it is the children who suffer worst in such situations. Some families migrate, exposing children to new challenges often in ill-equipped and unsafe urban slums, others send their children out to work, and others marry off their girls. The impacts of climate change through disasters and as well as slower erosion of people's assets and opportunities, has the potential to put back advances in child protection. It also means that who is vulnerable and where they are located may well change.

Climate change initiatives that could be consider include Pilot projects to target prevention of post-disaster/disruption child labour and child marriage, initiatives to take cash transfers /social protection measures to keep climate change vulnerable children in school post climate disruption or disaster, child-centred social protection measures to be implemented as a vital component of the government's climate change adaptation strategy, provision of child and adolescent safe cyclone shelters, education and awareness-raising of the role of climate change in increasing the vulnerability of children, and ways to identify and reduce vulnerability of at-risk children.

1.3.7 Natural resource management

Disasters and NRM have a complicated relationship, as disasters can both exacerbate and be intensified by existing environmental degradation. Deforestation, for instance, directly affects the environment by reducing the amount of pure air or oxygen to breathe and destroying the natural habitat for wild animals and birds; it also increases floods, drought and climate change and cause soil erosion because trees help in binding soil with their roots. Not only can NRM support adaptation to climate change and buffer communities from some of the worst impacts of climate-related disasters, it can also offer significant opportunities to reduce carbon emissions.

Mainstreaming DRR and CCA in NRM means considering disaster and climate risks and including risk reduction measures in NRM programming.

1.4 Climate Change and Vulnerability

Who is most vulnerable to climate change, and why?

- Those who depend on climate-sensitive resources and ecosystems for their families' livelihoods, such as agriculture, fisheries, and forests.
- Those who live in marginalised and more hazard prone areas, such as flood plains, urban slums, and deforested hillsides.
- Those with limited assets and political voice to enable them to respond to the impacts of climate change (lower adaptive capacity).

1.4.1 Climate Change and Children

"*In every crisis, children are the most vulnerable. Climate change is no exception. As escalating droughts and flooding degrade food production, children will bear the greatest burden of hunger and malnutrition. As temperatures increase, together with water scarcity and air pollution, children will feel the deadliest impact of water-borne diseases and dangerous respiratory conditions. As more extreme weather events expand the number of emergencies and humanitarian crises, children will pay the highest price. As the world experiences a steady rise in climate-driven migration, children's lives and futures will be the most disrupted.*"

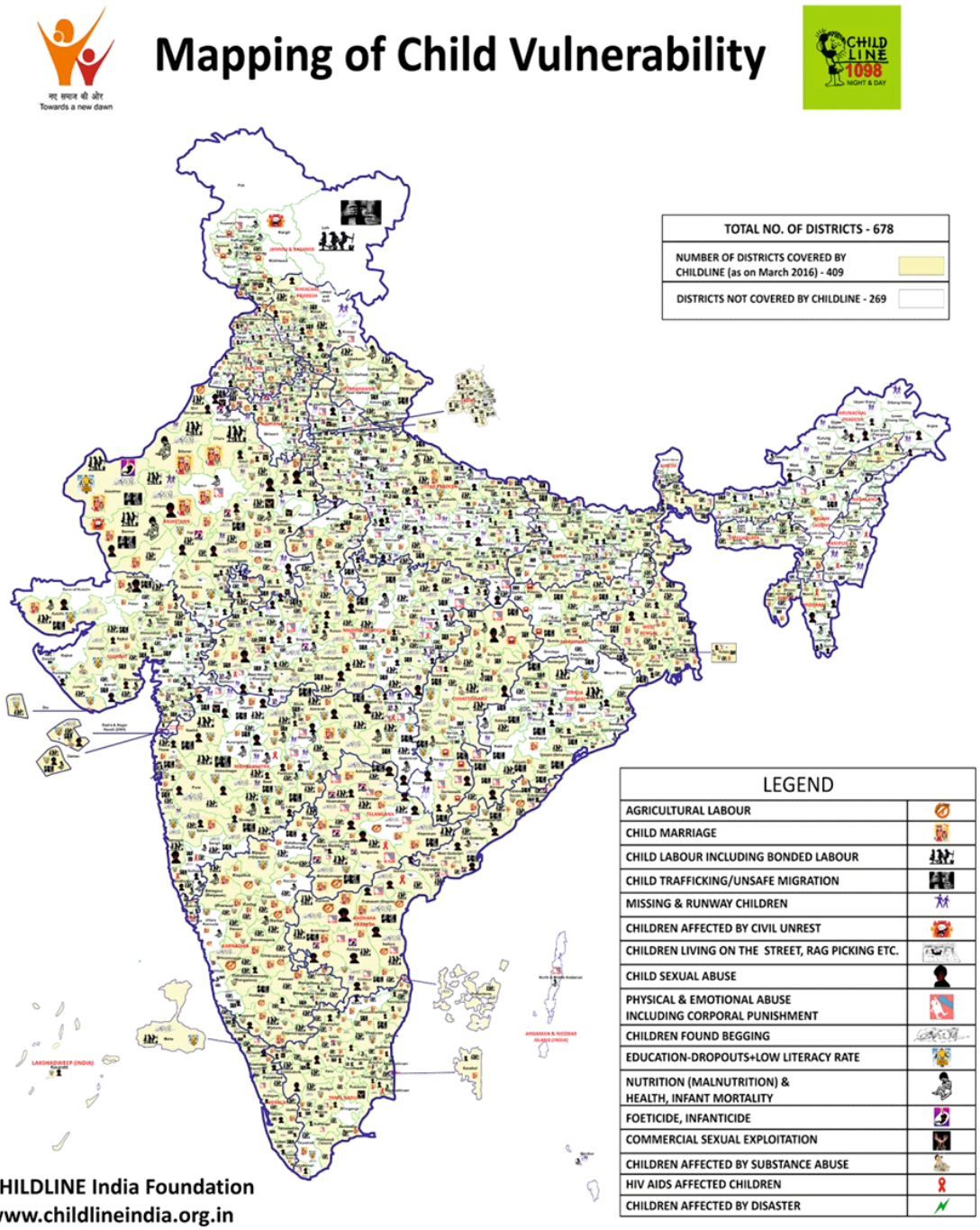
- Anthony Lake, Executive Director, UNICEF (2015)

"Climate change and environmental degradation are already harming children, especially those that are most disadvantaged. Unless action is taken, future impacts will be far more dramatic, undermining much of the progress made for children over the last decades. Each of the seven Outcomes Areas of the UNICEF Strategic Plan 2014-2017 – health, nutrition, HIV, water and sanitation, child protection, social inclusion and education – is affected in some way by climate change and/or environmental degradation."

- UNICEF Strategic Framework on Environmental Sustainability for Children 2016-2017

Frequently forgotten in the global discussions and agreements on climate change are children and young people, who both disproportionately suffer the consequences of a rapidly changing climate, yet also offer innovative solutions to reduce greenhouse gas emissions (climate change mitigation) and adapt to climate change. Children and women are among the most vulnerable, and face the brunt of the growing impact of natural and human induced disasters. Due to their manifold particular vulnerabilities (physical conditions, role and status defined by socio-political processes, limited access to resources,

power and education, including access to life-skills training, etc.), they systematically constitute over 70% of disaster victims.



The adverse effect of climate change is already visible among these groups, and risks further jeopardizing their natural development and exacerbating pre-existing vulnerable conditions to become a life-long threat impeding their well-being through recurrent shocks and stresses. It is therefore imperative to focus particular action in reducing vulnerabilities and exposure to disaster and climate risks through the development of their own capacities and those of government departments, particularly at the State levels, who have a primary responsibility to address disaster risks and provide safe and secure living conditions for all their citizens.

The approach to building (children's and women's) resilience to disasters is referred to as “Child-sensitive disaster risk reduction”. This includes adaptation to climate change (referred to as “mitigation” in disaster risk reduction to address the underlying drivers of disaster risk). While addressing disaster risks, an increasing focus on managing climate risks is critical, as the adverse effect of hydro-meteorological phenomena are linked to almost 70% of all natural disasters, with increasing trends due to global warming and increasingly unpredictable climate conditions, often creating more intense and more frequent drought, storm and high intensity rainfall spells, which adversely impacts crops, access to nutrition, livelihoods, development services and brings about epidemiological changes, etc.

Making sense of the changing and unsafe conditions, and taking planned and organized action for maintaining continuum of care for children is still not an established policy or practice. The duty bearers and institutions responsible for planning and programming for children are yet to be included in the mainstream work on climate change mitigation or adaptation. Climate change is an issue of vital importance for children, not just because they are one of the most affected groups right now, but also because their future – and their children's future – will be so fundamentally influenced by what actions are taken now to meet this challenge.

Children are affected in many ways by climate change in India, both in a worsening of challenges that were already present, and through new challenges arising from changing average climatic conditions becoming the new 'normal'.

The types of climate risks confronting children are diverse, ranging from direct physical impacts, such as cyclones, storm surges and extreme temperatures, to impacts on their education, psychological stress and nutritional challenges:

- Cyclones, floods, rising sea levels, tidal surges, and river erosion are damaging and destroying infrastructure critical to children's well-being, including schools, health facilities, latrines, houses, and roads.
- Floods, increasing salinity, and droughts are destroying crops and trees, disrupting water systems, and contaminate water resources, reducing children's access to safe water and nutritious food.
- Seasonal shifts, salinity, increasing temperatures, and more erratic rainfall patterns are eroding livelihoods, increasing poverty and leaving families struggling to meet their most basis needs.
- Rising temperatures and changing rainfall patterns are exacerbating the spread of vector-borne diseases such as dengue, which disproportionately affects children.
- Land loss from flooding and river erosion, dwindling water supplies, and failing climate-sensitive livelihoods are increasing migration, disrupting families and increasing vulnerability of displaced children.

These impacts are falling unequally on children compared to adults. Children are more vulnerable to vector-borne diseases than adults; under-nutrition and diarrhoeal diseases can much more easily lead to severe and often dire consequences in children; and the physical dangers of disasters pose unique threats to young bodies and minds. Children will suffer the effects of climate change and climate change policies longer than adults, making them vital stakeholders in today's decisions about climate change responses.

1.4.2 Climate Change and Women

Indian society is segregated in multiple ways, by caste/class, gender, wealth, poverty and religion. The complex caste system in India stratifies the population into so called upper and lower castes. Some groups are ostracized as 'untouchables', while Other Backward Castes (OBC) is a collective term used by the Indian Government to classify socially and educationally disadvantaged castes. An entrenched patriarchy and gender divisions, which value boys over girls and keep men and women and boys and girls apart, coupled with child marriage, contribute to the creation of a society in which sexual abuse and exploitation of women, particularly 'untouchable' women, is an accepted part of everyday life.

India has performed poorly in removing gender-based disparities, ranking 114 out of 142 countries according to the World Economic Forum's 2014 Gender Gap Index. In 2015, only 12.2% of parliamentary seats were held by women and just over one quarter of adult women (27%) received some sort of secondary education, compared with 56.6% of their male counterparts.27 Female participation in the labour market is 27%, compared with 79.9% for men.

Gender issues for WASH

Gender division of labour

Women and girls more often collect water for families and animals, purification, food, family hygiene and sanitation practices, and home-based businesses in their households.

- When women and girls have to travel long distances to collect water or defecate openly, they are more vulnerable to assault and harassment and urinary tract infections. Women and girls have less time for economic activities due to their unpaid duties related to water collection.
- Clean and private sanitation facilities play a significant role in enabling girls to stay in school; clean water supports better family health, including improved maternal and infant mortality.
- Tasks related to sanitation are also assigned by sex (e.g., families expecting women to have greater responsibilities for toilet care, although women are not always involved in household choices about these facilities).

Women have had a greater role in family hygiene oversight and education.

As with other health services, women more often have greater involvement and programs are directed to them. Hand-washing education and communication campaigns are more often targeted to women and their children.

Women do not always have the same level of information as men regarding the timing of drought forecasts, water shortages, and supply disruptions.

Access to information varies by sex.

Women are less involved WASH decision-making and planning at community and higher levels.

There has been more progress in recent years at achieving greater gender balance at the community level, but women's percentage still declines as the scale of management activities increases. WASH issues are often priority ones for women and provide a way to involve women in larger multiple-use water management decisions in their communities.

- For sanitation, women have not always been involved in community decision-making about service level, type of system, design, and construction, and the distribution of all opportunities brought by sanitation.

- For both water and sanitation, women have also not been as involved as men in decisions about what is affordable and in willingness to pay, even though women may be responsible for paying for family water or sanitation services.

Gender-WASH issues in the context of climate change

While climate change affects everyone, it is not gender neutral. It magnifies existing inequalities, reinforcing the disparity between women and men in their vulnerability to climate change, and their capability to cope with it. Women, who form the majority of the world's poor, tend to be more vulnerable to the effects of climate change and are being affected in their multiple roles as food producers and providers, as guardians of health, care givers, and economic actors. They are more likely to become direct victims (through death and injuries) of climate-related disasters, such as hurricanes and flooding, because they are less likely to be able to swim, and are more likely to be at home when such events occur. Drought, deforestation, and erratic rainfall cause women to work harder to secure resources (such as food, water, and fuel) and mean that women have less time to earn an income, get an education or training, or participate in decision-making processes. Families affected by poverty, many of which are headed by females, often live in more precarious situations: on low, flood-prone lands or on steep slopes.

Climate change disproportionately increases women's time burdens.
These include:

- After a flooding event, women have to spend additional time collecting water, cleaning their home, and ensuring family well-being.
- Coastal flooding may lead to increased salinization of household and business water sources, which is a particular problem in coastal areas. As a result, water security and conflict will become bigger issues and multiple agencies will become involved.
- With droughts, women need to spend more time and calories on water collection and suffer physical strains from heavy loads.
- As water-borne or sanitation-related illnesses increase, so do demands for women's time for family care-giving.

Climate change increases conflicts over competing water uses.
Communities are increasingly faced with allocating scarce water across multiple uses and users, including potable water for humans and animals, irrigation, water for hydropower and other energy, and business usage. With less involvement in community water decision-making and planning, women's priorities may get less attention.

Gender related policy recommendations and responses for climate change adaptation in India
The 2008 National Action Plan on Climate Change (NAPCC) drawn up by the Government of India fails to recognise the gender dimensions of climate change, either explicitly or implicitly. The national plan has been translated into State Action Plans on Climate Change (SAPCC). As a result of the policy research and advocacy on gender and climate change pursued by organisations, the Federal Ministry of Environment and Forests (responsible for climate change in public policy and programming) has advised State Governments to address gender concerns in State Action Plans on Climate Change, ensuring adequate participation of men and women in the implementation process. As a result, State Governments are now beginning to reflect greater gender sensitivity in their SAPCCs. For example, the Uttar Pradesh Climate Change Action Plan discusses links between gender and climate adaptation and mitigation.

CLIMATE CHANGE AND WASH

Key Learning Objectives:

- To understand WASH risks and uncertainties due to climate change in Indian context
- To understand climate change induced disruptions
- To understand potential (direct and indirect) impacts of climate change for water and sanitation service delivery (WASH)
- Understand impact of climate change in terms of:
- Environmental Impact
- Social Impact
- Impact on Health

Key Learning Points:

- Impact of climate change in WASH service delivery due to climate-change induced disruptions are:
- Infrastructure collapse
- Contamination by flood water Displacement and scarcity of safe water and sanitation service
- Diminishing supply of ground water Salinity intrusion and water contamination
- Saline environment and health hazards
- Responses led by government WASH ministries and departments need to be robust to climate risks alongside other pressures on resources, systems and services (so-called stressors) such as demographic change, economic transitions, increasing competition over limited resources, and conflicts.
- Integrating climate resilience into WASH strategies and plans is an important entry point in working towards and delivering more sustainable WASH services.
- The effects of climate change can be grouped into four categories:
- Increasing intensity of rainfall
- Greater rainfall variability
- Longer term decline in rainfall and run off
- Sea level rise

Session Content:

2.1 WASH context

The water, sanitation and hygiene (WASH) sector is already affected in many different ways by weather and climate events such as variability, seasonality, extreme events and climate-related disasters. This translates into negative impacts on drinking water availability and quality and on the performance of sanitation and hygiene services as well as impacts on investments and infrastructure. Climate change will place additional stresses on delivering and sustaining public health and well-being related outcomes, and today's evidence suggests that people living in developing countries will be worst hit by changes, particularly those living in marginalised and vulnerable environments.

Although the precise nature and extent of change are not yet certain, planners and policy-makers responsible for the WASH sector should start acting now to build climate resilience and support adaptation within the WASH sector. Waiting for certainty is not an option.[2]

2 WHO/DFID, 2009

•At a global level, significant progress has been made in extending access to improved water services. The international target for halving the number of people without access to safe water – Millennium Development Goal (MDG) 7 – has already been met, three years before the 2015 deadline (WHO/UNICEF, 2012). Progress on sanitation lags further. Over 2.5 billion people globally still lack access – over one third of the world's population – and more people live without access to sanitation today than in 1990, Globally, the costs of inadequate water supply and sanitation amount to US$260 billion annually (Hutton, 2012).

Climate variability and change

- Projections indicate warming by the end of the 21st century of between 0.3 and 5°C (centigrade).
- With a 2°C global temperature rise, up to 10 million more people could be affected by coastal flooding each year. With a 4°C temperature rise, a 50% decrease in water availability could occur in East Africa and the Middle East.
- In developing countries, the incidence of diarrhoea is expected to increase by around 5% for every 1°C increase in temperature.
- US$2.5 trillion economic losses from disasters so far this century – 70% relate to floods and droughts.
- Since the original Rio Earth Summit in 1992, floods, droughts and storms have affected 4.2 billion people (95% of all people affected by disasters).

Source: IPCC

•As the quarter-century for completion of the MDGs approaches in 2015, there is now growing debate over appropriate goals for the next quarter-century. While a final set of Sustainable Development Goals (SDGs) has yet to be agreed, it is clear that an aspiration of universal coverage will not be realised unless investments are resilient to both current levels of climate variability and future change. Failure to ensure that services are resilient will have major public health consequences if water quality deteriorates, water availability becomes less certain and sanitation systems cause environmental contamination (Hunter, Zmirou-Navier, & Hartemann, 2009; Howard & Bartram, 2010; Calow et al, 2011). Indeed not taking climate change into account, alongside other pressures on services, could result in a reversal of progress against future targets and the loss of hard-won public health and poverty alleviation gains (ibid).

While much has been written about resilience and adaptation in general terms, relatively little has been written about its practical substance (Fankhauser & Burton, 2011). In short, what 'adaptation' and 'resilience building' actually mean in the context of delivering sustainable water and sanitation services in the face of multiple pressures. In part, this is because of the 'deep uncertainty' regarding the translation of large-scale climate scenarios into local adaptation solutions on the ground (Ranger, 2013), and the difficulties associated with untangling the climate signal from the many other factors affecting the sustainability of services – see Box below (Conway, 2011; OECD, 2013). This has not stopped a simplistic crisis narrative emerging around climate change and WASH, in which climate change is held principally responsible for perceived increases in water scarcity and system failure (Calow et al, 2011; Conway, 2011). The evidence, such as it is, does not support such claims. Rather, an understanding of the known risks posed by existing climate variability reinforces the need for responses that are robust to both existing variability and future uncertainty, alongside other pressures on resources, systems and services.

Resilience can be defined as the ability of people and systems to anticipate, adapt to, and recover from the negative effects of shocks and stresses (including natural disasters and climate change) in a manner that reduces vulnerability, protects livelihoods, accelerates and sustains recovery, and supports economic and social development, while preserving cultural integrity.[3] Climate resilient development promotes measures and approaches that will deliver benefits now as well as under potential future climate change5, and enhancing disaster risk prevention and preparedness is often a first line of defence in adapting to future climate change.

Responses led by government WASH ministries and departments need to be robust to climate risks alongside other pressures on resources, systems and services (so-called stressors) such as demographic change, economic transitions, increasing competition over limited resources, and conflicts. Integrating climate resilience into WASH strategies and plans is therefore an important entry point in working towards and delivering more sustainable WASH services. To manage these risks, specific actions may be based on impacts that have already been observed.

Making WASH services more resilient and adaptable to climate change brings potential to improve overall WASH service provision and to enhance poverty reduction and sustainable development. Extending and securing access to water and sanitation services also plays a key role in poverty reduction. Households benefit through a range of health, educational, nutritional and broader livelihood impacts; local, regional and national economies benefit from greater economic activity, spending and investment; and over the longer term, households and economies benefit through greater resilience to climate change. In monetary terms, the numbers are compelling: combined water supply and sanitation interventions have a combined return of at least US$4.3 for every dollar invested (Hutton, 2012), if services can be sustained in the face of multiple risks, including that posed by climate change.

2.2 Climate change and WASH: risks and uncertainties in Indian context

Climate change in India is very often described through water issues and its associated health, safety, and hygiene challenges. Whilst it is wrong to characterise climate change in India only as a water issue, this is an area that will be heavily impacted and will be enormously challenging to manage. With climate change the threat multiplier, the water impacts will be most pronounced where there are already significant challenges relating to water: where there is limited water there will likely become even less, where there is flooding it will likely become more severe, and where there is salinity this will become harder to combat and more widespread.

The complex interaction of changes to amounts of rainfall, distribution of rainfall, evaporation rates, and storm events, further interact with non-climatic influences such as population size, water management measures, and changing resource use, to make the design and delivery of effective climate change adaptation measures extremely challenging. Whilst the development challenge has previously been to ensure access to safe drinking water for all – and India has made significant advances in this – the challenge now presented by climate change is to shore-up that coverage against climate change impacts, which may well prove to be an even more difficult outcome to achieve.

3 Interpretations and definitions will vary across organisations, for example “The ability of children, households, communities and systems to anticipate, manage, and overcome shocks and cumulative stresses” (UNICEF) and “The ability of a social or ecological system to resist, absorb, accommodate and recover from the effects of a (climate) hazard in a timely and efficient manner while retaining the same basic structure and ways of functioning” (GWP)

Globally diarrhoea is the second biggest killer of children, after pneumonia. Vector-borne diseases such as dengue, malaria, and diseases are associated with poor water quality, inadequate sanitation, and poor hygiene practices are on the rise as a result of climate change, and children are far more vulnerable to these diseases than adults.

As with the other sectors, infrastructural damages will increase with climate change, and latrines, hand washing equipment, and irrigation infrastructure are all vulnerable to disasters.

Climate effect	Hazard	Impact on WASH sector
Decrease in precipitation	Drought	Reduction in raw water supplies, reduced flow in rivers, less dilution/increased concentration of pollutants in water, challenge to hygiene practices.
Increase in precipitation and severe weather	Flooding	Pollution of wells, inundation of wells, inaccessibility of water sources, flooding of latrines, damage to infrastructure, landslides around water sources, sedimentation and turbidity, challenges to sustainability of sanitation and hygiene behaviours, and waterborne diseases.
Increase in temperatures	Heatwaves	Damage to infrastructure, increase in pathogens in water leading to increased risk of disease.
	Melting and thawing of glaciers, snow, sea ice and frozen ground	Seasonality of river flows affected leading to a reduction in water availability in summer.
Sea-level rise	Flooding and saline intrusion into freshwater aquifers	Reduction in availability of drinking water, with high impacts on quality.

Globally, water is predicted to be the main channel through which climate change impacts will be felt by people, ecosystems and economies (Bates et al, 2008). Both observation records and climate projections provide strong evidence that freshwater resources are vulnerable, with the potential to be strongly impacted. However, predicting impacts on the availability and quality of freshwater resources, and more so on water-dependent services, remains extremely difficult. Changes could be gradual or dramatic, but with the potential to jeopardise water security over the long term, making it more costly over time for governments to adjust to changing circumstances (Elliot et al, 2011; OECD, 2013).

While there is a high level of confidence in the scientific community about the geophysical processes that link emissions to warming, much less is known about how warming will manifest itself at the local level through changes in rainfall, runoff, groundwater recharge and climate extremes (Conway, 2011; Taylor et al, 2013). Some of this information can be obtained by downscaling GCMs, but resolution remains coarse and levels of uncertainty are high, particularly for rainfall. As a result, the usefulness of climate models for adaptation decisions has been questioned (Stainforth et al, 2007).

Drawing on the above, what can say about the range of possible rainfall scenarios and associated risks? Despite the uncertainty and knowledge gaps, there is a growing body of evidence documenting the range of possible changes in water systems that could be expected in a changing climate. Drawing

principally on Howard et al. (2010), Calow et al. (2011), Elliot et al. (2011) and OECD (2013), the effects of climate change can be grouped into four categories:

Increasing intensity of rainfall, such that even in those areas where average rainfall is expected to fall, a greater proportion of rainfall is likely to fall in heavy rainfall events.

- Increased risk of flooding, leading to both infrastructure damage and contamination of surface and groundwater supplies. In rural areas for example, floods can damage or inundate springs, wells, rainwater harvesting systems, and boreholes, though boreholes are typically less vulnerable. This can hamper both access to water and cause contamination and health risks. Piped systems are also vulnerable because of their size and complexity, and their exposure to multiple threats from source, through treatment to delivery. The pit latrines widely used in rural areas are also vulnerable to flooding and can cause serious environmental contamination, although adapted designs are available and latrines can be upgraded.

- Depending on timing and intensity, and whether critical recharge thresholds are breached, an increase or decrease in groundwater recharge and groundwater levels. Longer term increases in groundwater levels could reduce the potential for pathogen and chemical attenuation or removal, and cause flooding of sub-surface infrastructure such as pit latrines or septic tanks. Longer term declines in groundwater levels could affect the viability of springs and wells drawing on shallow groundwater systems with limited storage.

- Increased flushing of fertilisers, animal wastes and particulates into water supplies, potentially affecting both quality and flow.

Greater rainfall variability, including changes in the timing, duration and distribution of rainfall.

- Longer and/or more frequent droughts, with implications for all water supply systems relying on limited storage to buffer seasonal and inter-annual variability. These include urban systems relying on limited and variable surface water flows and storage, and also groundwater-based supplies – particularly springs and shallow wells - drawing on aquifers with limited storage. Water-borne sanitation may also be compromised.

- For many areas, a proportional increase in winter flows may result in further reductions in water availability during low-flow periods, reducing the capacity of rivers to dilute, attenuate and remove pollution and sediment loads.

Longer term decline in rainfall and run off

- While impacts on groundwater resources remain uncertain even with decreasing rainfall, declining annual rainfall will lead to reductions in river flows, especially in conjunction with population growth and the need to grow more food. This, in turn, could increase the demand for groundwater, potentially threatening sustainability.

- As above, long term declines in water availability could also threaten the viability of water-borne sanitation systems, and the capacity of surface water to dilute, attenuate and remove pollution.

To this list, we could also add sea level rise and the threat this poses to coastal zones in terms of saline intrusion, and damage to/contamination of water systems and treatment works from inundation during coastal storms.

2.2.1 Climate change induced disruptions

Climate change (and disasters) damage asset and environment and disrupt services including water supply and sanitation facilities.

- **Infrastructure collapse –** cyclone, tidal surge or riverbank erosion may damage tube-wells and latrines; infrastructure for water supply and sanitation service may collapse. Also, tube-wells and latrines could be inundated. It seriously reduces people's access to safe water and sanitation.

- **Contamination by flood water –** Faeces from inundated latrines spread in the surrounding and contaminate environment and water sources. Open defecation also spreads contamination. Similarly, hanging unhygienic latrines contaminate water and environment. In such situation, safe water becomes very scarce.

- **Displacement and scarcity of safe water and sanitation service –** Cyclone and flood force people to leave their houses. Also, people living in low lying area have to leave their houses during water logging. Temporary shelters rarely have arrangements for adequate supply of safe water or sanitation facilities. Moreover, displacement affects life and livelihood so severely that the people often do not enough resources to set facilities for safe water supply and sanitation.

- **Diminishing supply of ground water –** Climate change may cause ground water table to drop; also, the volume of accumulated water could diminish. Generally, it occurs in drought prone areas. However, more often, it is induced by human actions such over extraction of ground water for agriculture. It results in serious reduction in the availability of safe water for household consumption. People could not get enough water for drinking or cooking; also, they become unable to use hygienic latrine that depends on water availability.

- **Salinity intrusion and water contamination –** Saline contamination could make the natural sources of water totally unusable for human consumption. It happens during cyclones. However, to some extent, human actions are also responsible for that. Shrimp cultivators bring in saline water in their farms. Tidal surges during cyclones breach the embankments and inundated the fields with sea water and cause water logging. Then fresh water becomes unavailable in the area.

- **Saline environment and health hazards –** Saline environment and saline water adversely affect health. It causes various skin diseases. It also has harmful consequences on reproductive health. In particular, adolescent girls and pregnant women suffer the most. Moreover, warm and humid weather help breeding of insect vectors. So, prevalence of water borne and insect transmitted diseases such as diarrhoea – including cholera, dysentery and malaria increases in the areas.

To sustain safe water supply, sanitation service and hygiene practice in climate change disaster affected areas, it is crucial to find new sources of water, e.g. rain water instead of ground water, and new technologies – e.g. reverse osmosis instead of tube-wells.

2.3 Impacts of Disaster and Climate Change on WASH Practices

Climate change and recurring disasters region wise contaminate natural water sources; make infrastructures of water, sanitation and hygiene practice fragile and causes shortage in supply. The adverse impacts affect environment, society and health simultaneously. As a result severe shortage of accessibility to services occurs and accessing safe water and sanitation services as well as health protection become very difficult for the communities.

2.3.1 Environmental Impact

Losses due to disasters and climate change increasingly affecting the environment. For example water logging, salinity and desertification are increasing; ground water level is dropping. The adverse environmental impacts of Climate change are different in different regions of India. In some regions severe drought and extreme cold; in some regions excessive rainfall and flash floods; in river basin and flood plain areas flood, river bank erosion, water logging and in coastal region tidal surge, cyclone, salinity and river bank erosion are occurring with increased frequencies and higher magnitude. It is seriously affecting the environments of the respective areas and contaminating natural water sources as well as making sanitation systems ineffective.

Salinity

The frequencies and magnitudes of the current hazards of coastal regions, such as cyclone and tidal surge have increased due to climate change. Apparently, the trend continues. Consequently, excessive saline water intrusion continues to contaminate the natural sources of water and create scarcity of potable water. Because of high levels of salinity sources of potable water, such as river, water bodies, and ponds are becoming unusable. Salinity intrusion is also causing severe damage to the sanitation systems and infrastructures. As a result some of the existing technologies are becoming ineffective and communities are being forced to use contaminated water for household chores and drinking purposes as well as apply unhygienic sanitation systems.

Desertification

Lack of rainfall has been considered as one of the climate change impacts in some regions in India. Due to the lack of rainfall frequently severe seasonal drought occurs in these regions. During this period most of the water sources, such a river, wet lands, ponds dry up at the same time the ground water level drops so low that most of the tube-well as well as deep tube-wells dry up, which cause severe potable water crisis. Apart of that as because the surface water dries up, communities are forced to uses unsafe water and consequently suffer various health problems.

Increasing Hazard Proneness

Although types of natural hazards are different in different regions of India, due to climate change impacts the hazard proneness is increasing everywhere. The frequencies and magnitude have increased noticeably in comparison to the past. Because of these natural hazards, especially, cyclone, river bank erosion and flood, water supply and sanitation system get severely affected; sometimes collapse completely. In this situation existing technologies, such as tube-well, PSF or ring slab latrines become ineffective.

Water Logging

In case of excessive rainfall or flooding when the water does not have sufficient channels to flow away

then water logging occurs. Because of climate change impacts and recurring disasters as well as anthropogenic interventions for disaster risk reduction (building embankments) and development (building roads and high ways) several parts of the country have become prone to water logging.

Water logging causes severe distress to communities. Emergency services, especially safe water, sanitation and hygiene practices get seriously disrupted. Because of water logging severe fresh water crisis occurs and the affected communities have no other options but to use unsafe or contaminated water for household chores and drinking. As a result they suffer from various water born diseases. Apart from this, in water logged areas latrines are inundated and become ineffective. People are forced to defecate in open places, which cause environmental pollution and water born diseases to spread. Due to water logging women and adolescent females suffer the most. They cannot perform regular hygiene practices as well as reproductive health related practices properly. In addition, as they have to go in open places for defecation, risk for sexual harassment increases significantly.

2.3.1 Social Impact

Disaster and climate change impacts, not only affect lives and livelihood but also gradually making the entire social and socio-economic system of the country vulnerable. Consequently social discrimination, deprivation, unacceptability and migration are increasing significantly and its adverse impact is reflecting on safe water accessibility, sanitation services and hygiene practices.

Deprivation

Ensuring safe water supply and sanitation services has become increasingly difficult because of climate change and disasters. Every community members are not being able to access safe water and proper sanitation services as per requirement. As a result deprivation occurring.

First of all, due to disasters water supply and sanitation system frequently collapse. Restoration of the collapsed system takes time. During the restoration period affected people get deprived from the services. Because of the recurring disaster these state of deprivation repeatedly comes back.

Secondly, as the sources are contaminated, people can no longer fetch safe water from farther distances. It is very difficult, especially for the women, to fetch safe water from such distance.

Thirdly, due to disaster and climate change the managing safe water supply has become reasonably expensive. For example in severely saline polluted areas instead of existing technologies, such as tube-well and PSFs, Reverse Osmosis Machine (desalination technology) is needed, which is very expensive compare to the existing technologies. Because of asset losses government or humanitarian agencies are not being able to establish sufficient number of Reverse Osmosis Plants. As a result many people in the affected areas are being forced to use unsafe water.

Discrimination

Due to climate change and disaster when scarcity of safe water occurs then the excess demand and water scarcity create a highly competitive situation. Because of that people have to spend relatively more money that normal conditions, which may not be possible for some people under the circumstances. Only those have the ability can ensure access to safe water. The same scenario can be seen in restoring damaged latrines and sanitation systems. Only the wealthy families can ensure safe water supply and sanitation systems during disaster. This creates social discrimination and inequity.

Distress

To cope with the crisis of safe water and sanitation system due to climate change and disaster, affected communities have to make new arrangements instantaneously. For example, in case of saline contaminated areas or during flood if a family's tube-well or latrine becomes dysfunctional, family members, especially the women of the family have to fetch water from distant places instantly. In case of using the latrine they have to ask help from others or defecate in open places. These instant decisions are often socially unacceptable. As a result lack of safe water supply and sanitation cause severe distress to the affected community.

Migration

Because of climate change and disaster a lot of affected families migrate to other places. These migrations can be short run or permanent. Either short run or permanent whatever the case may be, the displaced families tend to take refuge in slums in urban areas. It is very difficult to construct separate latrines for each family in those urban slums. As a result the migrated families cannot access basic sanitation or perform regular hygiene practices.

2.3.3 Impact on Health

Due to climate change and disaster health related issues have been severely disrupted in the affected communities. During disaster water logging, inundation and crisis of safe water and sanitation system due to salinity occur. Because of these various diseases spread in the community. As a result personal health, public health and reproductive health gets affected in the community.

Personal health

Usually in the sources of safe waters in the affected areas get contaminated and safe water scarcity occurs. As a result usage of unsafe water increases in regular household chores. Under this condition people cannot perform personal hygiene practices. And because of this they suffer from various water born diseases, such as- Diarrhoea, Cholera and Hepatitis.

Public health

During disaster sanitary latrines in the affected areas get inundated; due to salinity the sanitation infrastructures get damaged and rapidly break down. As a result the sanitation system suffers great damage and sometime become completely dysfunctional. Insufficient sanitation system and latrines communities cannot perform minimum hygiene practices and also defecates in open places that pollute water sources and environment. As a result various water borne diseases spread widely and affects overall public health.

Reproductive health

During disaster due to water scarcity performing periodical health related practices becomes very difficult for the women and adolescent females. Because of this they suffer various health related complications. Pregnant women cannot perform personal hygiene practices. Apart from this women suffer from skin diseases due to saline water. Besides, during disaster, due to insufficient latrines adolescent females, women, and pregnant mother have to use other's latrines or defecate in relatively unsafe and open place, which is great threat to their reproductive health and safety.

SCENARIO-BASED PLANNING

Key Learning Objectives:

- Understand how to apply a 'climate lens' to WASH strategies and plans to learn about the limitations of existing planning approaches
- Know about the key elements of a climate lens approach
- Learn the benefits of a climate lens approach
- Understand how can scenario-based planning (in entirety or influenced by key ideas) be used as a practical framework/tool to improve WASH planning processes at different levels (from high level strategic to operational) and one in which it is easy to understand climate change.

Key Learning Points:

- A step by step approach to application of a climate lens approach to existing WASH strategies, programmes, and plans.

Session Content:

3.1 Applying a 'Climate Lens' to WASH Strategies and Plans

Most countries manage their WASH sector development process through cyclical multi-annual national and sector strategic plans, developed through participatory processes with lead WASH sector ministries and departments, central planners and others. The setting of objectives and priorities is informed by both top-down and bottom-up processes and benefit from lessons learned during previous implementation cycles.

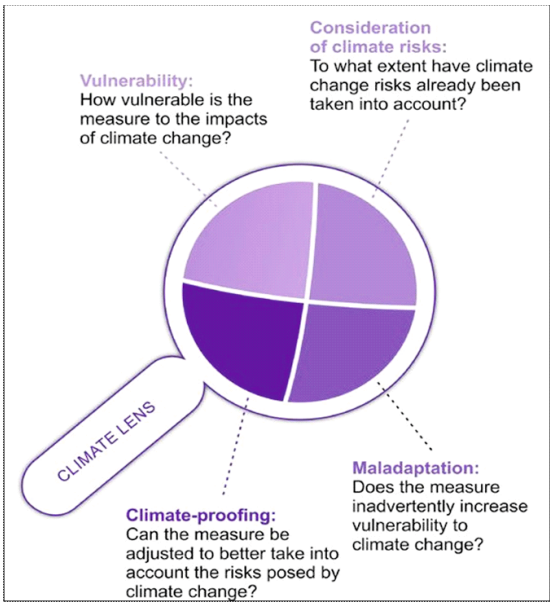
Within national WASH strategies and plans, the management of water resources and increasing access to drinking water supply and quality are important considerations alongside other public health aspects such as sanitation, hygiene and behaviour change.

Specific mention is often given to community WASH services in schools and health facilities. Strategies and plans consider the demographics of the country and advocate targeted interventions to areas of greatest need – like needs of women and children, and /or vulnerable groups.

Attention is also usually given to the critical issue of strengthening the institutional structure in the WASH sector, which will help to improve coordination, coherence and monitoring. Investment costs and financing mechanisms are generally provided at a high level. Strategy implementation plans include timelines and responsibilities of the WASH ministries and departments for individual intervention areas.

3.2 Elements of a 'climate lens' approach

A 'climate lens' approach is essentially an analytical method that stimulates a questioning mode of analysis, as illustrated in the figure. Ideally, a 'climate lens' should be applied during the formulation of national WASH sector strategies and plans. However, there are also many benefits in applying this retrospectively (at state level for example) to identify areas where existing strategies and plans, and the implementation priorities and approaches recommended within these, could be strengthened with respect to climate resilience during review and reformulation processes.



With respect to national/state WASH strategies and plans it can serve to examine the following:

- To what extent have climate risks already been taken into account? Examine the extent to which national/state WASH strategies and plans draw on already identified climate change and climate-related DRR priorities and analyses, and how these have been taken into consideration in the course of the formulation of national/state WASH strategies or plans.

- How vulnerable are strategies and plans to the impacts of climate change? Examine the extent to which climate change risks and impacts are understood, and the extent to which identified approaches are resilient to climate change.

- Does the strategy or plan inadvertently increase vulnerability to climate change? Examine the extent to which there is a good understanding of how to manage climate risks, and whether good practice and innovation can help to reduce vulnerability and enhance climate resilience.

- Can strategies and plans be adjusted to better take into account the risks posed by climate change? Examine the extent to which knowledge, information and good practice for climate resilience are integrated into national/state WASH strategies, programmes, and plans.

3.3 Benefits of a 'climate lens' approach

The application of a 'climate lens' to national/state WASH strategies, programmes and plans will help to improve their overall formulation, with positive impacts subsequently materialising during the implementation of on-the- ground activities and investments. Anticipated benefits would be to:

- Ensure national/state WASH strategies, programmes and plans are aligned with existing national climate change adaptation and climate-related priorities and actions

- Ensure vulnerabilities and risks arising from climate variability and change are considered in national/state WASH strategies, programmes and plans, and subsequent implementation

- Strengthen and supplement country/state analyses by incorporating climate change considerations and ensuring measures are responsive to the impacts of climate variability and change
- Assist with the prioritisation of measures by identifying children and their communities living in high-risk locations, and targeting investments to areas where the needs are most pressing
- Provide a foundation to ensure that subsequent programming and implementation incorporates considerations of climate risks
- Identify elements of good practice for managing current climate variability and risks that may also contribute to managing future risks
- Identify opportunities for innovative approaches to manage climate risks and to strengthen climate resilience
- Identify cross-sectoral influences on WASH services and provide the impetus for engagement, collaboration and shared learning with stakeholders from outside the WASH sector
- Provide evidence on what amendments might be warranted in order to address climate risks and to strengthen climate resilience.

3.4 Other considerations

The integration of climate resilience into national/state WASH strategies, programmes and plans is not an end point in itself. The challenge is to also integrate climate resilience into subsequent programmes and implementation actions, including those of the government's WASH partners and support agencies. Implementation approaches across water supply, sanitation, and hygiene services should be selected or adapted to reinforce climate resilience. Benefitting from existing good practice and the identification of innovative measures and approaches that help manage current climate risks is likely to be a good start point. This is particularly true where these innovative measures and approaches also provide a foundation for managing future climate risks. Strengthening awareness and sharing knowledge will help to ensure that considerations of climate risks are incorporated in subsequent programming, project planning and implementation cycles.

Although the concept of climate resilience in the WASH sector is relatively new, it is growing in importance. Cross-fertilization and the sharing of ideas and approaches are to be encouraged, and can help to speed up the identification of reliable and affordable responses and solutions. Making use of evidence and good practice that has been compiled at the national level can help to supplement state-level knowledge. Out-of-the-box thinking is also necessary, particularly where climate-related hazards affecting WASH services are addressed more efficiently and effectively by taking preventive measures outside the realm of the WASH sector itself (e.g. better land use management). An integrated approach to identifying climate resilient solutions will ultimately be one that considers all sectors and stakeholders that impact on the effective functioning of WASH services.

Strengthened capacity to supplement existing WASH planning, decision-making and implementation processes will be necessary. Capacity development should be firmly grounded in existing institutional roles and responsibilities and be targeted towards strengthening existing skills and practices in risk-based approaches, rather than as a separate stream of activity.

The process of integrating climate resilience into WASH sector strategies and plans should result in greater awareness among WASH sector planners and decision-makers of the implications of climate change risks on the sector and the appropriate responses to manage these.

3.5 A stepwise approach to applying a 'climate lens'

A step-wise approach to applying a 'climate lens' to national/state WASH sector strategies, programmes and plans is recommended. Quick wins can be achieved by considering the following initial questions:

- Does your state already have a state WASH sector strategy and plan, and is it aligned with overarching national climate change and climate-related priorities and actions?

- Is there a good understanding of climate change impacts on the WASH sector, and has this knowledge and information been used to inform strategies and plans?

- Is there a good understanding of how to manage climate risks, and has good practice and innovation been built into strategies, programmes and plans?

A flow chart centred on these questions, and their responses, is presented further ahead in this chapter. The pathway through the flow chart will vary from state to state as some states may be further advanced in terms of integration than others.

Suggested actions for different steps in the process are further elaborated in the following section.

3.6 Questions, responses and actions

Does your state already have a state wash strategy and plan?

State WASH strategies and plans can be adapted from the wider National WASH sector strategies and plans, as the national strategies and plans aim to anchor WASH objectives within wider development strategies and goals (e.g. Poverty Reduction Strategies, the Sustainable Development Goals or similar). They highlight the critical importance WASH contributions make to national development objectives with respect to health, education, gender equity, productivity, long-term poverty reduction and growth. In the context of state development, WASH strategies, programmes and plans should also be aligned with existing national climate change adaptation and climate-related DRR priorities and actions.

Climate change adaptation is increasingly referenced in overarching national economic, social and environmental development policies, and in many cases national priorities and actions have already been identified. The WASH sector is identified as a priority sector in many of these overarching national documents. However, many of the responses and actions have yet to be integrated into state WASH sector strategies and plans.

Is there a good understanding of climate risks in your state?

State WASH strategies and plans should be informed by analyses of the impacts of climate variability and change. Climate change intensifies risks to WASH systems and risk-based planning is essential.

WASH strategies and plans that are informed by climate risk assessments will help to deliver WASH approaches and solutions that are more likely to withstand climate-related s hocks and stresses.

Climate-informed decisions help to identify and prioritise high-risk locations and to target investments in areas where the risks are highest.

Strengthening and supplementing situational analyses by incorporating climate change considerations will help to ensure that strategies and plans become more responsive to the impacts of climate variability and change. Upfront climate risk assessments will also facilitate appropriate contextual customisation of adaptation approaches and solutions to climate resilience.

Cross-sectoral influences will need to be taken into consideration when improving the climate resilience of WASH services. Engagement and collaboration with stakeholders from outside the WASH sector, as well as between the various levels of governance within the WASH sector itself, will be an important factor.

A key element for the integration of climate resilience into WASH strategies and plans is the prioritization of no/low regrets measures and approaches (low-hanging fruits). These measures have a high chance of success against the full range of uncertainty in climate change projections and other future drivers. In addition, they often allow climate change adaptation agendas to be brought together more explicitly to tackle underlying climate-related issues.

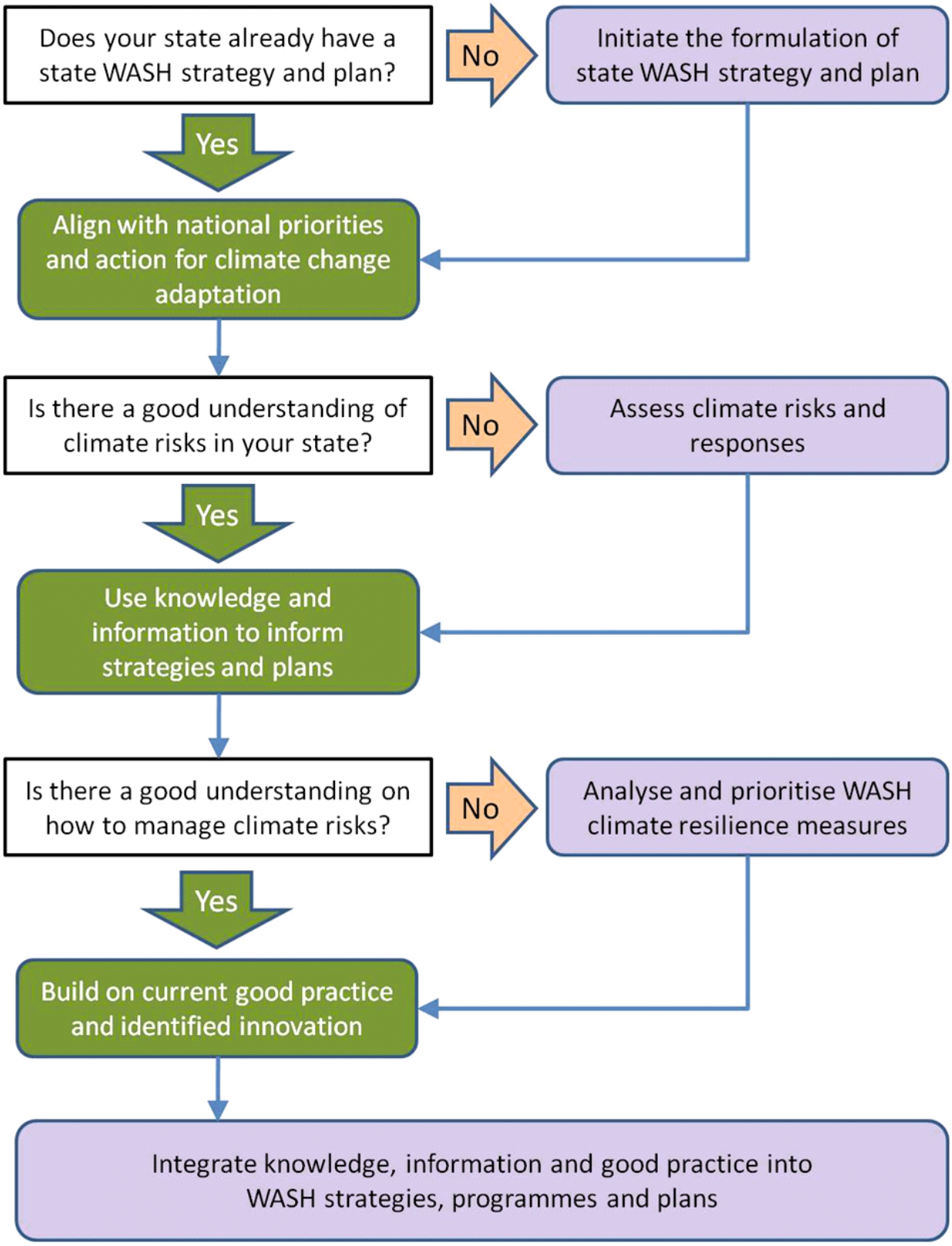
Is there a good understanding of how to manage climate risks?

Many elements of good practice for managing current climate variability will also provide opportunities to enhance resilience to future climate variability and change. For example, careful siting and design of water and sanitation infrastructure can help to ensure that it retains its ability to operate under climate-related hazards such as floods and droughts. In areas where there will be increased stress on water availability (surface water and groundwater), augmenting supplies through increased storage or rainwater harvesting may be a solution to managing periods of low flow. Protection of water sources and improved management of source catchments are also likely to bring benefits both now and in the future to water availability and water quality.

However, building climate resilience is not just about infrastructure and management practices. Raising awareness and stimulating behavioural change can also bring benefits by encouraging the use of water-saving technologies and promoting water use efficiency and conservation. Climate hazards such as floods affect not only water supply infrastructure, but also sanitation facilities. Flood affected latrines can lead to negative changes to sanitation hygiene behaviour with negative impacts on public health.

By adopting approaches that make WASH services more resilient and adaptable to climate change there is the potential to improve the overall performance of the sector. Integrating these at a state WASH strategy and planning level is beneficial and helps to ensure that existing good practice and innovation provide a foundation for subsequent refinement during more detailed programming and project implementation levels.

A Stepwise Approach to Integrating Climate Resilience



Does your state already have a state wash strategy and plan?

If YES – Align with national priorities and actions for climate change adaptation

The alignment of state WASH strategies and plans with national adaptation priorities is an important first step and ensures coherence between WASH sector development and national agendas for action on climate change.

Specific actions would be to:

- Review existing national climate change policies, strategies, plans and associated documentation to identify national adaptation and climate-related DRR priorities, noting in particular those that relate to, or have an influence on, the WASH sector
- Establish to what extent existing state WASH strategies and plans encompass and align with national climate change adaptation priorities, and in particular note any gaps or omissions
- Communicate and disseminate state climate change priorities relevant to the WASH sector among WASH ministries, departments and partner agencies at all levels of governance
- Work with WASH ministries and departments to align WASH strategies and plans with national climate change priorities
- Ensure realigned priorities are captured in outline plans for strategy implementation, including those for financing, budgeting, monitoring and evaluation.

If NO – Initiate the formulation of state WASH strategy and plan

Where state WASH strategies and plans do not exist, a process to develop these is recommended. This will bring opportunities to integrate climate resilience from the outset. Processes will vary from state to state, but many of the other considerations and actions will also remain valid. The reformulation or revision of state WASH strategies and plans also provides an excellent opportunity to strengthen the integration of climate resilience.

Specific actions would be to:

- Engage in WASH sector strategy and planning processes and ensure climate resilience becomes an integral component from the outset
- Make the case for climate resilience as an integral component of state WASH strategies and plans, drawing on evidence of existing climate impacts on WASH outcomes, and highlighting how climate change can further exacerbate these
- Engage in cross-sectoral dialogues, not simply within the WASH sector itself, to ensure factors outside of the WASH sector's realm of influence are taken into account within climate resilience strategies and plans.

Is there a good understanding of climate risks in your state?

If YES – Use knowledge and information to inform strategies and plans

Climate-informed decisions help to identify and prioritise high-risk locations and target investments to areas where the risks are highest. Findings from climate risk assessments will also help to deliver WASH approaches and solutions that are more likely to withstand climate-related shocks and stresses.

Specific actions would be to

- Strengthen and supplement WASH situational analyses by incorporating climate resilience considerations
- Ensure the formulation of strategies and plans has been responsive to the impacts of climate variability and change, and do not inadvertently increase vulnerability
- Review priorities and ensure these consider communities and locations most vulnerable to climate risks
- Prioritise no/low regrets measures and approaches as these will help to manage current climate variability as well as future change
- Ensure cross-sectoral influences and actions are identified and taken into consideration as a mechanism to improve climate resilience

If NO – Assess climate risks and responses

Risk assessment is already a central component of many WASH situational analyses, but in many cases this has not yet been extended to encapsulate climate risks. Strengthening and supplementing situational analyses by incorporating climate change considerations will ensure strategies and plans become more responsive to the impacts of climate variability and change.

Specific actions would be to:

- Gather evidence on the impacts of climate variability and change at the state level, including an analysis of climate hazards, vulnerabilities, exposure and adaptive capacity
- Draw on past experiences and benefit from previous studies and information on the impacts of climate variability and change
- Identify the most serious and plausible climate-related threats, and how these impact specifically on the WASH sector
- Reach agreement among WASH ministries, departments and their implementation partners on the most important climate risks, and how best to respond to these risks
- Increase understanding among state WASH ministries and departments, and their implementation partners, of the ways climate change influences WASH service delivery outcomes and response measures.

Is there a good understanding of how to manage climate risks?

If YES – Build on current good practice and identified innovation

Many elements of good practice to manage current climate variability will also provide opportunities to enhance resilience to future climate variability and change. Building on existing good practice and proven methods is a good place to start.

Specific actions would be to:

- Collate evidence on existing good practice and integrate recommended approaches into strategies and plans
- Maximise the use of approaches to influence and change behaviour to ensure this also supports the climate resilience agenda
- Ensure innovation benefits from lessons learned nationally and internationally, and from institutions specialising in the piloting and testing of innovative techniques and approaches

- Where appropriate, incorporate the piloting of approaches to test their effectiveness in managing climate variability and change
- Raise awareness among key WASH stakeholders on current good practice and innovative approaches for enhancing climate resilience.

If NO – Analyse and prioritise WASH climate resilience measures

Prioritisation should aim to ensure WASH resilience measures target areas of highest risk and meet the needs of those most susceptible to these risks, often the poorest and most vulnerable groups, including women and children.

Specific actions would be to:

- Evaluate the performance of WASH facilities and services under existing climate hazards such as floods, droughts and storms
- Gather evidence from local stakeholders on what worked well and what did not during extreme events, and from community experiences of coping with historic climate variability
- Identify aspects or components of WASH facilities and services that contributed to robust performance and those that led to failure or under-performance under different climatic hazards
- Draw on identified national and international best practice and innovation, and contextualise and customise recommended approaches and solutions for your own state context
- Agree recommended approaches (e.g. for different hazard types) and incorporate recommendations into strategies and plans.

GOOD PRACTICES, WASH INNOVATIONS AND CASE STUDIES

Key Learning Objectives:

- Review case studies on good practices and innovations for climate change adaptation in WASH

Key Learning Points:

- Case studies on good practices and innovations for climate change adaptation in WASH

Session Content:

4.1 Case Studies/Best Practices/Innovations in WASH

4.1.1 Pond sand filter

A sustainable solution for disaster- prone coastal areas

Introduction

Filtration is an ancient and widely used technology that removes particles and at least some microbes from water. The practicality, ease of use, availability, accessibility and affordability of the medium and methods of filtration vary widely and often depend on local factors. The effectiveness also varies depending on the type of microbe.

The Challenge

It is found that saline water transgresses into ground and surface water sources in the disaster-prone locations, especially adjacent to the coastline. Besides, ponds and rivers are also found to contain biological contaminants. Majority of the communities use pond water for drinking and domestic purposes in spite of it being unsafe.

The Intervention

The main objective of construction of a pond sand filter was to have an alternate filtering unit through which people in the coastal community can access safe drinking water during and post- disaster situations. A slow sand filter is sometimes referred to as a "Biosand" filter, or a biological sand filter. All three refer to a water filter that works using biological action in sand without adding any chemicals to the water and are classical examples of sustainable technology. A slow sand filter consists of a container with a system of pipes with holes drilled in them covered by about 6 inches of gravel, in turn covered by three feet sand. Water is allowed to flow over the top of the sand and flow slowly down (because of the pull of gravity) through the sand and gravel to the pipes at the bottom. The water then flows back up (due to hydraulic pressure) through an output pipe to the level of input water. After about 3-4 weeks, a biological layer forms on the sand that traps and destroys harmful bacteria and viruses.

How does it work?

When a slow sand filter is first put into operation or after it is "cleaned," a living "community" of aquatic aerobic, predatory microscopic organisms grow on the top 5-10 cm of wet sand and forms a bio layer or "Schmutzdecke" made of exo-celluar polymers (complex proteins and carbohydrates) and living organisms consisting of diatoms, algae, bacteria, and zooplankton. This sand and bio layer must always be submerged under oxygen rich water (the filter must always have water in it up to and cover all the

sand) and it is effective in mechanically filtering small particles out of the water flowing through it. Also, the living organisms in the bio layer literally "eat" the pathogens in the water that get caught in the bio layer from a process known as "biological flocculation" (they stick to the biofilm). Some filtering also occurs because of the physical action of sand below the bio layer. Moreover, organisms in the bio layer produce substances that are toxic to viruses and bacteria in the water. Water must not flow through the filter faster than the biological action occurring in the “Schmutzdecke.” In small versions of slow sand filters, the drainpipes at the bottom connect to a (usually PVC) pipe that runs out and up to an outlet several inches above the top of the sand. This way, water drains slowly and never leaves the surface of the sand exposed to open air.

Tests have shown that slow sand filters remove viruses, bacteria, and chemicals. They are an alternate option for safe drinking water in coastal belt and arsenic and fluoride affected areas. The surface water source may be a nearby river or a pond and the water can be lifted by hand or motorised pump to the treatment unit. The untreated water passes through gravel, pebbles, sand and then passes through carbon medium. The safe drinking water can then be stored in another chamber supplied through taps.

Are slow sand filters safe?

They can be quite safe but should be used with caution and sufficient knowledge of their operation. The effectiveness of slow sand filters depends on the conditions in which they operate; and on the degree of pollution in the water to be filtered. Water must be allowed to run through them for at least three weeks before consumption. All parts of the filter must be kept clean to prevent contamination. Water must be always kept over the sand and the filter must be allowed to run again for three weeks after cleaning before consuming water from them unless "wet harrowing" is used. Slow sand filters are thus able to provide safe water free from biological pathogens.

However, though biological sand filters can remove some harmful substances from water and most certainly improves the quality of water in all respects, the exact nature of its ability to remove industrial pollution has not been well-established. Nevertheless, the ability of carbon filters to remove chemicals from water is proven and the addition of a high quality carbon filter to the output of a biological sand filter could be a good idea. Water should not be consumed from a slow sand filter unless it has been tested and shown to be of acceptable biological and chemical quality; monitored and tested regularly by someone who understands its operation. Also, an UV filter on the output after the carbon filter is advisable. The output treated water chamber may be provided with the transparent sheet cover so that sun rays can enter into the chamber helping in further treatment through sunlight.

Disadvantages of small slow sand filters

- They do not remove 100 % colour or odour from water
- They require relatively non-turbid water to function properly
- They cannot function if water is frozen
- Water must be added regularly and the sand must stay covered by water continuously
- Care must be taken to prevent air pockets from forming in the sand during construction as it will foul the filter and require removing sand and all anaerobic bacteria and odours.
- Industrial pollution is only partially removed from water by these filters
- Water must flow for at least 3 weeks before it can be used
- They are very heavy and the location for its set-up must be well-thought of

Advantages of small slow sand filters

- They can remove over 99 % of harmful bacteria and 91-99 % of viruses from water
- They improve water clarity and do not require addition of chemicals to function
- They can be designed to function using only the power of gravity. They last many years by occasionally adding more sand to the top layer
- They are inexpensive and do not pollute
- They are based on sustainable technology and do not produce harmful by-products as chlorine and ozone purification processes.
- Its construction and maintenance is simple and easy to understand.
- They can be built from locally available materials and can operate in remote areas where no electrical power or petroleum energy is available.

4.1.2 Bio- Digesters

A potential solution for faecal sludge management in flood prone areas

Introduction

Human waste disposal is an ever-growing problem resulting in environment pollution, ground water contamination and health problems leading to epidemic proportions at times. Besides, untreated waste is responsible for several diseases like, dysentery, diarrhoea, amoebiasis, viral hepatitis, cholera, typhoid etc. causing deaths of lakhs of children annually.

The challenge

Under the Govt. of India's flagship programme Swachh Bharat Mission (SBM), the super structure in toilet construction allows access to a room (or covered space) having water closet taking into factors like dignity, safety and security. The faecal sludge management is generally done by construction of leach pit, septic tank or any other suitable options. However, this important aspect of collection of faecal sludge and its proper management is usually left inadequately unaddressed.

Unless special care is taken, the leach pit and the septic tank prove to be unsuitable options in high water table areas. In disaster-prone areas, due to water logging and frequent submergence due to flood, there is greater chance of surface and ground water contaminations through such types of faecal sludge management system.

Thus bio-digester technology was conceptualized and developed for resolving problems of un-decomposed human waste. The inoculum degrades and converts the human waste into usable water and gases in an eco-friendly manner. The generated gas can be utilized for energy/ cooking and water for irrigation purposes. The process involves bacteria in the form of inoculum, which feed upon faecal matter inside the tank through anaerobic process. This finally degrades the matter and releases methane gas that can be used for cooking, along with the treated water. The bio-digester tank can be manufactured and customized as per the requirement.

Advantages of using a bio-digester

- No bad smell in toilets from tanks and faecal matter in the tank not visible
- No infestation of cockroaches and flies
- No clogging of digester
- Effluent is free from odour and solid waste
- Reduction in pathogens by 99% and in organic matter by 90%

- Reduction in pathogens by 99% and in organic matter by 90%
- No maintenance required and no requirement of adding bacteria/enzyme
- No need of removal of solid waste
- Use of phenyl is permitted upto 84 ppm

1.1.1 Iron Removal Plant (IRP)

Makes water potable for communities in disaster-prone area

Introduction

The coastal district of Puri with a 150-km of coastline is prone to cyclone and floods. Epidemics are a regular phenomenon in these parts. Most of the areas in the District are waterlogged and high salinity in the groundwater makes the water unsafe for drinking. This is further aggravated during floods. Moreover, the water sources in the coastal district - both surface water and groundwater- have high contamination levels. The groundwater in Puri has high salinity and iron content. Data shows that almost 63 % of its population consumes iron contaminated water. Though iron is not as toxic as other heavy metals like lead or arsenic, but a higher concentration of iron (WHO approves 0.3 mg/l to 1 mg/l as the agreeable levels of iron contamination) is undesirable in potable water. It has an unpleasant taste and odour and turns red on settling down. The alternative water source is untreated surface water (with biological contamination). This leads to spread of water borne diseases like cholera, typhoid, diarrhoea, and dysentery. The community also suffers from skin ailments and allergies.

Oxfam India has been working with NGO, SOLAR, in Puri district since 2008. It has reached 44 villages in Kanas block with its work on Disaster Risk Reduction (DRR). Providing safe drinking water solution is one of the focus areas of Oxfam's work in Puri. Currently, Oxfam is working in 15 villages in three Gram Panchayats in Kanas block. These villages, close to the coast, are located in the Daya and Makhara river basins and are frequently affected by floods and water logging. They suffer mostly due to lack of safe drinking water- both during and after disaster. For the communities in Ogalpur and Jaguleipadar - two villages where Oxfam India worked - the options drinking water sources were limited to the tube well that generated water with high iron content and surface water (village ponds, and Daya and Makhra rivers) with biological contamination.

Ogalpur village has about 128 households, with an approximate population of 780. Due to high iron contamination from the two tube wells, the villagers draw water from the Makhara river. The community here is primarily agrarian. On the other hand, Jaguleipadar village is larger with 450 household, with approximately 2400 members. This village has 10 tube wells. The village is on the banks of the Daya River. This village mostly comprise of fisher folk community.

The communities collect water for cooking and drinking purposes from the river to avoid the foul smelling water from the hand pump. Further, they used to collect it from the same point where they would bathe and clean. Water borne diseases were common in these parts. Oxfam supported SOLAR to install Iron Removal Plants (IRPs) to address the drinking water problem, especially the groundwater problem in these villages. These IRPs are attached to the existing hand pumps.

Implementation

The first hand pump was reinstalled on a raised platform in 2013 in Ogalpur. The shallow sub-surface tube wells, the main source of drinking water in these parts, get easily contaminated during floods. The height of the hand pumps were raised above the highest flood levels in the area to overcome this

problem. This prevented the hand pump from submerging during floods and kept the water source functional. The hand pump wasn't reinstalled on a raised platform in Jaguleipadar village.

Middle Plate with filtration system

The IRP, a cylindrical structure retrofitted with terra filters were set up in 2015 in both the villages. The terra filters separate the IRP internally into two chambers. The IRP has a capacity of 2000 litres and is filled four times during the day. A motor pump lifts the water into the top chamber of the IRP and the filtered water is collected in lower chambers. Two taps are fitted at the bottom as outlets. The terra filters filter the iron out. The tube well water is filtered and the community now has access to drinking water that is free of pungent smell or taste. The WASH (Water, Sanitation and Hygiene) Committees formed in these villages were trained by Oxfam India and SOLAR to run, clean and maintain the IRP and its adjoining areas. The seven-member WASH Committee in Ogalpur for example, which also functions as the maintenance committee, has been trained to clean tanks.

The tank and the filters are cleaned every Sunday; the insides of the tank and filters are scraped cleaned to ensure that no residues remain in the inner sides of the tank. Bleaching powder is applied, twice daily, in the areas adjoining the IRP and the hand pump to keep it dry and disinfected. While the village funds are used for the upkeep of the tank, a nominal fee of INR 5 is also collected from each household towards these costs. The cost of setting up an IRP is between INR 35, 000-45, 000. Some cost is incurred towards electricity consumption as well.

Results & Lessons Learnt

Earlier, when the water collected from the hand pumps was stored, its colour would turn red. Now with the IRP filtering out the iron, the water tastes better and doesn't have a foul smell. The households collect water twice daily and use only for drinking purposes. They still rely on the hand pump or the river for cooking largely because the water is boiled during cooking.

However, on probing it was understood that there wasn't enough filtered water. At its full capacity, at least 7 litres of water per capita is what would be available to the community at Ogalpur village, which complies with the WHO standards. But because the water has to be lifted into the IRP through an electric motor and electricity is not very regular, the tank doesn't reach its full capacity. This leaves the families with only enough water for drinking and sometimes not even that. Moreover, the long queues make women opt for the hand pump. Thus, the IRPs have been able to address only part of the problem at the moment but it is a promising start. The communities want more such IRPs built in the village. The second hand pump in Ogalpur was in a school and if another IRP is set-up, it could meet the cooking requirements as well. The one IRP in Jaguleipadar caters to only 150 households from four wards. But the families are unable to stop villagers from other wards and that means less water for the community. They have nine other hand pumps; the Sarpanch or the village head has agreed to build one more IRP. This proposal has been passed in the Palli Sabha and the work will be taken up at the block level. Communities from neighbouring villages flock to see this model work and have approached SOLAR to set at least one such plant in their villages as well. The Block Officer in Ogalpur has sent a Junior Engineer to assess the IRP and the water quality. The WASH Committee is following up with the district administration for an additional IRP and in case the administration doesn't assist in building it they will do it on their own. They plan to pass it through the Palli Sabha by next summer.

Conclusion

The community recalled that in the last few months, cases of diarrhoea have fallen down drastically. The

high demand for IRPs is a clear indication that the model is a success and should be replicated in the coastal villages prone to flooding. Renewable Energy could be explored as a source to run the motor. This will ensure that there is water all the time in the tank. Secondly, another tank should be attached to the main IRP for storing water as and when it gets filtered. This will help ease the load and ensure that families have enough water for drinking and cooking. The IRPs are extremely relevant in the coastal districts and villages as they provide a clean source of drinking water without bad odour or taste. Though partially, the IRPs have been both effective and efficient. There are some teething problems like electricity shortage which can be addressed through alternate sources of energy like solar to make the initiative sustainable. Though the pilot IRPs were set up by Oxfam India and SOLAR, the community has played a big role in its maintenance and upkeep. The success of the IRPs in these villages has encouraged other villages to consider sourcing village funds for setting up these plants.

4.1.4 Raised Handpump Platform

Introduction

Access to safe drinking water for the community becomes very difficult during emergencies like flood or cyclone. In spite of numerous water sources available within the community, they become contaminated due to open defecation and animal excreta. Water sources such as well, pond and hand pump are affected. The hand pumps get submerged with contaminated water making it unfit for human consumption. Thus, people suffer from water borne diseases like diarrhoea and gastroenteritis. Therefore, to provide safe drinking water during such natural calamities, raised platform are being designed by considering the high flood level in the community so that they can easily access safe drinking water.

The implementation

Nankar is a revenue village under Jalapok Gram Panchayat in the Luna-Karandia river island. The village suffers from annual flood as the two rivers on south and north of the village merge during flood and remain so for days and at times in multiple phases. The deep tube well situated in the lowland gets completely submerged preventing access to 24 households. The tube well in the only source of safe water and the villagers had no other option but to use contaminated river water.

After the initial assessment, discussion with village community and PRI members, it was decided to set-up a tube well with raised platform and inclusion features. The tube well will be centrally located and accessible to the dependent households. Moreover the tube well was newly sunk and hence preferred by the community assuming it to serve for a longer time. The present design raised the hand pump considerably above the high flood level, where the community can easily access safe drinking water. The raised platform with DRR features operates throughout the year providing safe drinking water to the community. The waste and excess water could also be utilized for kitchen garden.

Design Components

- Raised platform to protect the water source from the incoming flood
- Ramp is provided with stairs and also surface mounted tiles with hand railings on both sides.
- Fencing around the raised platform is provided to make it child-friendly.
- Platform, columns and hand pump seating casting is through RCC ensuring good quality for longer period of use.
- RCC ratio M 20 (1:1/2:3)
- Ramp is placed and maintained at the angle of 65 degree from the raised platform to the ground.

- During flood and normal operation, the contaminated water does not leak to the ground below due to proper sanitation seal.
- The excess water drained from the hand pumps are channelized to nearby water sources or the kitchen gardens.
- Railing on the ramp is provided for support while fetching and carrying.

Innovation

It was observed that the raised platform hand pump generally used during the flood or cyclone remained idle in the normal days. So, to use it on a day-to- day basis new innovative features were added. A Bath Room (6'x6'x5'6") underneath the platform was designed. The structure was brick masonry adjoining the 4 columns. Ventilators were provided in either side with a door. The bath room was supplied with water from the water tank placed parallel to the platform height.

Plumbing was done in such a manner that the water could be pumped to the tank and it could be accessed for bathing through pipe. Floor and wall tiles were fixed on the floor and walls. Both adolescent girls and women now had a bathing space in the locality for which they were happy.

- A synthetic tank of 1000 litres placed at par to the hand pump seating platform
- The water tank connected through pipe to the out flow of the hand pump
- The water tank connected to the bath room with PVC pipes for 24x7 water supply with continuous hand pump operation.
- An additional tap can be fitted at the bottom of pipe connection so that others can also access the water as and when required.
- The outlet hand pump fitted with T-valve for fetching water during the bath room is not in operation.

The excess water coming out from the hand pump operation is collected through PVC pipe to a sediment tank and from the sediment tank it is directed to nearby water source or for the kitchen garden by the community users group.

Water Quality Testing

All sources of water in the affected villages underwent a biological test three times along with a chemical test. The H2S kit and field testing kit were used for ascertaining contamination and 10% of the positive screening was tested with the Rural Water Supply Scheme (RWSS) laboratory for confirmation. The water testing report was shared with the RWSS.

Linkage with Government line departments

Before starting the construction, the concerned line department from Health, ICDS, RWSS and Education were consulted. The RWSS especially was linked for water quality and raising the platform in the community.

Community engagement

The community was made aware about the operation and minor maintenance of the raised platform to sustain it. The group formed within the community known as Water User Group (WUG) was responsible for O&M. The WUG have 15-20 members comprising women, adolescent girls and religious leaders. The members are familiar with WASH practices and maintenance of the raised platform. The WUG entered with a MoU with the partner organization for its O&M. The capacity of the group was built by the

organisation. The WUG convened meetings in the community and strengthened the activities of the Village Water, Health and Sanitation Committee. The WUG was also involved in monitoring the work in progress including the quality and quantity of building materials. Save the Children provided hand-holding support at the time of need and assisted in establishing linkage with government departments for any major repair work. After initial testing, the WUG was trained in water quality testing methods.

Exit strategy

After completion of the work the same structure was handed over to the WUG for O&M. The WUG is now conducts monthly meetings regularly and maintains the hand pump for minor repairs. It is also responsible for cleaning the surroundings of raised platform and the sediment tank regularly. It promotes hand washing in the locality and remains in touch with the Gram Panchayat for any major repair of the hand pump.

4.151 Roof Top Rain Water Harvesting

An alternate sustainable water source

Introduction

Natural disasters like drought often compound the ever increasing problem of water scarcity. Also, other disasters often leave water sources contaminated causing a multiplicity of water borne diseases and infections. Besides, in many areas ground water contamination occurs due to fluoride and arsenic resulting in serious problems among communities residing in the area. Roof top rain water harvesting is an alternative technique through which rain water is captured from the roof catchments of community buildings and collected after which it passes through the pipe network and stored in the storage tank. This technique can be adopted in disaster- prone and water scarce areas facing water shortage or contamination to store water. In saline or coastal areas, rain water provides good quality water and when recharged to ground water, it reduces salinity and also helps in maintaining balance between the fresh-saline water interfaces.

The intervention

The ground water in Nuapada district of Odisha was found to be contaminated with much more than the permissible limit fluoride contact. The sub-surface lithology imparted high fluoride to the aquifers. Thus, the tube wells in Nuapada generated fluoride contaminating drinking water resulting in dental and skeletal fluorosis among the population. Assessment of the quality of water by the volunteers of NGO RCDC with support from WaterAid in the intervention villages revealed high amounts of fluoride in the groundwater, much beyond the permissible limits as laid down by the Bureau of India Standards. It was thought to use surface water resources for drinking purposes to address the problem. However, this was a comparatively costlier intervention with maximum engineering and skilled work to be installed through its transportation, treatment, storage etc. in a complete network. So, it was thought to collect rain water for drinking and domestic use. The water collection can be made in the roof top of existing community buildings like schools; Panchayat buildings etc. The safe storage conditions can be made by constructing a structure. The stored safe water can be beneficial to school students and the community. Roof top rain water harvesting is an alternative technique through which rain water is captured from roof catchments of community buildings. The collected water passes through the piped network and is stored in the storage tank generally constructed by excavating the earth from the ground level. The water of first rain is released as it might be contaminated. The water collected in the tank passes through a filter medium and is also disinfected. The prime objective of rooftop rain water harvesting is to make water available for future use. Capturing and storing rain water for use is particularly important in water

scarce areas, more so where there are further issues of fluoride contamination due to the typical lithology of the area.

Rooftop rain water harvesting could be used for a number of purposes such as to meet the ever-increasing demand for water, reduce the runoff which clogs storm drains, avoid flooding of roads augment ground water storage and control decline of water levels. It is also adopted to reduce ground water pollution improve its quality and helps in reducing soil erosion. Importantly, it supplements domestic water requirement during summer, drought etc.

Rooftop rain water harvesting through storage in tanks

The storage tank should not be located close to a source of contamination, such as a septic tank etc. It must be located on a lower level than the roof to ensure that it fills completely. A rainwater system must include installation of an overflow pipe which empties into a non- flooding area. Excess water may also be used for recharging the aquifer through dug well or abandoned hand pump or tube well which has been demonstrated in Nuapada. The capacity of the storage tank should be based on the average annual rainfall of the area and also to meet the users' water requirements. Storage tanks should be accessible for cleaning and the inlet into the storage tank should be screened in such way that these can be cleaned regularly. In addition, water may be disinfected regularly before using for drinking purpose by chlorination or boiling etc.

4.1.6 WASH Watch Group

A Community Advocacy Network

Introduction

Too often existing budgets for water and sanitation remain unspent. Civil society groups can play a crucial role in facilitating service delivery for policy implementation. Besides, by giving evidence of what works on the ground with respect to varying geospatial circumstances, the community network can effectively bring the needs of poor and marginalized to the fore. Working closely with the Government, yet retaining the watchdog role has led to a sustainable solution in WASH in Puri, Odisha.

The Process

The WASH Watch Group (WWG) - a community advocacy network facilitated by the CYSD with support from WaterAid India is playing a crucial role in enabling the community and civil society organizations to demand and facilitate services from the Government. The members of the WWG normally comprise of: ASHA, Anganwadi Worker, school or retired teachers, SHG and PRI members and other influential people of the village/Gram Panchayat. It is also organically linked to the Village Water & Sanitation Committee (VWSC) and the Gaon Kalyan Samiti (GKS) and works together as a powerful pressure group to influence policy actions at the ground level.

Major outcomes of the advocacy efforts

The restoration of drinking water lifting points through a campaign called Nirmal Daya Abhiyan is a striking example of restoration of the water resources working in collaboration with the Govt. of Odisha.

There were four water lifting points along the Daya river in Kanas Block and about 22 Gram Panchayats (GPs) were connected with water supply system through these units. This was a multi-GP water supply system. It soon became defunct due to poor O&M.

The WWG intervened and influenced the local administration and was able to clean river Daya through

the campaign. The villagers got together at the call of the groups. Over 20 boats were utilized to clean the weeds from the river on 21st September 2015 and encroachment by some vested interest group which was contaminating the source and blocking its free flow. The water supply system was restored by ensuring chlorination and minor repair work by the Rural Water Supply & Sanitation (RWSS) Department. Thus, the water supply was restored in all the 22 GPs. As a follow-up action to maintain the water flow in the river, The Groups again cleaned the river after three months. Thus the water lifting points were restored at Benagaon, Chupuringi, Gadabalabhadrapur and Baidyanath Patna in Puri district of Odisha. "Although it was a ceremonial call for action, it had lasting impact retaining the free flow of the river," says Adikandha Srichandan, the Chairman of Nirmal Daya Abhiyan.

In addition, letters were dispatched by the Campaign to the Central Pollution Control Board, State Pollution Control Board, Commissioner of Environment & Forests, State Govt., Ministry of Environment and Forests (MoEF), local MLAs to stop discharge of untreated waste of Bhubaneswar city into Gangua river. The waste ultimately gets offloaded in Daya river, killing the aquatic life forms and making the water highly toxic. Besides, a post card campaign was also undertaken to raise incentive for individual household latrine (IHHL) under Swachh Bharat

Abhiyan as the area is low-lying and needs additional cost to build toilets with raised platforms unlike the conventional leach pit latrines. The water flow was also restored in Dimirisena GP in Puri where the Khajuria pipe water supply unit was supplying the drinking water earlier. It was defunct owing again to poor O& M. The pipe water supply system is now being restored with major repair work including activation of its filtration system of water lifted from Bhargavi river, thanks to the initiative of the WWG. The fund (over INR 4 lakh) for the activity was allocated by the Sarpanch of Dimirisena Panchayat.

Conclusion

Thus, the effective and proactive community WASH Watch Group is the true devolution of power to the people, which has immense potential to bring about lasting changes in the lives of people.

4.1.7 Community-managed Flood-Proof Pond Sand Filtration Unit

A Community-based initiative

Introduction

Puri, a coastal district of Odisha, is prone to cyclone, floods and water logging. Epidemics are thus, common. Communities are often unable to get safe drinking water because the two sources of drinking water i.e. groundwater and surface water are often contaminated. While groundwater in Puri has high levels of iron and salinity, the surface water has biological contamination. Lack of access to safe drinking water during and after the disasters leaves the population vulnerable to water-borne diseases like cholera, dysentery and diarrhoea.

Lack of sanitation in the rural areas, especially open defecation, is one of the key factors contributing to surface water contamination. Draining of human and animal waste in the surface water bodies is another source of biological contamination. Further, the waste from the cities is dumped into rivers, which form the lifeline for these villages. About 70-80 % of water used for daily domestic purposes drains out to nearby ponds, tanks or rivers through the drains or nalas carrying loads of harmful bacteria and viruses. For instance, a tier-II city like Bhubaneswar generates approximately 10 lakh litres of sewage every day and discharges it into the Kuakhai and Daya river. The latter is one of the rivers flowing through Puri and serves as one of the source for water for the villages along its bank.

Oxfam India has been working with NGO, SOLAR, in Puri district since 2008. It has reached 44 villages in Kanas block with its work on Disaster Risk Reduction (DRR). Providing drinking water solution is one of the focus areas of Oxfam's work in Puri where it is currently working in 15 villages in three Gram Panchayats of Kanas block.

The village pond was the main source of water for drinking and cooking - for the community in Harasapada village in Kanas block. Since the tube well water had high iron contamination with bad taste and smell, the villagers used the pond water. The pond was also used for washing utensils and clothes along with bathing and cleaning. Open defecation along the pond, especially during the rains, added to the biological contamination. The pond catered to the needs of 250 households with 2000 members.

The community spent INR 100,000 to clean the pond in 2014. In the next year too, the pond was cleaned during the summer (when the water body dried up) but before it could be cleared, the rains refilled the pond with water and waste. Oxfam India supported SOLAR to set-up a flood-proof Pond Sand Filtration (PSF) unit in Harasapada. The overhead tank built approximately 10 feet above the ground filters water to make it potable which has helped reduced the dependency of community on the pond. Apart from the village households, nearly 30 families from neighbouring villages also collect water from the unit.

Implementation

The overhead tank is built close to the pond. The structure on top of stilts is 10 feet above the ground. This ensures that the water filtration unit is not contaminated during floods. Water from the pond is drawn into the overhead tank that holds about 10000 litres of water through an electric motor. The motor is run early morning for a couple of hours.

The tank is divided into six chambers, containing 20-mm stone chips, 10-mm stone chips, sand and charcoal. The water passes through the inlets and moves from one compartment to another before the filtered water is stored in the last compartment. This is then attached to outlets/taps through which the community draws water. The raised structure was built in 2014.

Though the water is drawn to the tank through an electric motor, there is an alternative hand pump installed to draw water. The hand pump can be used when there is no electricity and this is especially useful when there are floods.

The members of the WASH (Water, Sanitation and Hygiene) Committee run the tank and take care of its maintenance and cleaning. The tank is cleaned every Sunday. The village youth have been trained by Oxfam India and SOLAR to clean the tanks through the backwash technique. All outlets are opened and the water is let out clearing the sediment. The filters - pebbles, gravels etc. - are cleaned with fresh water. Once clean, the outlets are shut tightly and the tank is ready to be used. If the pond water has been extremely dirty then the tank filters need to be changed annually. The tank is cleaned voluntarily. A nominal amount is collected from the community for the upkeep of the tank and the electricity bill. The monthly electricity bill to run the pond filtration unit is approximately INR 250. The capital cost incurred in building the flood-proof PSF unit was INR 4.5 lakh. A low-cost design with a smaller tank sans flood proof features will cost around INR 50,000-75000. Around INR 2000-5000 would be incurred if the tank had to be overhauled and renovated.

Results & Lessons Learnt

The community vouches for the quality of the PSF unit as it is the most viable option. Women prefer to collect water from the tank. The water is currently being used for drinking purposes only as there isn't

sufficient water to meet cooking requirements. For cooking, the community still continues to rely on the pond.

Lack of sufficient water is attributed to two factors: A single tank cannot meet the requirement of the village and so more tanks need to be built. Besides, the erratic electricity supply meant that the pump could be run only for a minimum number of hours. Though there is a hand pump connected to the tank, it is rarely used (except during floods) because it is time consuming and requires hard work.

Though the PFU is the best option during floods and for most of the year, during the two months of extreme summer when the pond dries up, the women have to walk for nearly two km to fetch water. The community wants more such units that can provide clean and safe drinking water. There is a demand from neighbouring villages also. A quick check with the villagers confirmed that the number of cases of water-borne diseases has fallen substantially.

Conclusion

A reduced disease incidence and a high demand for more PSF units is a clear indication of its success and the need to replicate it. Though partially, the units are efficient and effective. To make it a sustainable and permanent solution, renewable energy should be explored. The electricity needed to run the motors can be replaced by a renewable energy alternative which would ensure water in the tank at all times. More units should be installed along other ponds to ensure that water is made available for cooking as well. The youth is eager to be trained and train others on the upkeep of the unit. The success of these units has encouraged other villages to consider building similar structures and approach SOLAR and Oxfam India for the same.

4.1.8 Making toilets accessible and inclusive for PwDs

Introduction

People with Disability (PwD) represent the largest socially excluded group. Most of them live without access to basic sanitary services, which can exacerbate impairments and poverty. The situation is worsened by exposure to poor sanitation, unsafe water and inadequate hygienic behaviour practice. It is important to provide minimum accessibility features in WASH infrastructures for PwDs who are considered as most vulnerable among the marginalized and excluded groups.

The most common WASH constructions that we find in India are individual and community toilets, drinking water sources like open wells, sanitary wells and hand pumps etc. Disability inclusive infrastructures reinforce the WASH programmes to make more accessible, inclusive and user friendly, not only for the PwDs but also other vulnerable members in the family and community like old men, pregnant, women, children, and sick persons. It is much cheaper to ensure designs are disability inclusive at the planning stage than to make adaptations later.

The intervention

WaterAid decided to include disability inclusive designs in construction of individual household toilets through its sanitation programme in Odisha and Jharkhand states. WaterAid experimented using the local materials to modify the existing design of individual toilet and helped the community in constructing disability inclusive toilets. The particular disability of the individual in the family was thoroughly studied and the appropriate design was made to make it accessible.

The following are the adaptable design consideration for accessible toilet construction.

- Toilet with inner space of 1.2mt X 1.5mt (must for wheel chair user). Otherwise existing dimensions of IHHL (1.2mt X 1.2mt) is manageable.
- It is better to have two offset (leach pit) pits and connected through Y-connection and chamber in which one pit will be functional and second will be blocked. Once the first pit is filled up it will be blocked and the second pit will be made functional. After a few months, the excreta will turn to compost in the first pit, cleaned up and kept ready to be use in future when the second pit is filled up.
- No wash basin and possibly other fixtures should be there in the toilet that will shrink the inner space.
- Water has to be carried for flushing or a storage tank constructed outside adjacent to the structure having the tap at inner side and pipe connection arrangement from the water storage tank for easy handling of water. The water storage tank and wash basin may be constructed as suitable to use by the PwD.

PwD Friendly Toilets

- The Water Closet (WC) should be a commode or modified commode (a raised structure of masonry work on which Indian pan is fixed). The commode should preferably be placed at one side of the room, neither at the entrance nor in front of gate to provide a space for movement. The following are different type of commode arrangements.
- There must be grab bars to support the person with disability to transfer himself/herself into the commode base. These should be 25mm to 35mm dia G.I. pipe or stainless steel bars fixed at both sides of the commode at appropriate height (may be at 700mm from ground).
- The toilet should be supported with superstructure and roof. The walls of the superstructure should be plastered.
- The door of the toilet may be of at least 900mm wide and should open outward. There should not be any threshold fixed at the bottom floor.
- If the toilet is at a distance from the house, then possibly bamboo made railings at height of 0.9mt from ground could be fixed at both sides of the approach (pathway) from the hose to toilet.
- The entrance/pathway of the toilet should have a ramp (moderately with a slope of 1:12), if there is a level difference between toilet base and the ground.
- There should be a landing of at least 900mm wide at the end of ramp before entrance door of the toilet extended to the floor, so that the person can open the door outside and enter into the toilet.

Locally available materials like bricks, clay earth, bamboo, wooden poles, could be used to make such toilets along with the features so that it is cost effective. Technology for using such materials is available.

The cost of interventions carried out during 2013-2015 varied from INR 1,500-12000. Some of the cases have also been cited in the Disability Manual published by MoDWS, Govt of India in its guideline.

General considerations	Consideration using local materials
Ramp The ramp may be prepared with cement concrete (1:2:4) with brick masonry at the side wall. The gradient of the ramp may be kept between 1:12 to 1:20. The surface should be rough.	**Ramp** If the soil is clay soil. There may be side walls in brick masonry constructed. The inside material may be clay earth, rammed to powder and compacted to provide a walking surface. It may require maintaining the gradient (between 1:12 to 1:20) in proper slope and accordingly the surface. Otherwise a cement mortar may be provided to the earth fill gradient surface to access.
Hand Rails The hand rails may be of Steel pipes or G.I. pipes of 40 to 45 mm dia and fixed with support bars of same size. The surface of the bar may be painted with contrast colour painting.	**Hand Rails** The hand rail may be provided with good quality bamboo or wooden poles fixed with support poles of 40 to 50mm dia size. The surface should be painted with contrast colour paint.
Commode It is the western type pan available in the market. Its height may be up to 480mm with S or P trap in built and facility to attach the cistern to it.	**Commode** It is a raised base and Indian squatting pan fixed by masonry work and P trap is connected and extended till leach pit or septic tank.
Grab Bars These are specially designed steel bars of 40 to 45 mm dia fixed to the walls (may be L and U shaped)	**Grab Bars** These may be the G.I. bars of 35mm to 45mm size shaped to L type or U type using the fittings like elbow, socket, sort piece etc. and fixed to the masonry wall or floor as appropriate
Approach Pavement: There should be a complete approach pavement of 1200mm clear wide, concrete or masonry pavement without any obstructions in between and hand rails fixed in both sides at the height between 750mm & 900mm.	**Approach Pavement:** The pavement surface should be clean dressed, rammed earth and earthen policed to mark as pavement with hand rails fixed in both sides as appropriate (between 750mm & 900mm). Sometimes the pavement floor is lined with brick or rammed with morrum.

Conclusion

Small and suitable changes in design make a great change in converting the existing toilet designs into inclusive toilets using locally available materials.

4.1.9 Sanitary Wells

A viable alternative to safe drinking water

Introduction

Water is needed by all for drinking, preparing food, washing, cleaning, etc. Access to adequate and safe water greatly contributes to improved health. Surface water of suitable quality is not always enough in the places where it is required.

Access to safe water for drinking and other domestic needs was a problem in almost all the intervention villages of WaterAid and RCDC in the 10 Gram Panchayats of Nuapada district in Odisha. Excessive fluoride concentration much beyond the permissible limit was found in ground water in large areas of the district. The underground strata contained lithological formations with presence of fluoride in the rock types. When the sub-surface aquifer comes in contact with these fluoride rich rocks, the fluoride leaches into water concentrating its composition. The rate of concentration of fluoride compound varies from place to place. While in some areas it is within permissible limit, in other areas it is beyond permissible limit. Over extraction of ground water or depletion of ground water table reduces the quantity of water available in an aquifer whereas leaching of fluoride increases its content. Excessive fluoride content causes serious health hazard in the form of dental and skeletal fluorosis and gastrological disorders.

The Govt. of Odisha predominantly dug tube wells in the villages after 1975 and during the 1980s and 1990s, to meet the requirement of safe drinking of water. It was observed in Nuapada that the tube wells dug post 1997-98 in the district generated fluoride contaminated drinking water which soon resulted in visible manifestation of the contamination through dental and skeletal fluorosis. The assessment of the water quality by RCDC volunteers with support from WaterAid in the intervention villages revealed high amounts of fluoride much beyond the permissible limits as laid down by the Bureau of India Standards (BIS) in the groundwater.

The intervention

It was then decided that creating sanitary well in the area will to a large extent will meet the needs of safe drinking water for the communities. The main purpose of creating a sanitary well- either new or through renovation of an existing well into sanitary well - is to tap sub-surface water in the region where ground water is contaminated with chemical contaminants, store it safely in a well form and sanitize it for drinking and domestic requirements.

The traditional wells of shallow depth (varying from 1-6.5 m) were almost defunct in the area due to non-use or other reasons. However, it showed relatively low amount of fluoride and were within the permissible limits as per BIS. Thus as an alternative, shallow sub- surface water was thought to be tapped to ensure access to safe drinking water in these villages.

Sanitary well is a dug well excavated with the diameter varying from 1 to 6.5 m which and lined with brick or stone masonry to create a storage at the sub- surface level. The well protection measures are taken up to safeguard it from external contaminants converting it to sanitary well. Disinfections are undertaken at critical time intervals to enable safe water supply to the targeted community.

Necessary recharge structure could be designed in the upper terrain to store rain water and recharge to these wells through sub-surface recharging methodologies.

Sanitary well is also of particular relevance to microbiological quality of water. It is essential to prevent direct contamination of groundwater at the point of extraction or resulting from rapid recharge

pathways close to the source. The sub-surface leaching and transport of mobile and persistent biological and chemical contaminants is prevented by plastering of inner surface of the staining wall of the sanitary well till the water level. This allows natural recharge while limiting the leaching of fluoride and other contaminants into the well. The sanitary well remains completely covered with an appropriate lid (for periodic disinfection). Water extraction is done through a hand pump while taking care to prevent sanitary activity (waste disposals, water logging, waste water drains etc.) within an approximate distance of 10 metre radius. Proper drainage arrangement of the waste water is done near the sanitary well.

Besides the underground and over ground construction of the extraction facility (sanitary well), the designing of the surrounding area was designed by the technical team of WaterAid. Thus, the fluoride ingress and biological contamination (particularly E.coli) into the water regime was prevented whilst ensuring safe drinking water in the intervention villages of Nuapada.

MAINSTREAMING CLIMATE CHANGE ADAPTATION IN WASH

With focus on women and children

Key Learning Objectives:

- Understand the relevance of the concept of mainstreaming climate change adaptation for WASH and different mainstreaming principles and approaches/steps.
- Discuss existing responses and issues in climate change in WASH planning in India on an adaptation/mainstreaming continuum.

Key Learning Points:

- Development, disasters and climate change are very closely related.
- DRR and CCA share extensive similarities and common actions.
- Sustainable development will depend upon integration of DRR, CCA and development.
- Mainstreaming should be planned and implemented at all levels and across all sectors of development.
- Mainstreaming is a dynamic process with twin objectives of protecting development as well as ensuring development is not contributing to increase further vulnerability to disasters and climate change.
- Suggestions on Way Forward.

Session Content:

What is climate change adaptation?
Climate change adaptation refers to the actions that people and institutions make in anticipation of, or in response to, a changing climate. This includes changes to the things they do and/or the way they do them.

The purpose of climate change adaptation is to create the conditions where people become increasingly able to make informed and appropriate decisions about their lives and livelihoods in a changing climate. The goal is the ability for everyone to thrive in spite of a changing climate.

What is adaptive capacity?
Adaptive capacity refers to the potential of individuals, communities, and societies to be actively involved in the processes of change, in order to minimise negative impacts and maximise any benefits from changes in the climate. This potential is undermined in situations of poverty and inequality, and points to the wider socio-economic factors that influence how households and communities manage risk on a daily basis, and relates to the successes and failures of development and poverty reduction.

What is resilience?
Resilience means many things to many people, and there is no universally applied definition within the international development and humanitarian sector. Notions of resilience tend to be similar to adaptive capacity, but often focusing more on shocks and hazards (such as disaster events) than on longer term changes (such as changes to average seasonal conditions over decades).

Mainstreaming something into development means doing development better, by integrating additional qualitative considerations into the way we define, implement and evaluate development projects and programs. In a way it emphasizes upon shaping the development pathway in a holistic manner that considers the sustainability concerns. The mainstreaming should ensure that the development is protected and is not bringing negative consequences for the vulnerable and poor. Different elements of mainstreaming take into consideration the various left out or unaddressed issues that have both scope and potential to be addressed under the developmental domain.

Development is very closely related to disasters and climate change. Climate change and disaster risk are fundamental threats to sustainable development and the eradication of poverty. The negative impacts threaten to roll back decades of development gains. Building resilient and sustainable societies means addressing both climate and disaster risks, and integrating these risks, as well as potential opportunities, into development planning and budgeting.

DRR and CCA are those components which have both scope and potential to be integrated and mainstreamed in development. Mainstreaming DRR and CCA is a process of integrating DRR and CCA at all levels of decision-making including national, State and local government & community levels, empowering for evidence based decision-making for hazard assessment and vulnerability assessment at all levels, creating appropriate incentives, including regulatory and incentive based instruments for disaster management, for risk reduction, creating appropriate public-private partnerships at different levels and creating direct linkages with international and regional commitments like SFDRR.

The mainstreaming of DRR and CCA can be taken as a dynamic process which is primarily designed for twin purposes. First, it strives to ensure that development is protected and sustainable with DRR and CCA elements and second, development is not increasing people's vulnerability to disasters and climatic extremes. Thus mainstreaming strives to address the concerns of present impact as well as commits for reducing future impacts. For mainstreaming to be successful, a number of issues are to be addressed. It requires assessment of the implications of disasters & climate change on any planned development action covering all thematic practice areas and sectors at all levels and as an integral dimension of the design, implementation, and monitoring and evaluation of policies and programs.

5.1 India: Current Climate Change Adaptation status

India's development agenda is implemented through various State administered policies and schemes with guidance from the Central Government. CCA approaches are integrated at national level through India's commitment to HFA 2005-15, SFDRR 2015-2030, NAPCC and other programmes of the government. The recent ratification of the Paris agreement by India will test the existing institutional capacity at state level to plan, implement and monitor targets for climate action within their regular development work and responsibilities. Thus the states will urgently need access to a sound knowledge base and gain experience on climate change adaptation, to adapt their regular development work to enhance climate resilience and monitor to report on climate benefits. Unless additional efforts are made, inter-departmental coordination, which is already known to be weak with many limitations, will become a major impediment in enabling climate change adaptation which requires multi-sectoral planning and action to ensure that the local priorities of diverse populations with diverse needs on differing scales are met in most efficient manner.

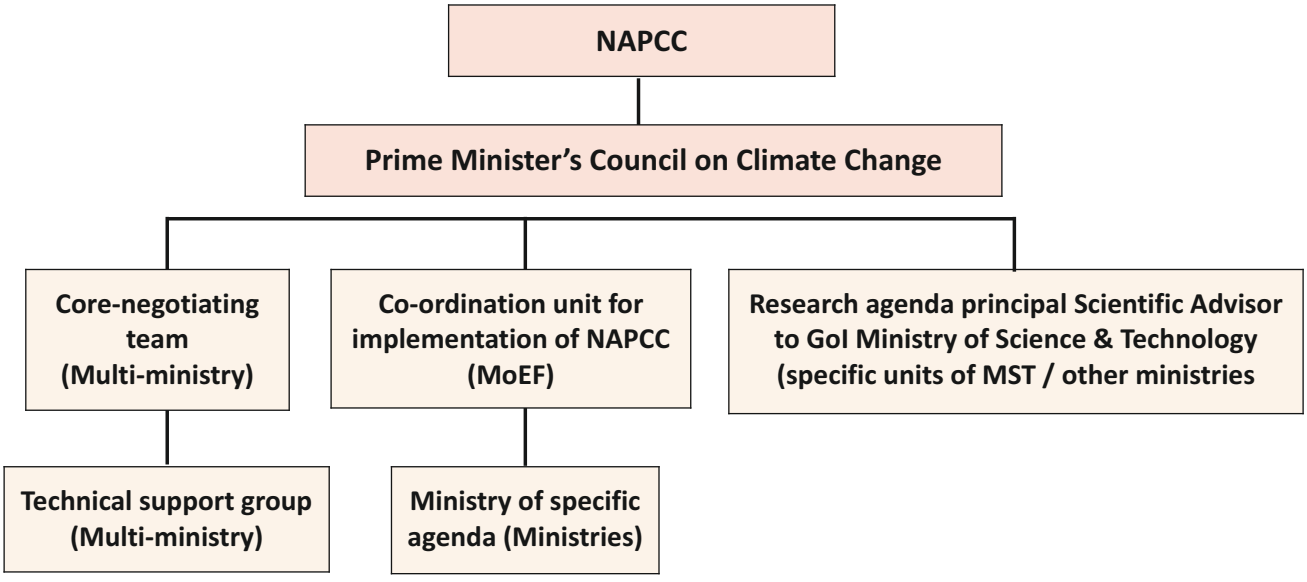
There will be urgent need for new frameworks, mechanisms and tools by relevant departments and institutions to integrate climate needs and growing vulnerabilities that need to be addressed by climate resilient development plans. The onus is now on the 29 states of India to implement the above mentioned international agreements and revise and amend their current state policies and programs in order to mitigate, adapt, reduce disaster risk and achieve the SDGs in the next 14 years.

Agencies such as the State Disaster Management Authorities, District Disaster Management Authorities, Department of Forest and Environment, Agriculture and Urban Local Bodies are required to have a forward looking approach in their planning and implementation activities that account for range and trends in climate projections. Promoting climate sensitive decentralised disaster management planning in DDMAs and at ward levels represents a potential point of entry for addressing the above gap.

5.2 The Institutional Mechanism on Climate Change

Constituted on 6th June 2008, a committee chaired by the Prime Minister, known as the Prime Minister's Council on Climate Change (PMCCC), coordinates national action for assessment, adaptation and mitigation of climate change. The committee is serviced by the Prime Minister's Office (PMO), which may obtain assistance as required from any Ministry/Department/Agency of Government. Specifically, the Ministry of Environment and Forests (MoEF) assists PMO in facilitating the work of this Committee. 25 committee members include, External Affairs Minister, Finance Minister, Minister of Environment and Forests, Minister of Agriculture, Minister of Water Resources, Minister of Science and Technology, Minister of New and Renewable Energy, Deputy Chairman of Planning Commission, National Security Advisor, Chairman of Economic Advisory Council, Chairman of Investment Commission, Chairman of National Manufacturing Competitive Council, Principal Scientific Advisor and Principal Secretary to Prime Minister, Chairperson of The Energy Research Institute, Chairman of Bureau of Energy Efficiency, Foreign Secretary, etc. Besides, the Chairman may invite any other ministers/ officers/experts to any meeting of the Committee depending upon the context of the meeting.

The institutional arrangement on climate change in India can be understood from the following figure.



(Source: National Action Plan on Climate Change, 2008)

5.3 National Action Plan on Climate Change

The 11th Five Year Plan for 2007-2012 recognized that a substantial adverse change in climate appears unavoidable, and stated that achieving rapid economic growth as targeted in the Plan is a key element in adaptation. In June 2008, India's National Action Plan on Climate Change (NAPCC) was released, outlining existing and future policies and programs addressing climate mitigation and adaptation (GoI, 2008). The Plan identifies eight core national missions running through to 2017 and directs ministries to submit detailed implementation plans to the Prime Minister's Council on Climate Change by December 2008:

National Solar Mission:
The NAPCC aims to promote the development and use of solar energy for power generation and other uses with the ultimate objective of making solar competitive with fossil-based energy options.

National Mission for Enhanced Energy Efficiency:
To achieve growth with ecological sustainability by devising cost effective and energy efficient strategies for end-use demand side management.

National Mission on Sustainable Habitat:
To promote energy efficiency as a core component of urban planning.

National Water Mission:
With water scarcity projected to worsen as a result of climate change, the plan sets a goal of a 20% improvement in water use efficiency through pricing and other measures.

National Mission for Sustaining the Himalayan Ecosystem:
The plan aims to conserve biodiversity, forest cover, and other ecological values in the Himalayan region, where glaciers that are a major source of India's water supply are projected to recede as a result of global warming.

National Mission for a “Green India”:
Goals include the afforestation of 6 million hectares of degraded forest lands and expanding forest cover from 23% to 33% of India's territory.

National Mission for Sustainable Agriculture:
The plan aims to support climate adaptation in agriculture through the development of climate-resilient crops, expansion of weather insurance mechanisms, and agricultural practices.

National Mission on Strategic Knowledge for Climate Change:
To gain a better understanding of climate science, impacts and challenges, the plan envisions a new Climate Science Research Fund, improved climate modelling, and increased international collaboration.

Since the National action plan is a vision oriented plan with specific missions, each mission occupies a huge arena of goal, objectives and activities and considerable amount of resource allocation, strategic implementation, monitoring and evaluation mechanisms are addressed through a coordinated approach involving different ministries and departments.

The NAPCC has already set a landmark for initiating climate change mitigation and adaptation actions in the country. The eight national level missions emerging from NAPCC cater to address socio-economic and environmental concerns arising from climate change. India also recognises that strategy for addressing climate change has to be based on a sustainable development strategy, which is particularly addressed in the 12th Five Year Plan of the country. Current government expenditure in India on adaptation to climate variability exceeds 2.6 percent of the GDP with agriculture, water resources, health and sanitation, forests, coastal zone infrastructure and extreme events being specific areas of concern.

Government of India has shown strong commitment in realizing the vision of the NAPCC and slowly but gradually resources have been identified, channelized, allocated and utilized marking the implementation of the plan as per its eight missions.

5.4 Other National and State level Initiatives for incorporating DRR and CCA

State Action Plans on Climate Change (SAPCCs)

A key instrument to address climate change has been the existing "State Action Plans on Climate Change (SAPCCs)". Twenty nine states in India have completed the process of drafting SAPCCs, however, the SAPCCs submitted so far remain vision documents at state level waiting to be integrated into the existing policy practice framework. Further support is needed to prepare the ground and move towards systematic and large scale adoption of climate sensitive action as part of the States' redefined development agenda. This would be a dynamic process involving close partnerships with multiple stakeholders, formation of new committees, cross sectoral deliberations, capacity development, and significantly, the marriage of new research and plans with existing policy programmes. The SAPCCs, if implemented effectively, can build a resilient society and address climate change drivers in India.

Five Year Plans

11th five-year plan (FYP) of India (2007-2012) recognized the urgent need to balance the trade-off between economic growth and environmental stability. With regard to adaptation to climate change, the strategy stated that, since a substantial adverse change in climate appears unavoidable even with the optimal mitigation response, the process of adaptation to climate change must have priority. The plan also recognized the need to incorporate adaptation responses in the relevant programs, including those relating to watershed management, coastal zone planning and regulation, forestry management, agricultural technologies and practices, and health. However, in this plan there was no systematic or scientific effort to incorporate climate change in planning developmental projects, probably due to lack of scientific knowledge on climate change impacts and economic vulnerabilities.[4] This also states that programs and projects that will lead to sustainable development, with assurance of disaster risk reduction built in. It speaks about mainstreaming disaster management in development planning. It states that every development plan of a ministry/department should incorporate elements of impact assessment, risk reduction and the 'do no harm' approach.[5] The 12th plan also echoed for more sustainable and inclusive growth and focused on both climate change adaptation and disaster risk reduction. Somehow the integrated vision for DRR and CCA is missing even in the 12th five year plan as well.

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4 Ravindranth D, Chaturvedi R.K and Dr. Kattumuri R- Mainstreaming Adaptation to Climate Change in Indian, Policy Planning available at http://www.lse.ac.uk/asiaResearchCentre/_files/ChaturvediKattumuriRavindranath.pdf

5 Eleventh Five Year plan of India (2007-12), Inclusive Growth, Volume I, Planning Commission, Government of India available at http://planningcommission.nic.in/plans/planrel/fiveyr/11th/11_v1/11th_vol1.pdf

Convergence of Green India Mission and MGNREGS

On 3rd March 2015, Ministry of Environment and Forest, Government of India sent letters to Chief Secretaries of all states issuing guidelines for convergence of Green India Mission (One of the eighth missions under the NAPCC) and the MGNREGS. The guideline provides a comprehensive framework with background, shared visions, supported interventions, planning and implementation framework, targets, funding mechanism, monitoring and evaluation with list of works that can be carried out under different sub-missions in convergence with MGREGS. This is a welcome step where climate change and development are viewed with one perspective and links both mitigation and adaptation activities.[6]

5.5 Call for action

CCA needs to be prominently integrated in all national planning processes. While the strategic thinking in the region, regarding disaster risk reduction, has been initiated and institutional arrangements are being implemented, the ground reality is far from satisfactory. Risk levels and exposure are increasing due to ill-managed development and growth of populous centres invulnerable locations. Considering the above, the major areas like health, nutrition, child protection, education and WASH would be given priority in addressing effective disaster preparedness for achieving sustainable development goals. Therefore, the region's policy makers, planners and climate negotiators need to endorse long-term approaches to building resilience, building on effective regional cooperation, while planning for uncertainty in the long-run. There needs to be a shift away from relief to risk reduction and climate change adaptation to build people's resilience to disasters, climate variability and change, reducing the underlying risk factors that make them vulnerable to hazards.

From preliminary reviews of the State Action Plans for Climate Change (SAPCCs), the following observations, discussion points and recommendations have emerged.

5.6 Background understanding on CCA

CCA is an important element of disaster risk preparedness and reduction. Amongst others, the impacts of climate change include an increase in the frequency and severity of the hydro-meteorological events. Some types of extreme weather and climate events have already increased in frequency or magnitude, and this trend is expected to continue over coming decades. Climate change is altering the face of disaster risk, not only through increased weather-related risks and sea-level and temperature rises, but also through increases in societal vulnerabilities - for example, from stresses on water availability, agriculture and ecosystems.

Climate change is a new factor that will act as an additional stress to increase the existing vulnerabilities of many people. As a result of global warming, climate-related hazards like floods, droughts, heat waves, and storms are expected to become more frequent and/or possibly also more intense (e.g. cyclones may have more rainfall and stronger winds, cover more territory). This will result in increasing vulnerability as climate trends will damage livelihoods, increase poverty and damage food security. In addition, some climate-related hazards such as tropical cyclones, storms, floods, droughts, heat and cold waves will affect places that have not experienced them before.

Climate change confronts India with a whole series of challenges. It makes existing problems worse, and

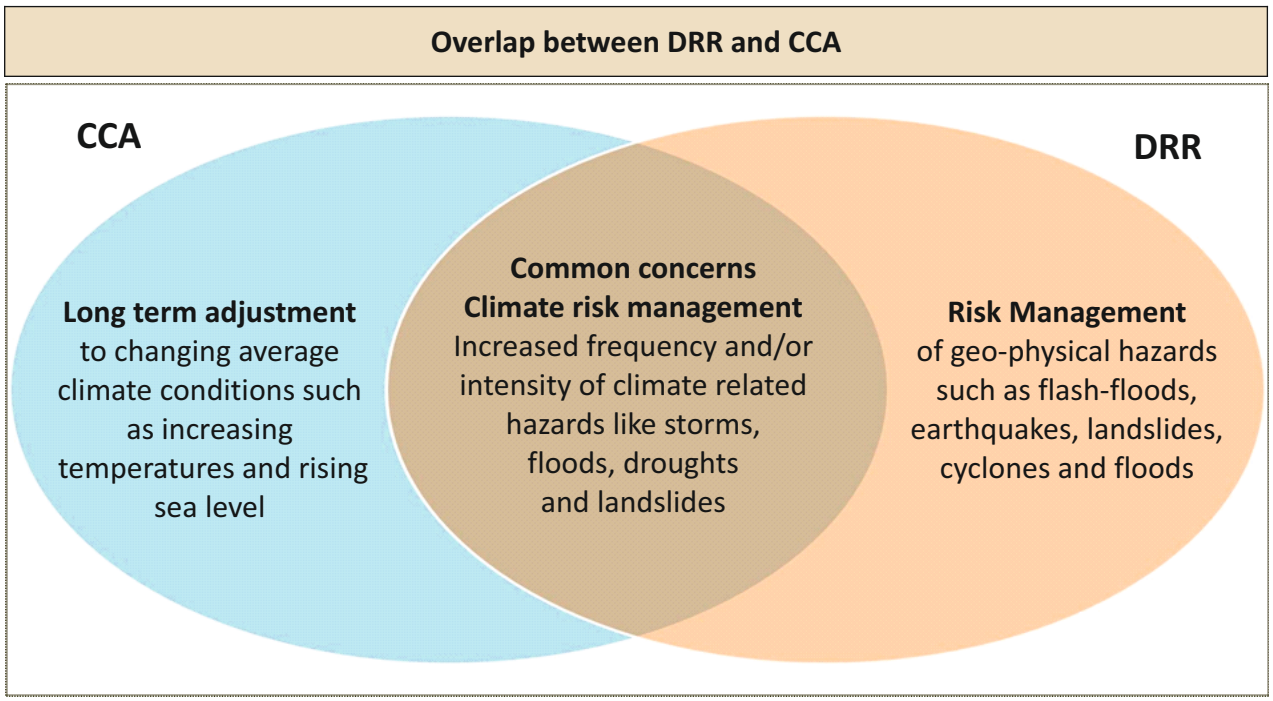
6 MoEF's letter to Chief Secretaries of all states on convergence of MGNREGS and GIM available at http://envfor.nic.in/sites/default/files/MGNREGS-GIM_0.pdf

brings new risks to people. Nothing will be the same, and "business as usual" is no longer an option. The myriad and uncertain effects of changing climate oblige the government to possess an increased ability to analyze, assess and understand the future consequences in order to support better planning and preparedness.

5.7 Convergence of DRR and CCA

In recent years there has been a growing convergence between DRR and CCA. However they do not overlap completely. Broadly speaking, DRR deals with all hazards, including hydro-meteorological and geophysical hazards, while CCA deals exclusively with climate-related hazards associated with changes in the average climate conditions. CCA also considers the long-term adjustment to changes in gradual changing climatic condition, including the opportunities that this can provide, whereas DRR is predominantly interested in extremes leading to disasters.

However, DRR and CCA have common concerns in managing climate-related risks; this is the area where they converge. DRR and CCA share a common goal of reducing vulnerability and achieving sustainable development. They also share a common conceptual understanding of the components of risk and the processes of building resilience; they regard risk as the product of exposure and vulnerability to hazards or effects of climate change, or both. Both exposure and vulnerability are compounded by other societal and environmental trends, for example, urbanization, environmental degradation, and the globalization of markets. Thus, to reduce these risks, exposure needs to be minimized, vulnerability reduced, and capacities for resilience strengthened. This is a dynamic process requiring continual effort across economic, social, cultural, environmental, institutional and political spheres to move from vulnerability to resilience.



5.8 Mainstreaming DRR and CCA

Owing to its linkages with humanitarian emergency response, DRR is often the first line of protection against weather-related disasters, and because this risk increases it is an essential part of CCA. For DRR to be efficient, it has to take into account climate-related risks or be climate-smart. Increasingly, humanitarian and development practices will have to gain the benefits of bringing together DRR and CCA in a more holistic approach to development programming, in order to maximize the effectiveness and sustainability of efforts and investments made by all stakeholders.

For DRR and CCA measures to be effective and efficient and to produce desired outcomes, they need to be mainstreamed into the states' development planning to ensure that their strategies, policies, programmes or projects are designed with due consideration for potential disaster and climate change risks and thus prevent them from inadvertently increasing vulnerability to disaster or climate change.

5.9 Barriers to mainstreaming DRR and CCA

DRR and CCA mainstreaming, like other mainstreaming processes, encounter both foreseeable and unforeseeable barriers. They include, among others:

1. bureaucratic organizational processes
2. lack of capacity and knowledge
3. restricted financial frameworks
4. short term thinking
5. lack of access to relevant information
6. ineffective procedures for retaining organizational memory
7. a culture of working in 'silos' (departments)

At a practical level, there are also disparate issues such as lack of clarity of roles and responsibilities and time constraint when it comes to DRR and CCA mainstreaming. The lack of funding for cross-cutting initiatives is another hurdle.

5.10 Suggestions for Way Forward

Some ideas that can be considered for the way forward are:

1. **Developing a Programmatic approach.** We need a programmatic risk management approach, to coordinate initiatives, actions, existing expertise and financial resources of disaster risks, climate change and other environmental hazards within the development context.

2. **Improving communication.** It is of paramount importance to improve existing channels of communication between all experts dealing with DRR, CCA and development and finding ways to communicate more effectively.

3. **Improving the institutional framework.** It is time for a radical assessment and improvement of institutional arrangements which today deal with disaster risk management and climate change.

4. **Optimising existing financial arrangements and providing additional resources where needed.** Financial resources should become available for preventive efforts to reduce vulnerability.

5. Creating an enabling environment for mainstreaming DRR and CCA

5.1 Institutional arrangement and capacity. As the mainstreaming process goes far beyond the adoption of official documents for development planning, it is important to make appropriate institutional arrangements and build the necessary capacity to make mainstreaming happen. As DRR and CCA are crosscutting issues, the mainstreaming process needs to be owned by all departments, rather than by a single department or an individual. It is important to anticipate potential barriers to ownership and consider how to address them to ensure that mainstreaming can be considered as an institutional asset rather than a liability. It will be necessary to develop strategies or initiatives, define responsibilities at different levels of the various sectoral departments, coordinate this multi-sector, multi-tiered engagement, and monitor and evaluate progress. DRR and CCA focal points should be appointed in technical departments to direct and coordinate sectoral DRR and CCA initiatives, including the mainstreaming of DRR and CCA into broader programmes, to identify and draw on existing DRR and CCA expertise within the department and to provide sector-specific technical support.

5.2 Appropriate institutional capacity should be put in place to support the mainstreaming process. Building the necessary skills and knowledge is crucial to increasing departmental staff's understanding and ultimately, ownership of the mainstreaming process. Policies and best practices must be understood, implemented and maintained by all staff. Skills, knowledge and understanding can be developed through senior management briefings, reference materials, training for staff, and regular communication between themselves.

5.3 Departmental Programme/Project Cycle Management. For DRR and CCA to be mainstreamed, it is necessary for project/programme managers to make it a rule to consider and address disaster and climate change risks in their departmental planning phases, including analysis, design, implementation, monitoring, and evaluation. Using a DRR and CCA lens in the project cycle is an effective way of designing risk-informed and climate-smart projects and programmes.

5.4 Advocacy can create the conditions in which the awareness-raising and education can empower government departments to change the way they think, behave or strategize in terms of DRR and CCA.