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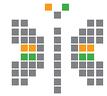


Federal Ministry
for the Environment, Nature Conservation
and Nuclear Safety

of the Federal Republic of Germany



Ministry of Housing and Urban Affairs
Government of India



Smart City
MISSION TRANSFORM-NATION



Training on Stormwater Management

A Training Course for Decision Makers and Operative Staff from ULB Level

Training Manual

Supported by

giz Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH

lifu
Deutsches Institut
für Urbanistik

niu | **C³**
Climate Centre for Cities

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Imprint

As a federally owned enterprise, GIZ supports the German Government in achieving its objectives in the field of international cooperation for sustainable development.

Published by:

Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

Registered offices
Bonn and Eschborn, Germany

Climate Smart Cities Project:
Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH
B-5/2, Safdarjung Enclave
Neu Delhi 110 029, India
T + 91 4949 5353
F + 91 4949 5391

E giz-indien@giz.de
I www.giz.de

This project is part of the International Climate Initiative (IKI). The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) supports this initiative on the basis of a decision adopted by the German Bundestag.

Responsible:

Vaishali Nandan
E vaishali.nandan@giz.de

Authors:

National Institute of Urban Affairs (NIUA)
Amanjot Kaur, Dr. Umamaheshwaran Rajasekar

German Institute of Urban Affairs (Difu)
Kaj Fischer, Finya Eichhorst, Jens Hasse

TU Berlin
Marcus Jeutner

GIZ

Liju Mathew, Ravi Kumar, Shabaz Khan, Vibhor Sood

Design and layout:

GIZ, NIUA

Photo credits/sources:

Cover photo: National Institute of Urban Affairs
All images: GIZ unless otherwise stated

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New Delhi, India | Berlin, Germany, February 2022

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List of Abbreviations

| | | | |
|----------------|---|------------------|--|
| ARGs | Automatic Rainfall Gauges | kml | keyhole mark-up language (file type used for digital maps) |
| BDA | Bhubaneswar Development Authority | KSA | knowledge-skill-abilities |
| BMI | German Ministry of Interiors Building and Community | LID | Low Impact Development |
| BMU | German Ministry of Environment, Nature Conservation and Nuclear Safety | LIUDD | Low Impact Urban Design and Development |
| BMZ | German Federal Ministry for Economic Cooperation and Development | NbS | Nature Based Solutions |
| BTCD | Bhubaneswar Town centre district | NDC | Nationally Determined Contributions |
| CSC | Climate Smart Cities project | NDMA | National Disaster Management Authority |
| CSCAF | ClimateSmart Cities Assessment Framework | NDRF | National Disaster Response Force |
| CWC | Central Water Commission | NEC | National Executive Committee |
| DDMA | District Disaster Management Authority | NGO | Non-Governmental Organisation |
| DEOC | District Emergency Operation Centre | NIDM | National Institute of Disaster Management |
| Dept. | Department | NIUA | National Institute of Urban Affairs |
| DIFU | German Institute of Urban Affairs (Deutsches Institut für Urbanistik) | NMISH | National Mission on Sustainable Habitat |
| DRWM | Decentralized Rainwater/ Storm water Management | NRSC | National Remote Sensing Centre |
| DST | German Association of Cities | MoHUA | Ministry of Housing and Urban Affairs |
| EbA | Ecosystem based Adaptation | MoUD | Ministry of Urban Development |
| EbM | Ecosystem-based Mitigation | RWA | Resident Welfare Association |
| Eco-DRR | Ecosystem-based Disaster Risk Reduction | SDG | Sustainable Development Goals |
| EMS | Emergency Management Service | SDMA | State Disaster Management Authority |
| EOC | Emergency Operation Centre | SDRF | State Disaster Response Force |
| ESF | Emergency Support Function | SK:KK | Service and Competence Centre: Local Climate Action |
| GHG | Green House Gas | SoI | Survey of India |
| GI | Green Infrastructure | SOP | Standard Operating Procedure |
| GIS | Geographical Information System | sqmt | Square metre |
| GIZ | German Agency for International Cooperation (Deutsche Gesellschaft für Internationale Zusammenarbeit) | SQUIDS | Storm water quality improvement facility |
| HFL | High Flood Level | SRSACs | State Remote Sensing Application Centres |
| IDRN | India Disaster Resource Network | SuDS | Sustainable Urban Drainage Systems |
| IIT | Indian Institute of Technology | SWC | Smart Water City |
| IKI | German International Climate Initiative | SwM | Stormwater Management |
| IMD | Indian Meteorological Department | SWCNP | Sound Water Cycle on National Planning |
| IRS | Incident Response System | TU Berlin | Technical University of Berlin |
| IUCN | International Union for Conservation of Nature | UDA | Urban Development Authority |
| IUWM | Integrated Urban Water Management | UFDM | Urban Flood Disaster Management |
| | | ULB | Urban Local Body |
| | | UN | United Nations |
| | | UT | Union Territory |
| | | WSC | Water Sensitive Cities |
| | | WSUD | Water Sensitive Urban Design |

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Introduction

Objective

The intent of the training on Stormwater Management (SwM) is to inform about the relevance of water related risk and challenges for urban development, especially with regards to climate change. The training aims to broaden the perspective on SwM beyond infrastructure measures to approaches such as rainwater harvesting and behaviour change. A key message of the training is that addressing water related risks improves resilience to climate change induced disasters but can also reap direct economic and social benefits and improve infrastructure development.

Furthermore, the training will familiarise participants with the 'water dimension of the ClimateSmart Cities Assessment Framework (CSCAF), developed by Ministry of Housing and Urban Affairs (MoHUA), Government of India in partnership with Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and the National Institute of Urban Affairs (NIUA), and lay out the benefits of applying this framework to improve livelihoods and living conditions in Indian cities.

Content of the Manual

The manual is designed for the training of operative staff in the field of water management and water infrastructure, including storm water management, as well as decision makers at Urban Local Body (ULB) level. The methodology of the training sessions focuses on practice-oriented and interactive learning. They help to reflect the content and, whenever possible, deepen the learnings. After the training, participants will be able to independently perform some of the analyses required for the CSCAF and have all required information to tender out more detailed assessments where necessary.

The sessions are divided into sections. Each section starts with a general description and background information, exercises follow that reflect the content to increase the participants' knowledge and experience. Instructions on how to move from planning to implementation are described subsequently.

About Climate Smart Cities Project

The training SwM is facilitated within the framework of the Climate Smart Cities (CSC) project (2018-2022). The CSC project is funded under the German International Climate Initiative (IKI), by the German Ministry of Environment, Nature Conservation and Nuclear Safety (BMU) in cooperation with the German Ministry of Interiors Building and Community (BMI) and coordinated by GIZ jointly with MoHUA, Government of India. Implementing project partners are the German Institute of Urban Affairs (Difu), NIUA and the Technical University of Berlin (TU Berlin). The CSC project attempts to anchor climate-friendly solutions within the Smart Cities Mission.

The project contributes to the achievement of the Nationally Determined Contributions (NDCs) to the Climate Goals as well as the Sustainable Development Goals (SDG). It acts as a facilitator in promoting cooperation between national and subnational actors by technically supporting international advisory and exchange formats and by supporting the implementation of measures.

The project works with three Indian Smart Cities of Bhubaneswar, Coimbatore, Kochi and their respective state governments of Odisha, Tamil Nadu, and Kerala, in the planning and implementation of smart and climate-friendly measures for infrastructure and area-based development, as well as the measuring and monitoring of their Green House Gas (GHG) emissions.

Partners

GIZ – As a service provider in the field of international cooperation for sustainable development and international education work, GIZ is dedicated to shaping a future worth living around the world. We have experience in a wide variety of areas, including economic development and employment promotion, energy and the environment, and peace and security. The diverse expertise of our federal enterprise is in demand around the globe – from the German Government, European Union institutions, the United Nations, the private sector, and governments of other countries. We work with businesses, civil society actors and research institutions, fostering successful interaction between development policy and other policy fields and areas of activity. Our main commissioning party is the German Federal Ministry for Economic Cooperation and Development (BMZ).

The commissioning parties and cooperation partners all place their trust in GIZ, and we work with them to generate ideas for political, social, and economic change, to develop these into concrete plans and to implement them. Since we are a public-benefit federal enterprise, German and European values are central to our work. Together with our partners in national governments worldwide and cooperation partners from the worlds of business, research, and civil society, we work flexibly to deliver effective solutions that offer people better prospects and sustainably improve their living conditions.

The registered offices of GIZ are in Bonn and Eschborn. In 2019, we generated a business volume of around EUR 3.1 billion. Our 22,199 employees, almost 70 per cent of whom are national staff, work in around 120 countries. As a recognised development service provider, we currently have 556 development workers in action in partner countries. Furthermore, in 2019, the Centre for International Migration and Development (CIM), which is run jointly by GIZ and the German Federal Employment Agency, placed 262 integrated experts and 515 returning experts with local employers in our partner countries, or provided them with financial support, advice, or other services.

GIZ in India – For over 60 years, GIZ has been working jointly with partners in India for sustainable economic, ecological, and social development.

India is fast emerging as an economic and industrial power. Despite the country's rapidly growing economy, poverty and other socio-economic issues remain a challenge. The burgeoning population and accelerated urbanisation in the country have resulted in an environment at risk and greenhouse gas emissions that continue to spiral upwards.

The thematic areas of GIZ in India are:

- Energy.
- Environment, Climate Change and Biodiversity.
- Sustainable Urban and Industrial Development.
- Sustainable Economic Development.

The Government of India has launched numerous important initiatives to address the country's economic, environmental, and social challenges, and GIZ is contributing to some of the most significant ones. For example, it supports key initiatives such as Smart Cities, Clean India, and Skill India. GIZ, in close cooperation with Indian partners, devises tailor-made, jointly developed solutions to meet local needs and achieve sustainable and inclusive development.

NIUA – The National Institute of Urban Affairs is one of the implementing partners of the CSC Project. It is India's leading national think tank on urban planning and development. As a hub for the generation and dissemination of cutting-edge research in the urban sector, NIUA seeks to provide innovative solutions to address the challenges of a fast urbanising India and pave the way for more inclusive and sustainable cities of the future.

NIUA was appointed as an apex body to support and guide the Government of India in its urban development plans in 1976. Since then, it has worked closely with the MoHUA, alongside other government and civil sectors, to identify key areas of research, and address the lacunae in urban policy and planning. With a team spanning planners, engineers, researchers, architects and analysts, the Institute provides cross disciplinary expertise and technical assistance for city and state-level projects, as well as developing toolkits and customised training programmes to strengthen the capacity of local and regional, and governing agencies. In its aims of enriching and expanding urban knowledge bases within the country, its work today addresses 5 major thematic concerns:

- Urbanization & Economic Growth
- Urban Governance & Finance
- Urban Infrastructure & Built Environment
- Environment, Climate Change & Resilience
- Social Development

The skills, resources and deep-rooted knowledge NIUA has accumulated in the urban sector also make it the first port of call for international donors and institutions seeking to develop meaningful partnerships in the country. Whilst helping bolster India's urban narrative at the global level, NIUA is also committed to aligning its efforts in accord with the UN SDGs, ensuring that global targets are achieved through locally adapted and integrated urban frameworks.

Difu – The German Institute of Urban Affairs is the largest urban research institute in Germany and is a central research, advanced training and information institution for cities, municipalities, administrative districts, municipal associations and planning departments. Founded in 1973, the institute is an independent, non-profit limited liability company and is based in Berlin and Cologne. Difu's main task is it to help cities deal with their complex day-to-day tasks, while identifying long-term prospects and developing urban action programs. The non-profit institute is supported by more than 100 cities, municipal authorities and planning bodies in Germany.

The institute is subdivided into four research and practice-oriented work areas. The research areas "Urban Development, Law and Social Affairs", "Infrastructure and Finance", "Mobility" and "Environment" prepare empirically substantiated research reports, studies, work aids and other materials and conduct experimental projects in cooperation with cities and municipalities.

This work is shaped by

- constant dialogue with the municipal practice,
- the objective of aligning empirical studies with transferable conclusions that may be useful to other cities,
- the implementation of research projects and other activities in various forms of cooperation with cities (for example, in case studies, joint research projects, surveys or in project-accompanying working groups), the German Association of Cities (DST) as well as federal and state ministries.

Other work areas at Difu are responsible for training and knowledge transfer. As a research institute focussing on municipal and urban affairs, Difu contributes to the continuous provision of information to cities and communities in Germany. For more than 10 years, Difu operates the "Service and Competence Centre: Local Climate Action (SK:KK)", and publishes the well-known practitioners' guide "Climate Mitigation in Communities".

Since 5 years the issue of Smart Cities has become an important focal point of Difu's research activities. Studying the activities of the 200 biggest German cities is the basis for projects on conceptual approaches and the impact assessment of concrete measures within a network of partners from municipalities, ministries,

the telecommunication sector, and consultants. In this capacity, Difu has also been involved in the development of the German Smart City Charta.

ClimateSmart Cities Assessment Framework

MoHUA launched the CSCAF under the Smart Cities Mission in February 2019 jointly with GIZ and NIUA. The CSCAF serves as a tool for cities to assess their present situation and provides a roadmap for cities to adopt and implement relevant climate actions. It is the first city assessment framework on climate relevant parameters in India.

The ClimateSmart Cities Assessment Framework 2.0 aims to capture the progress made by cities since the Phase-1. The framework has been revised considering the feedbacks provided by the cities and sector experts and learning from the first phase of assessment. The Assessment Framework 2.0 is based on an integrated scoring system which could help evaluate cities across various sectors and intend to rank them in order of their performance.

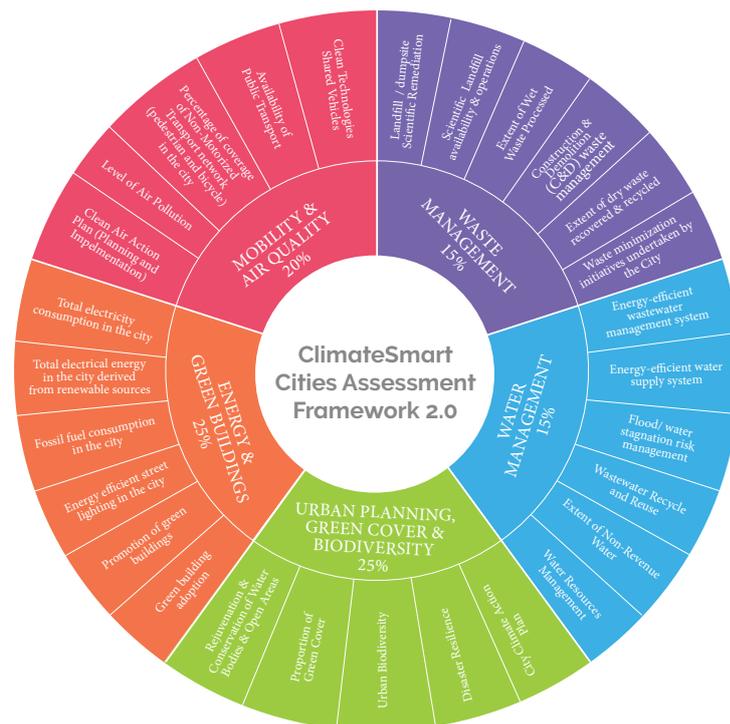
The CSCAF 2.0 is broadly categorised into 5 sectors with 28 indicators (see figure 1). Each of these indicators has a maximum of 5 levels representing different stage of development each with a corresponding weightage:

- i. Energy and Green Buildings,
- ii. Urban Planning, Green Cover and Biodiversity,
- iii. Mobility and Air Quality,
- iv. Water Management, and
- v. Waste Management.

The framework provides assessment of both, mitigation, and adaptation measures. The indicators are progressive in nature to support cities in assessing where they stand and encourage them to adopt appropriate actions enabling them to improve their score in the future and consequently build climate resilience.

In terms of mitigation, sectors such as transportation, waste, energy consumption and green cover are most important while for adaptation, sectors such as water, biodiversity, urban planning, and land-use play an important role.

Figure 1: Indicators of the ClimateSmart Cities Assessment Framework 2.0; NIUA



Section 1:

Introduction

Key content:

- Purpose of the training
- Introductions of the concepts around Stormwater Management

Learning goals:

- Participants learn about the topic and the aim of the workshop
- gain theoretic background knowledge on the scope of the topic, the aims and benefits, the climate relevance, and state-of-the-art concepts

Purpose of the training - SwM in Climate Smart Cities

To prevent flooding, and manage floodwater when prevention is not possible, has long become a major challenge for cities around the globe. Whether caused by sea-level rise, an increased number of stronger extreme weather events such as hurricanes or extended monsoon seasons, flooding events have become a steady concern for city managers.

Climate Smart Cities employ strategies to mitigate the damage caused by the increased occurrence and severity of flooding events. It is vital to build the appropriate infrastructure to deal with the large amounts of water within city boundaries to protect the city population, its build environment and, not least, the urban natural ecosystem and biodiversity. This undertaking must be seen against the backdrop of rapid urbanization dynamics while many city administrations face financial strains. However, a climate smart approach to flooding may even enable a city to benefit from increased water supply, for example through rainwater harvesting.

Contemporary concepts around green infrastructure, nature-based solutions or the 'sponge city approach' can provide a cost-effective solution to flooding, while also benefitting the city in terms of the wider context of climate change adaptation. This training will clarify some of these concepts and approaches and provide applicable advice on their implementation. Mostly focused on the issue of risk mitigation to prevent loss and damage from flooding, it will enable participants to navigate the Indian legal framework to include SwM in their urban planning and establish Standard Operating Procedures in case of flooding events.

Introduction of the concepts - Thematic Background

As indicated, climate change aggravates the pressure on cities when it comes to SwM. First, it impacts the volume and intensity of precipitation and the frequency and intensity of rainfall events. In that regard, climate change functions as a risk multiplier, increasing the vulnerability of people, assets, and infrastructure. This is especially true when climate change hits ageing and inaccessible drainage infrastructure.

A second factor causing growing urgency for action is intensive urban development, which increases the chances of extensive damage to infrastructure and disruption. Current fast-paced urbanisation brings rapid population growth, with secondary impacts on population density and settlement typology. It also is associated with heavy construction activities, reducing the availability of space to build infrastructure for water conveyance and storage facilities. Further it reduces the amount of permeable city areas, causing both, increased water run-off and additional water stagnation in different areas.

Non-permeable surfaces become a problem in heavy rainfall events, as stormwater

runoff causes water pollution in cities. Rainwater washes over paved surfaces carrying dirt, oil, and other pollutants into local water bodies, sometimes also causing erosion and flooding. Polluted water-bodies harm people and aquatic and land-based ecosystems, such as lakes and tanks in cities. Thus, urban drainage is critical to urban ecosystem health, from the perspective of water pollution, flooding, climate change and biodiversity loss.

The terminology describing urban drainage is diverse: Reflecting the diversity and complexity of urban SwM. Globally, the terminology of principles and practices have also become quite diverse. This diversity is important, as it reflects a locally shared understanding of the scale at which SwM is to be addressed, and how. Differences in geography (land and water availability), urban infrastructure, regulatory regimes and incentives can lead to different solutions for SwM.

The main concept in the most conventional approach is to provide appropriate drainage capacity through the existing or new central infrastructure systems. Based on a network of drains and canals, such centralised systems often require an update to handle the changed situation. This may be done by better connecting all parts of existing infrastructure, upgrading sewage systems to manage larger water quantities, building additional piping or canals dedicated to handle floodwater- and heavy rainfall run-off, or building water retention reservoirs to ease the stress on the existing drainage infrastructure. Newer approaches also consider more permeable street cover materials or using available, low-lying areas such as parking lots for water retention.

Increasingly, cities consider a different approach based on green infrastructure to complement and reinforce their existing SwM infrastructure. Its viability to mitigate urban flooding is based on the simple notion, that rainwater has a different impact on natural surfaces than it has on artificial cover. Often associated with more decentralised measures, green infrastructure uses vegetation, soils, and other elements to restore natural processes for managing storm water. Natural, under-, or undeveloped areas absorb and clean water through the soil and plants, resulting in reduced and cleaner water runoff. As a decentralised approach, green infrastructure at city scale presents a patchwork of natural areas that provide habitat, flood protection, cleaner air, and water. At site scale, SwM systems that mimic nature, soak up and store water are part of the green infrastructure umbrella.

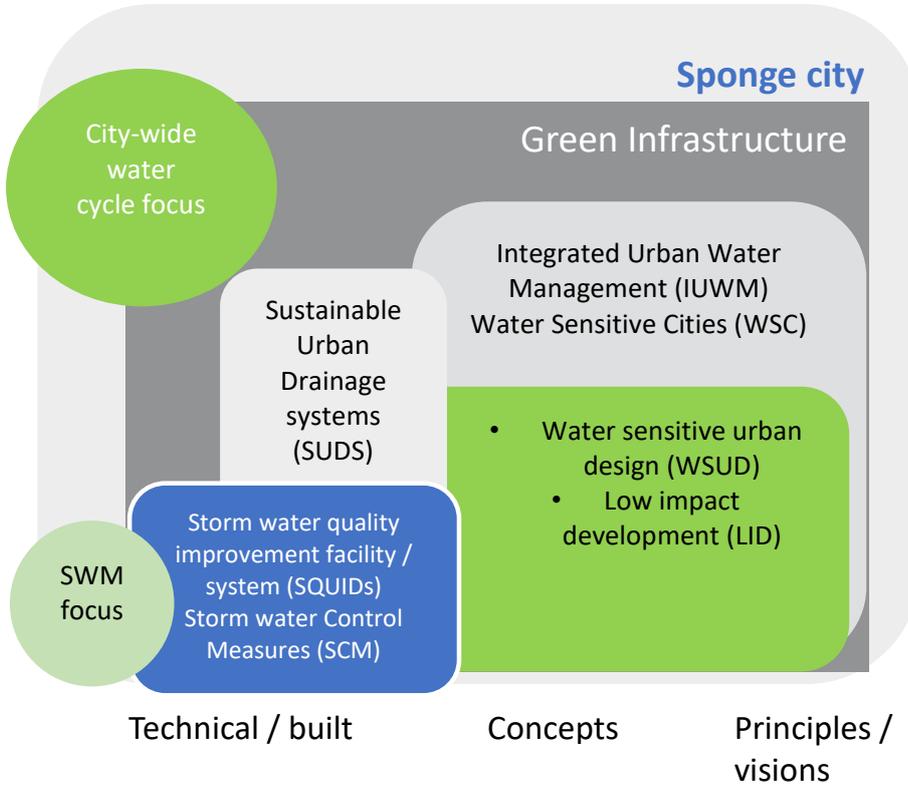
Two additional terms frequently associated with green infrastructure are Nature Based Solutions (NbS) and Ecosystem based Adaptation (EbA). It is important to clarify definitions of both concepts, as they are closely interlinked but not the same. NbS are interventions which use nature and the natural functions of healthy ecosystems to tackle some of the most pressing environmental and socio-economic challenges of our time. Thus, NbS can be defined as actions to protect, sustainably manage, and restore natural or modified ecosystems to address societal challenges, simultaneously providing human wellbeing and biodiversity benefit, to achieve sustainable development.¹ It is an umbrella term, which encompasses different approaches of working with nature, such as EbA, Ecosystem-based Disaster Risk Reduction (Eco-DRR), and Ecosystem-based Mitigation (EbM).

Green infrastructure and NbS provide a range of co-benefits beyond their SwM potential that strengthen their viability to contribute to climate proofing cities. Increased green urban infrastructure, with increased use of NbS can reduce floods and drought, enable water conservation, and reduce urban heat island effects. Context-specific development of green spaces, that enhances ecosystem services, can also help address biodiversity loss. And a combination of green infrastructure, EbA and NbS can help sequester carbon in urban areas.

¹ Sources: Promoting Nature-based Solutions in the Post-2020 Global Biodiversity Framework - FEBA/PEDRR, 2020.
IUCN Global Standard for NBS, 2020

While these approaches certainly have their benefits, a ULB may still prefer a more conventional solution. This is a viable direction to take, as city administrations and planners tend to be more familiar with these and thus, solutions may be implemented faster and with more ease. However, for a truly sustainable and climate smart SwM system, a combination of approaches may prove to be most practical.

Figure 2: Dimensions of SwM planning



Source: Dr. Sumetee Pawa Gajjar, PlanAdapt

Session 2: Flood/ Water Stagnation Risk Management

Key content:

- Storm Water Management and Urban Flooding scenario in Urban India
- Introduction to Indicator 4: Flood/Water Stagnation and Risk Management
- Possible Strategies for Urban Flood/ water stagnation risk management

Learning goals:

- To understand components of Indicator 4 and road map to progress to next level for this indicator

Stormwater Management and Urban Flooding scenario in Urban India

Urban flood is defined as 'the submergence of usually dry area by a large amount of water that comes from sudden excessive rainfall, an overflowing river or lake, melting snow or an exceptionally high tide'².

For this training purpose and also under the CSCAF, water stagnation is defined as inundation of a particular area for more than four hours of a depth more than six inches. For Urban authorities, both flood and water

stagnation may be considered as hazard and need to reduce adverse impact of these phenomenon on citizens, infrastructure and services.

In last two decades, India has witnessed major flooding events in urban areas. Few of them are listed in Table 1

Table 1 List of Urban Flooding incidences in India

| Cities | Flooding Years |
|------------|------------------------------------|
| Ahmedabad | 2001 |
| Bangalore | 2005, 2009, and 2013 |
| Chennai | 2004 and 2015 |
| Delhi | 2002, 2003, 2009, 2010, 2013, 2016 |
| Guwahati | 2010 and 2011 |
| Hyderabad | 2000, 2001,2002, 2006 and 2008 |
| Jamshedpur | 2008 |
| Kolkata | 2007 and 2013 |
| Mumbai | 2005, 2007, and 2015 |
| Srinagar | 1992, 2014 and 2015 |
| Surat | 2006 and 2013 |

Source : NIUA, 2016

¹ Source: Guideline for Urban Flood Management, NDMA, 2010

These flooding and inundation are caused by various direct and indirect factors attributed to natural phenomena and human activities.

Some of these causes are explained in below given figure 3 for ease of understanding

Current urban water management systems are largely based on traditional engineering approaches which are developed to rid the city of storm water as quickly as possible, resulting in increased imperviousness in urban areas. This has no ecological benefit; on the contrary, it is counterproductive as far as natural resource management is concerned, as it prevents local freshwater recharge and adds to pollution of freshwater bodies in and around cities.

Pluvial flooding — rain-driven flooding that results from overloading of natural or engineered drainage capacity — has emerged as a critical issue in urban water management. Many cities are vulnerable to pluvial flooding and associated risks. Global climate change and urban population growth will only increase these risks. Moreover, encroachment on natural drainage increases flood risks in urban areas.

Lack of legal protection for city lakes, catchment areas and drainage systems and application of inadequate and inappropriate planning measures aggravate the problem further. Often, sewage lines carry rainwater and alternative or additional measures (storage /infiltration/delayed surface runoff) remain relatively unknown or unused in cities. National Mission on Sustainable Habitat suggests that 2-5 per cent of municipal area should be reserved for water bodies, but it is hardly followed in cities.

Thus, in order to reduce the frequency & severity of these events, it is required to work on a comprehensive strategy of risk reduction along with both structural and non-structural mitigation measures.

Figure 3 Causes of urban flooding

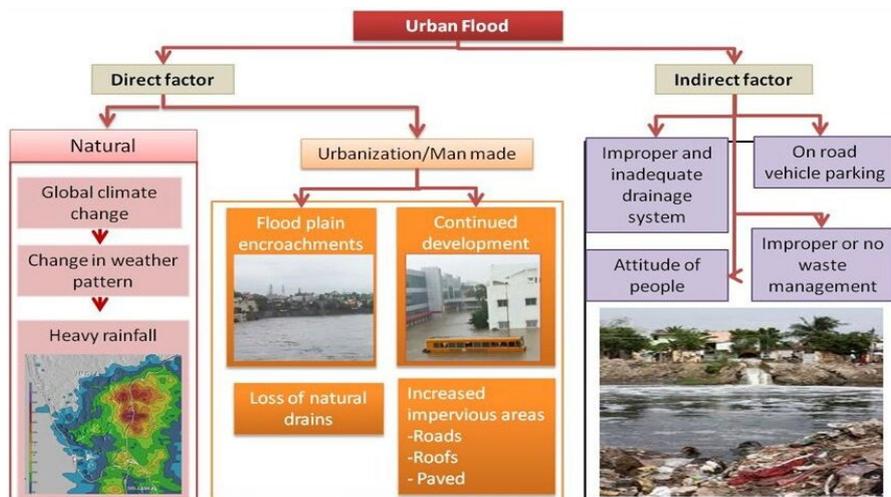


Image Source : <https://www.drishtiias.com/daily-updates/daily-news-editorials/urban-flooding>

Introduction to Indicator 4: Flood/Water Stagnation and Risk Management

This indicator assesses the preparedness of the city to address the risk of flooding and water stagnation. Main components of this indicator include³

- Rapid and Comprehensive Risk Assessment
- Developing Standard Operating Procedures for flood management at city level
- Implementation of structural and non-structural mitigation measures for flood mitigation

² Adapted from NIUA CSCAF 2.0

How is it ranked?

Total score for the indicator is 100.

- Cities will be marked in 5 levels with scores ranging from 0 to 100.
- In this indicator, levels 4 and 5 have been merged taking into consideration the various stages on implementation.
- Cities will be marked based on the evidence provided for the implementation of measures recommended in the flood management plan and urban flood management Standard Operation Procedure (SOP) form.
- 1 – 20 marks each, and
- 1-10 marks for establishing flood alert and early warning system.
- Any city scoring above 50 and 75 marks in total will be in level 4 and 5 respectively

Components of assessment framework and progression ranking is given table below:

Table 2 Components of assessment framework

| | 1 | 2 | 3 | 4/5 |
|-------------------------------|--|--|--|---|
| Progression levels | Flood/water stagnation risk assessment not conducted | Rapid flood/ water stagnation risk assessment | Detailed flood risk assessment and preparation of management plan | Implementation of actions for flood/ water stagnation management |
| Evidence/ Data sources | | <p>Rapid flood risk assessment for report prepared which shall include:</p> <p>Reasons of flooding/ water stagnation</p> <p>Flooding/ water stagnation Hotspots in city (including the number of incidences)</p> <p>Flood/ water stagnation Levels and frequency</p> <p>Map of flooding/ stagnation hotspots in the city as a .kml file (additional evidence)</p> | <p>Detailed flood risk assessment for various return period (5 years, 10 years, and 50 years)</p> <p>Flood management plans including structural and non -structural strategies (as per NDMA guidelines for urban flood management, 2010)</p> <p>Mechanisms for implementing SOPs (as per MoHUA/state guidelines) in place.</p> <p>Map of detailed flood risk assessment (scale 1:5000) as a .kml file (additional evidence)</p> | <p>Implementation of measures recommended in the flood management plan (20 points)</p> <p>Implementation of urban flood management SOP (as per MoHUA/state guidelines) (20 points)</p> <p>Urban flood alert and early warning systems established (10 points)</p> <p>Map of drainage and storm water networks in the city as a .kml file (additional evidence)</p> |
| Score | 0 | 25 | 50 | 100 |

Source : NIUA CSCAF 2.0

Figure 4 Components of Assessment Indicator



Figure 5 Components of Flood Management



Possible Strategies for Urban Flood/ water stagnation risk management

Strategies should be

- Holistic- considering inter sectoral linkages and implications of certain actions on other sectors

More attention to urban planning- the exercise of planning should address the risks due to various hazards and take into consideration people's participation in development process.

- Ecological quality- the ecological impact of development processes should be considered for sustainability
- Considering local conditions- one solution may not fit to all situations. Considering the socio-economy, terrain, geoclimatic conditions and other factors, the solutions should be tailor made for different neighbourhood even within the city.

Broadly the measures for flood mitigation can be divided into four categories:

1. Resilient Infrastructure: refers to assets and services which are minimally affected in any hazard and can be restored quickly. For example, in Surat floods of 2006, the piped gas services in most of the areas were not affected despite flooding in the supply management units.
2. Urban design Innovations: Innovative approaches and designs that lead to flood mitigation is discussed in detail in this section. This includes approaches like water sensitive urban design and innovative practices like Slow-Spread-Sink-Spread assets to prevent and mitigate flooding
3. Community Participation: Most of the governmental efforts to tackle urban flooding do not bear fruit because of low cooperation of communities. For example, sensitising communities to avoid throwing garbage in sewers, drains and water percolating structures plays an important role to curb flooding incidents.
4. Planning and regulations: These are the most important and effective means to systematically mitigate urban flooding. It involves, bylaws, zonal regulations, development guidelines which contribute to reduce urban flooding. Innovative designs may form part of guidelines and compliance regime. For example, a bylaw that mandates providing water recharging structure for projects more than 5000 sqmt area.

Urban Design and Innovation approaches cover a wide variety of initiatives as listed below. Though different terms are used in different countries, the basic tenets of the approach remain the same, i.e., to minimise the disturbance to natural ecosystem, promoting conservation and integrating natural assets/ systems (like water bodies) etc. in developmental planning.

Sustainable Urban Drainage Systems

(SuDS) in the United Kingdom

- Decentralized Rainwater/ Storm water Management (DRWM) in Germany
- Sound Water Cycle on National Planning (SWCNP) in Japan
- Smart Water City, U-Eco City (SWC) in South Korea
- Low Impact Urban Design and Development (LIUDD) in New Zealand
- Sponge Cities in China

Figure 6 Strategies for Flood Management



Urban design innovations for SwM include components of

- a. Slowing down runoff : e.g., Bioswales and permeable pavements
- b. Spreading the water in larger area: e.g., creating lagoons, ponds, and lakes
- c. Sinking in the excess water: e.g., water recharging and percolation structures
- d. Storing rainwater: e.g., Roof top rainwater harvesting, developing lakes etc.

Section 2B:

Exercise on Flood/ Water Stagnation Risk Management

Key content:

- Definition and objectives of Standard Operating Procedure (SOP)
- Different alert stages during flooding event
- Roles and responsibilities of stakeholders

Learning goals:

- To understand what is SOP and its importance
- To discuss key stakeholders/ actors and their functions in urban flood mitigation
- To know various functions during different alert stage of flood

This session is based on Urban Flooding Standard Operating Procedure (SOP) developed by Ministry of Urban Development (Now Ministry of Housing and Urban Affairs), Government of India.

What is SOP?

"A set of directives, covering those features of operations that lend themselves to a definite or standardized procedure"

Objectives of SOP

- To minimize the loss of life and damages to property and to ensure restoration and rehabilitation.
- To illustrate a concise chart, listing major executive actions required in response to urban flooding
- To list necessary tasks for preparedness, response relief and restoration required to be undertaken by the line agencies and departments involved.
- To ensure effective integration of tasks/events of each department at every stage of the disaster management process and enable continuous coordination of all actions.
- To enable reporting of actions taken by each agency / department for further review and updating of the existing SOP from past learnings.

Adoption of SOP

- To be executed without deviation / modification to guarantee the expected outcome.
- Modifications or deviation to be thoroughly investigated
- All quality impacting processes and procedures should be laid out in SOPs.
- SOPs should be adopted in routine training program of employees.
- SOPs should be regularly updated with a minimum review schedule of 3 years.
- SOPs should be in place for all Quality Systems including specific operations. (Procedures are applicable unless prescribed otherwise in a particular case. Flexibility necessary in special situations is retained without the loss of its effectiveness)

Box 1: Alert stages and Phases of SOP

Phases of SOP

The management of urban flooding is an emerging subject, and as such it has to be treated holistically in a multi-disciplinary manner. Three phases of disaster management for effective and efficient response to urban flooding:

Pre-Monsoon phase:

- Preparedness: Planning for Disaster Reduction

During Monsoon phase:

- Early Warning
- Effective Response and Management Relief planning and execution

Post-Monsoon phase:

- Restoration and Rehabilitation

Alerts and Warnings

For the purpose of dissemination of alerts, a uniform system has been devised by MHA categorizing alerts in stages – Yellow, Orange and Red.

While generating and transmitting alerts to Stakeholders and line departments, the concerned agency has to indicate the category of alert as well as its corresponding stage (Red/Orange/Yellow).

The communication stages are:

- **Yellow:** to be communicated to EOC through EMS.
Orange: to be communicated to EOC and SDMA@ 12 hourly updates.
Red: to be communicated to EOC, DEOC/SDMA, NEOC@ 3 hourly updates or more frequent
- Central Water Commission (CWC) has developed a network of flood forecasting stations to issue daily flood bulletins to all designated authorities/ agencies of the Central Government and State Government/ District Administration for all major river basins as following

| Category | Description | Stage |
|----------|--|--------|
| IV | Low Flood (Water level between warning level and danger level) | Yellow |
| III | Moderate Flood (Water Level below 0.50 m less than HFL and above Danger Level) | Yellow |
| II | High Flood (Water Level less than HFL but still within 0.50 m of HFL) | Orange |
| I | Unprecedented Flood (Water Level equal and above HFL) | Red |

However, typically flood warnings in local area may be categorised as per the following:

| Category | Description | Stage |
|----------|--|--------|
| IV | Sudden flash flood due to sporadic heavy downpour | Yellow |
| III | Water logging in arterial and sub-arterial roads and intersections | Yellow |
| II | Breach of river embankment /flooding of river plains | Red |
| I | Water logging/ flooding in residential and other buildings | Red |

Source : SOP on Urban Flooding MOHUA

Variation of SOPs

However, these SOPs need to be customised according to type of cities, its location, terrain and risks. Broad categories and relevant strategies are given in Table 3.

Table 3 Variation in SOP

| Location/ terrain | General | Short term | Medium Term | Long term |
|---------------------|--|---|---|--|
| Coastal cities | Floods in coastal cities are compounded by high tides depending on the time of the event. | Clearing of natural and engineered drainage system from silt and municipal solid waste. | | Plans to include emphasis on rainwater harvesting at household & neighbourhood level. |
| Inland cities | Immediate water discharge and prevention of water logging is a challenge in inland cities. | Clearing of natural and engineered drainage system from silt and municipal solid waste | Catchment areas with natural gradient towards a nearby lake / river to be restricted from development. | Afforestation for reduction of rainwater runoff. Rejuvenation and conservation of ponds, tanks and lakes with inter-connections |
| Hill towns | Challenged with very high runoff, short flow duration and high scouring on account of slope, floods may also trigger mud flow and land slide | Clearing of natural drains from municipal solid waste and other dumping. | Flood plains to be kept construction free by notifying "Conservation zones" along the river channels, suitably demarcated and with strict compliance/ enforcement. Natural drain channels to be always kept obstruction free. Digital Flood modelling to be attempted for different scenarios of precipitation. | Afforestation is highly desirable along the hill slopes to reduce impact of flood and prevent landslides. |
| Cities along rivers | Challenged with shifting water course in the middle and lower Gangetic plains or unexpected high-water discharge in-course | To undertake dredging and de-silting to keep the bed clear for volume flow | Building byelaws may incorporate provisions for construction on higher plinth or stilts as traditionally practiced. Vulnerable areas be demarcated and be kept construction free | Natural and manmade water bodies should be well conserved, rejuvenated and inter-connections be established for efficient flood control. |

| Location/terrain | General | Short term | Medium Term | Long term |
|---------------------------------|---|------------|-------------|-----------|
| Cities near dams and reservoirs | Requires selective actions from the measures mentioned above along with coordination with the reservoir management agencies | | | |

Exercise on Urban Flood Management SOP

Introduction to the Exercise

Urban flood management involves various stakeholders with different functions, both in normal time (to build capacity and prepare for flooding) and in emergency time (to respond). Understanding and application of SOP for flood management helps ULBs to prepare and respond effectively in flooding events.

Objectives

Key learning outcomes of this exercise are

1. Identify Stakeholders, their roles in various sectors and prioritise activities for capacity building and preparedness in normal times.
2. Identify sector wise Emergency Support Functions (ESFs) during response, relief, and recovery phases of flood management
3. Correlate emergency support functions in accordance with alert levels

Items Required

The exercise is conducted online using the "Mural" website platform, so a laptop/desktop with working internet is required.

How to use Mural? Basic Functions

Figure 7 How to use Mural

EDIT ELEMENTS

-  Double click Sticky Notes, Text Boxes and Titles to edit their text
-  Right click any element for more options

NAVIGATE THE MURAL

-  Use your mouse to zoom
-  Click and drag to move

ADD ELEMENTS

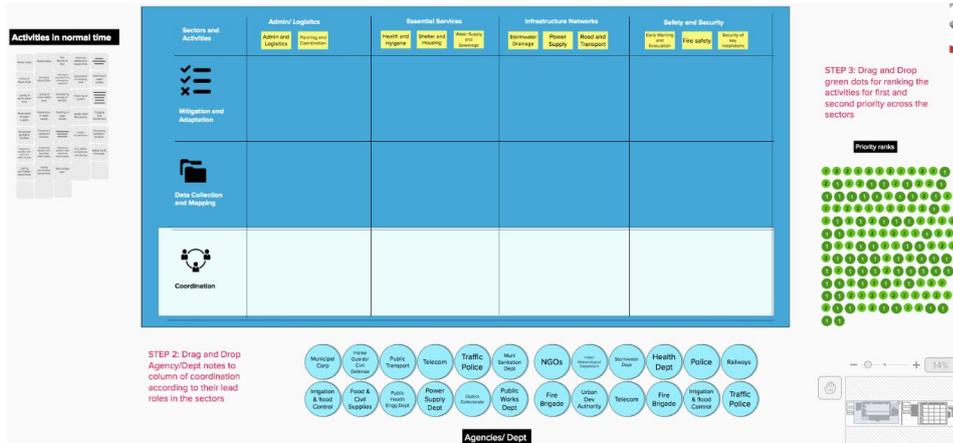
-  **Add sticky notes** by double clicking on the mural
-  **Add text and other elements** by dragging them from the sidebar
-  **Add images** by dragging them in from your computer
-  **Add links and other files** by pasting them into the mural (Ctrl + V)

Steps Involved

The activity is divided into two parts: 1) Normal time, where focus is on preparedness and capacity building activities in normal time, and 2) Emergency phase, where focus is on response, relief, and recovery activities.

Exercise 1A: Agencies and their roles in normal time.

Figure 8 Layout of first part of exercise



This exercise is designed to identify roles and responsibilities for various departments and agencies in normal time, for preparedness and capacity building for flood management, and to prioritise actions

The matrix consists of thematic sectors on the left column and processes of flood management related to normal times, in the top row.

These thematic sectors have further segments denoted by yellow notes. E.g., the first sector of "admin and Logistics" has two segments: admin and logistics, and planning and coordination.

There are three columns- Mitigation and Adaptation, Data collection and Mapping, and Coordination.

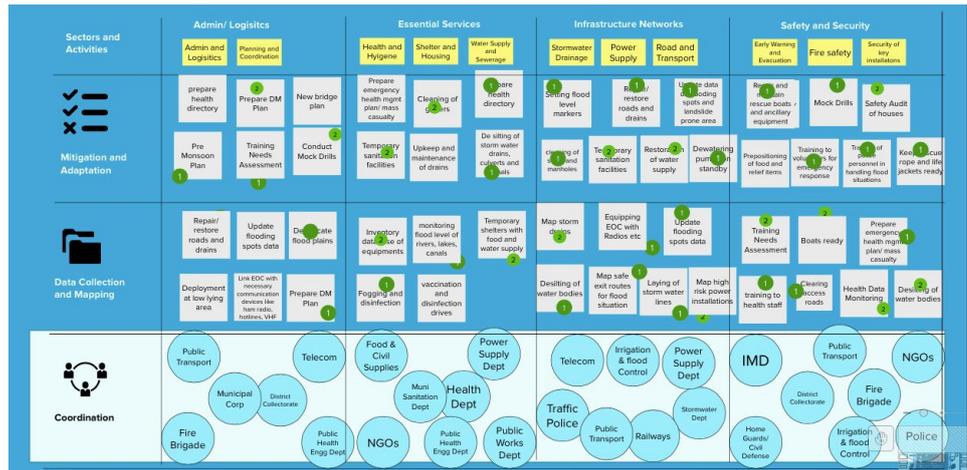
There are several 'activity notes' with different activities/tasks on right side of matrix. These notes are also available on bottom left corner for easy access. Below the activity notes on right side, are the circles marked with names of different agencies involved in urban flood management, as given in SOP for Urban Flooding by MoHUA, earlier called Ministry of Urban Development (MoUD). We will call these circles as 'Agency tags'.

Below the agency tags are small green circle dots numbered 1 or 2. These are the 'priority dots' for activities.

The exercise is subdivided in three parts:

- a. Participants need to drag and drop activity notes to the row/column matrix, which they think is appropriate. These notes are meant for the first two columns of Mitigation and Adaptation, and Data Collection and Mapping processes. (The third column of Coordination should only be used for "agency tags"). Blank notes can be used to come up with additional activities. For example, note of "Pre-Monsoon Plan" can be put in the first box of the matrix which denotes the 'Admin and Logistics' sector and process of 'Mitigation and Adaptation'. Likewise, all the activity notes can be placed in the appropriate cells of the matrix.
- a. Once the activities are arranged in the first two columns, participants can move 'Agency Tags' to the third column "Coordination". Here, agencies which will be involved in various activities of that sector should be placed in one cell of the column. Likewise, all the sectors will be assigned different agencies.

Figure 9 On completion of first part of exercise



a. Once we have activities and agencies arranged in the matrix, participants can move green dots to prioritise activities in each sector. Dot with number 1 is for the highest priority and dot with number 2 is for second or low priority.

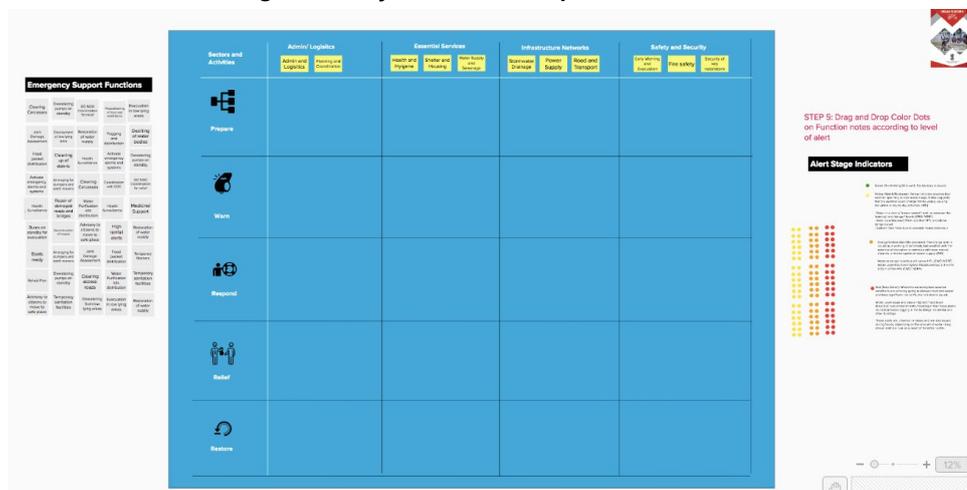
After all three activities, we get a clear picture of roles and responsibilities of various agencies in different processes of flood management in normal times. These are basically preparedness and capacity building activities to be done before the onset of monsoon. Then we move to the second part of the exercise which is focused on emergency support functions for flood management.

Exercise 1B: Emergency Support Functions and Colour Coded Alerts

This exercise aims to identify phase-wise emergency support functions in different sectors for flood management and prioritise actions according to colour coded alerts issues by administration/ government.

In this exercise, the matrix consists of sectors in the rows similar to Exercise 1A. However, the columns indicate five phases of emergency response, i.e., prepare, warn, respond, relief and restore. On the right side are notes of 'Emergency Support Functions' (ESFs). And below these notes are the colour coded dots of yellow, orange and red. These dots represent alert stages, which are described further below in the canvas.

Figure 10 Lay out of second part of exercise

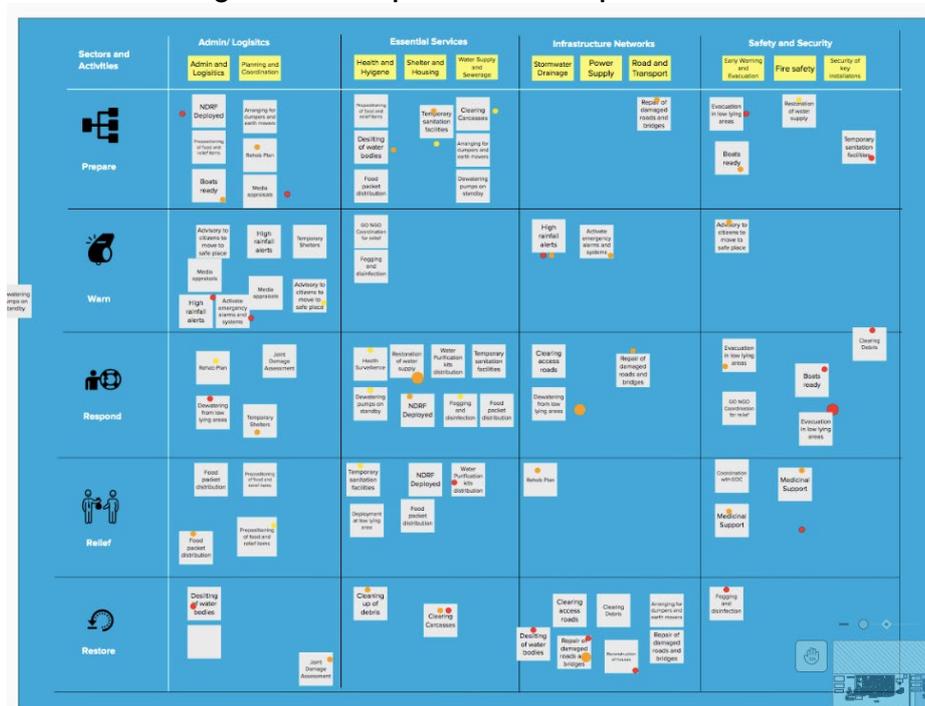


This exercise has two sub parts.

- Participants move these ESF notes to appropriate matrix. For example, the function of temporary sanitation facility can be moved to column of 'relief' phase and row of essential services. Once all the ESFs are arranged in the matrix, we can move on to the second part of the exercise. Before that, the facilitator will explain the colour coded alert indicators in detail.
- Participants can now put colour coded dots, representing the alert level on each ESF note. For Example, deployment of NDRF may be on the highest alert stage- Red, while pre-positioning of food items may be started at orange alert stage.

However, these allocation of alert stages will need discretion from the authorities in a real case scenario, as there are no watertight compartments in either phase of flood management or alert warning mechanism. These functions may overlap in one or more phases or on one or more alert indicators.

Figure 11 On completion of second part of exercise



Lastly, summarizing the learnings from both exercises, participants gain more clarity on activities and functions of different agencies in different phases and prioritizing the same. This leads to the development of effective SOPs where all actors are clear about their roles and responsibilities and how to coordinate with others.

Key Learnings

- Flood management functions are applicable to both normal time and emergency time
- Preparedness at normal time will make emergency time response more effective
- Understanding of SOP by different stakeholders helps in getting clarity of roles and coordinate in effective manner.

Key Takeaways

- Knowledge about different stakeholders and their roles at various stages of flood management
- Various normal time and emergency time functions of ULB and other agencies
- Development and application of SOPs for flood management for ULBs.
- Cities can start the engagement process with different stakeholder along with

Section 3:

Storm Water Management in the Indian Planning System

Key content:

- Institutional Framework and arrangements
- National / Local Policies and Guidelines

Learning goals:

- To understand Institutional Framework and arrangements for Flood management in India
- To know National / Local Policies and Guidelines for flood management in India

Introduction

Disaster management in India is the responsibility of respective state governments. The central government's role is to provide technical and financial aid to state governmental units. Central agencies do not step in and take over a situation, but stay in the background to provide general guidance, financial support, technical assistance, and coordination across governmental units.

Guidelines on Disaster management and flood management

The National Government issues policies and guidelines from time to time for streamlining and strengthening disaster preparedness at all levels. A partial list of guidelines issued by the Union Government on flood management includes:

- National Disaster Management Act, 2005
- National Guidelines on Flood Management, 2008
- National Policy on Disaster Management, 2009
- National Guidelines on Urban Flood Management, 2010
- National Water Policy (1987, 2002, 2012)
- National Disaster Management Plan, 2016

The Guideline on Flood issued by the National Disaster Management Authority (NDMA) in the year 2008 was the first comprehensive document to provide direction for planning and developing flood mitigation capacities at various levels. This included recommendations on structural and non-structural measures, including strengthening/revising flood forecasting and early warning systems, flood proofing of new developmental projects, building knowledge-skill-abilities (KSA) through awareness, education and training, improving compliance regime and flood emergency response capabilities at various levels (NDMA, 2008).

NDMA delinked urban flooding from the subject of (riverine) floods and channelized its efforts to come up with separate guidelines for it, as they understood that strategies on flood disaster management largely focused on riverine floods, which were specific to rural areas. The National Guidelines on Urban Flood Management, issued in 2010, provides a comprehensive elaboration on the steps to be taken by various stakeholders for enhancing national urban flood resilience. The national guidelines precisely define the respective roles of key players including Ministry of Housing and Urban Affairs, the Indian Meteorological Department (IMD) and the Central Water Commission (CWC) (NDMA, 2010).

CWC and MoHUA are charged with responsibilities associated with flood management in general and urban flood in particular. CWC holds the general responsibility of initiating, coordinating and furthering consultation with state governments and initiating schemes for the control, conservation, and mutilation of water resources in the respective state for the purpose of flood risk management, irrigation, drinking water supply and waterpower generation.

In addition to its other responsibilities, MoHUA is also mandated to be the nodal agency for flood management, tasked with establishing the urban flood cell I the ministry; state nodal departments and ULBs and facilitate urban flood risk assessment, forecasting and warning both at the national level and state/UT levels through the required mechanisms (NDMA, 2010).⁴

Statutory Provisions about Flood Management⁵

The subject of flood control, unlike irrigation, does not figure as such in any of the three legislative lists included in the Constitution State list, Union list and concurrence list of India. However, drainage and embankments, are two of the measures specifically mentioned in entry 17 of List II (State List), reproduced below:

"Water, that is to say, water supplies, irrigation and canals, drainage and embankments, water storage and water power subject to the provision of entry 56 of List I (Union List)."

Entry 56 of List I (Union List) reads as follows:-

"Regulation and development of inter-State rivers and river valleys to the extent to which such regulation and development under the control of the Union is declared by Parliament by law to be expedient in the public interest."

It may thus be seen that the primary responsibility for flood control lies with the States. A number of States have already enacted laws with provisions to deal with matters connected with flood control works. Therefore, the subject "flood management" falls within the purview of the States. The schemes for flood control are planned, investigated and implemented by the States as per priorities within the State with their own resources and the role of central government is technical, advisory, catalytic and promotional in nature.

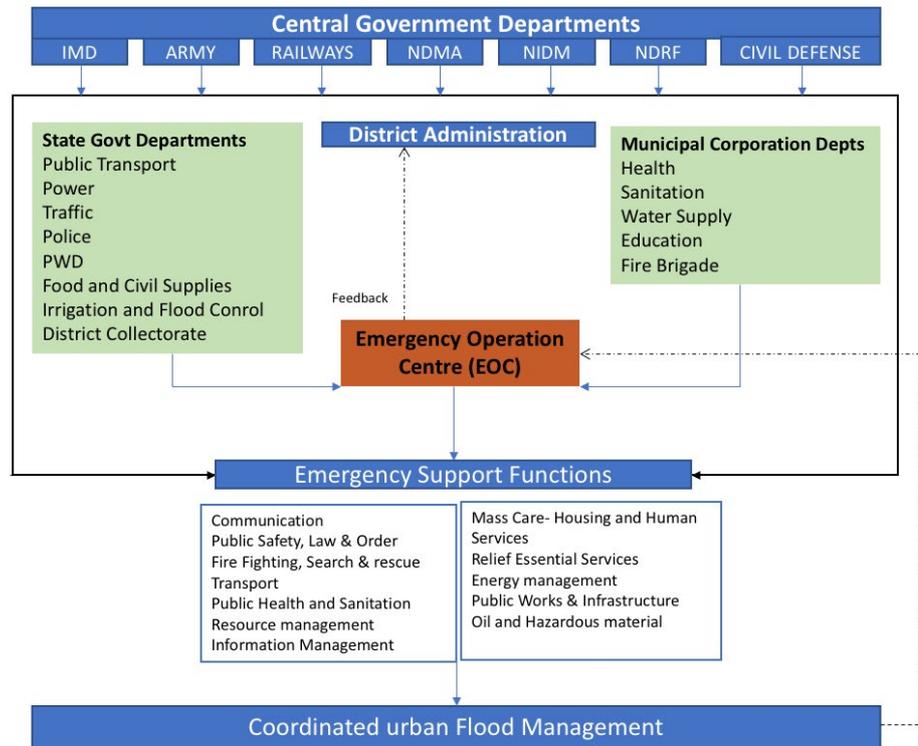
⁴ National Guidelines on Urban Flood Management, NDMA, 2010

⁵ <https://www.geographiaias.com/blog/2018/10/14/disaster-management-in-india-flood-hazard/>

Institutional Mechanism for Urban Flooding Management in India

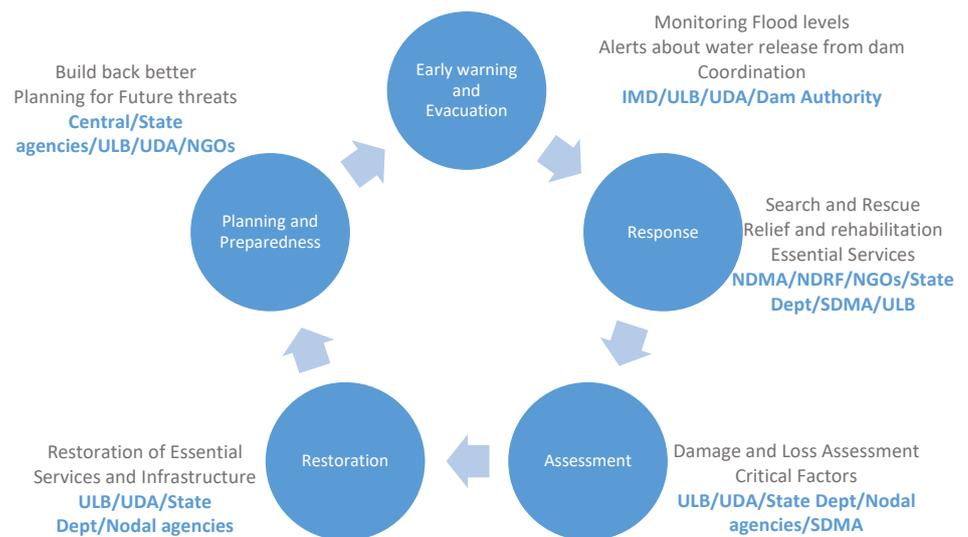
An overview of institutional mechanism for urban flooding, including agencies at National, State and Local level can be depicted as follows

Figure 12 Institutional Mechanism for coordination of Urban Floods (Source: NDMA)



- Below give figure depicts phase-wise roles and functions of different agencies in a flooding event (disaster)

Figure 13 Phase-wise roles of agencies in flood management



Key action points from NDMA guideline on urban flood management 2010

According to guideline, a standing mechanism to build and establish an integrated town/city-specific Urban Flood Disaster Management (UFD) Framework should be in place.

At national level following agencies are involved at different phases

- National Disaster Management Authority (NDMA)
- Ministry of Housing and Urban Affairs (MoHUA)
- National Remote Sensing Centre (NRSC)
- Central Water Commission (CWC)
- Survey of India (SoI)
- Related Ministries/ Departments /Agencies,
- States, and
- Experts from Indian Institute of Technology (IIT), other Institutes of national importance and service/ professional bodies

Figure 14 Key Components of NDMA guideline on urban flood management 2010

| Agencies and mechanisms | Provisions | Out Reach |
|---|---|---|
| <ul style="list-style-type: none"> • Ministry of Urban Development • Urban Flooding Cell • 'Local Network Cell • Automatic Rainfall Gauges (ARGs) • Protocol for Sub-Division of Urban Areas • Urban Flood Early Warning System • Establish Incident Response System (IRS) | <ul style="list-style-type: none"> • Catchment as basis for Design of Stormwater Drainage System • Watershed as basis for all Urban Flood Disaster Management Actions • GIS Mapping for all 2325 Class I, II and III cities • Contour Mapping at 0.2 - 0.5 m interval • GIS Based Inventory • Stormwater Drainage designed with Runoff Coefficient upto 0.95 • Desilting of drains before monsoon • Rainwater Harvesting in buildings | <ul style="list-style-type: none"> • Involve Resident Welfare Associations (RWA), Community Based organisations (CBOs) in monitoring • Removing encroachment and facilitating resettlement • Capacity development of stakeholders • Public awareness campaigns • Involvement of public representatives in awareness generation |

At State level, a State Level Guidance, Monitoring and Approval Mechanism for Urban Flood Disaster Management (UFD) should involve a consortium of local level technical institutions, along with agencies such as

- Ministry of Housing and Urban Affairs (MoHUA)
- States and Union Territories (UTs)
- State Remote Sensing Application Centres (SRSACs)
- Urban Local Bodies (ULBs)

Each city /ULB should establish an Emergency Operations Centre (EOC) under Control of the District Commissioner/ District Magistrate / Municipal Commissioner.

Key functions of EOC in managing urban flooding would be

- Coordination with line agencies
- Policy Making and plan preparation including action plans as per SOP
- Direction and Monitoring of Operations Management
- Information gathering and record keeping
- Preparation of web enabled resource inventory under India Disaster Resource Network (IDRN)
- Public Information and Citizen updating
- Resource Management
- Reporting

Section 4: Case Work – Learning From Case Study Experience

Key content:

- Bhubaneswar case study – applying Urban Design Thinking

Learning goals:

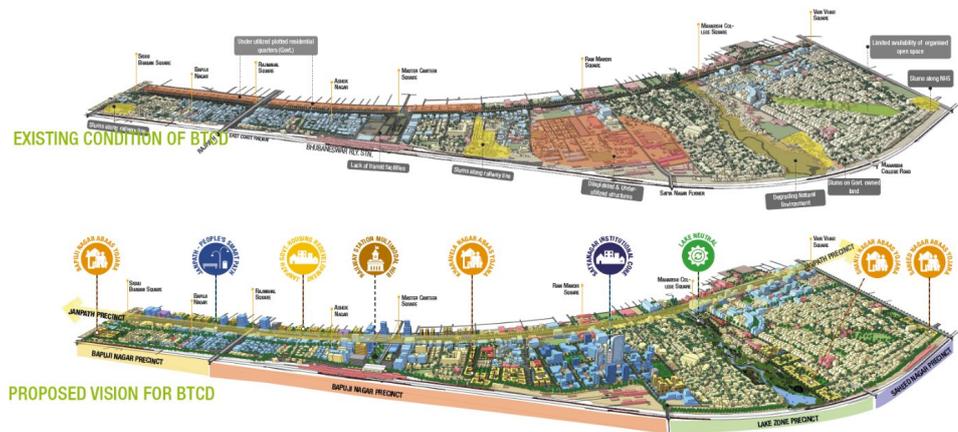
- Learn about an innovative approach
- Get to know a successful case to improve SwM conditions

As part of the CSC project, an urban restoration area in Bhubaneswar was chosen to apply an innovative approach in real city conditions.

Case study context:

“Development of Lake Zone III, also known as Lake Neutral Project, is one of the projects proposed as part of urban ecological restoration of Drain No. 10 within BTCD area. The Drain No. 10 has been taken up by Bhubaneswar Development Authority (BDA) for development of Bhubaneswar Lake Zone Project covering three zones of the drain [...].”

Figure 15 Proposed area-based development Bhubaneswar Town Centre District (BTCD)



Graphic: Bhubaneswar Municipal Corporation, 2015

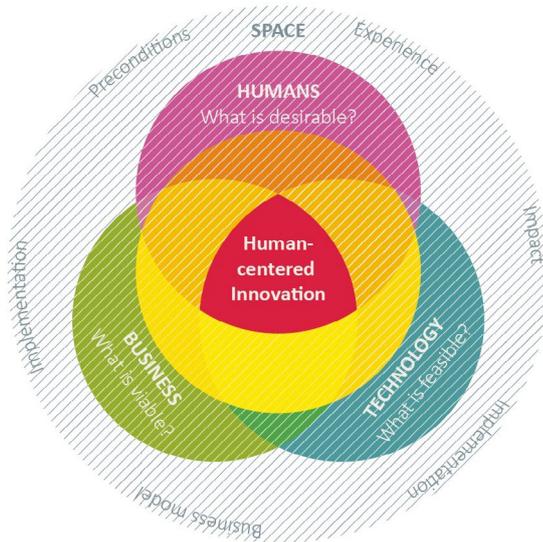
In order to better understand the situation on the ground, going beyond the build infrastructure and including human perspectives, the team used an approach called Urban Design Thinking. The method is based on a product innovation tool (called design thinking), which is adapted to the context of urban development.

The main concept of this iterative, stepwise approach is to put humans (inhabitants in this case) at the centre of all development considerations.

Step 1: The first step in the process was to gain a good understanding of the situation of the proposed area, including site visits and engaging with local residents through

various means such as interviews, surveys and workshops. Insight from phase 1 were then used in workshops to define a problem statement, based on a broad perspective. Two working groups of residents and experts addressed the challenge: how to develop Nayapalli as a 'sponge city' role model for Bhubaneswar?

Figure 16 Spheres of innovation



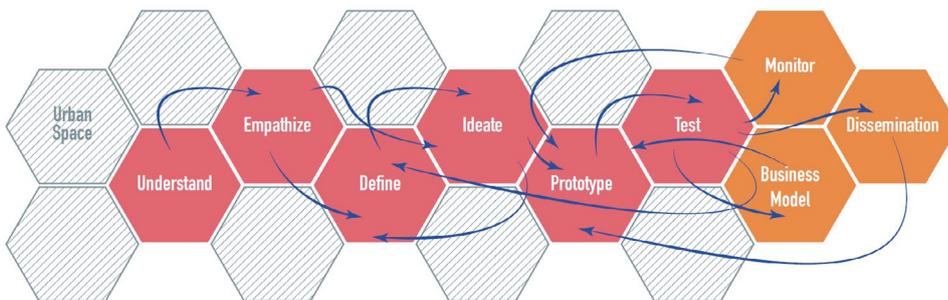
Graphic: TU Berlin, Marcus Jeutner, 2016

Specifically, the guiding questions were:

#1 at building level: How to hold and make use of rainwater on private plots?

#2 on open spaces: How to hold water in open spaces by water-sensitive design of open spaces?

Figure 17: Steps of the Urban Design Thinking Method



Graphic : TU Berlin, Marcus Jeutner, 2015

Based on the results of this second phase, further steps included formulation of a vision statement, a value proposition and defining specific layers of intervention. These will provide the base to test practical solutions to the previously identified problems (e.g., private water discharge), asses the success of such measures and either roll out the **solution throughout the area or refine the solution if needed.**⁶

⁶ For more information on the project and the methodology, please contact project lead Mr. Marcus Jeutner at m.jeutner@isr.tu-berlin.de

Step 2: Value Proposition

Proposed concepts in Nayapalli District are showcasing a scalable and sustainable approach of:

- Mitigating flooding at Iskcon Temple by retaining water in different types of open spaces
- Regulating urban microclimate, and recharging groundwater levels through green streets and activated open spaces
- Manifesting public awareness for environmentally conscious behaviour to reduce loitering in drainage system

Step 3: Vision Statement

The Nayapalli District should act as a pioneering example for integrated stormwater management by activating green public infrastructure to retain and distribute stormwater as well as infiltrate groundwater, mitigating flooding and enhancing microclimatic conditions.



Step 4: Layers of intervention

- Open Spaces
- Drainage system
- Green streets
- Public Awareness Campaign



Exchange Sessions

Key content:

- Experience from participants

Learning goals:

- Learning and suggestions from the audience

Direct Exchange between participants

Each day, one session is dedicated to the direct exchange between participants. These sessions provide an opportunity to network and make important contacts, as much as it is a peer-learning exercise. Since everyone participating in this training is to some extent a practitioner of SwM, it makes sense to showcase and share this practical knowledge among the entire audience.

The content of these sessions is always decided by the participants. It has been decided in advance if some participants are pre-selected to showcase their own work and receive comments and feedback, or if this will be done more spontaneously during the training and participants volunteer to share their experience. The exchange session might take form of a case clinic if an input has been prepared in advance.⁷

For facilitation purposes, most sessions will see participants separated into smaller groups of 4-5 people to enable an-depth learning and meaningful exchange within a short amount of time. In case the training includes participants from different regions with individual language requirements, translators will attend the sessions as well. Each group should take notes of the discussion results and be ready to share the same with the entire audience in the ensuing plenary session. Guiding questions for each session and some general engagement rules will be provided.

The guiding questions always follow this pattern:

- Question 1: What specific SwM projects exist in the participants' cities?
- Question 2: The group should agree on the 3 main reasons to engage with SwM
- Question 3: The group should identify the 3 main challenges related to SwM
- Question 4: The group should define the 3 main solutions to these challenges
- Question 5: The group should identify the 3 main benefits related to SwM
- Question 6: The group should identify the 3 main ways to ensure awareness of these benefits

⁷ https://www.presencing.org/files/tools/PI_Tool_CaseClinic.pdf

Reflection, OUTLOOK, and Feedback

Key content:

- A formal template to plan specific follow-up steps and set goals
- An informal exercise to set ambition
- Reflection exercise to consolidate the learnings from the training and provide feedback

Learning goals:

- Gain the tools to formulate an action plan and implement measures
- Reflect on the training, provide feedback and clearly formulate key take-aways

Outlook exercise: Easy action plan

This simple exercise the creation of a first action plan, before introducing a specific measure into a formal planning process. As with most project planning, the success of a SwM process depends on considering all necessary steps, the involvement of all important stakeholders and the right timing. This can serve as a first step to begin planning any urban green and blue project.

- first, identification what exactly should be done to realize a specific measure or project
- Second, identification who needs to be involved and engaged with early on
- Third, decision what exactly is the very first step for that particular task
- Fourth, definition of an overall timeline based on all necessary individual steps

Instructions:

Framework –the political responsible person or body has given the task to come up with ideas for better urban green. The indicators of the CSCAF indicate potential for improvement in the city. The report is due in a short time.

Possible Situation – Considering the learnings of this training and previous experience, one or several areas that should be addressed have to be chosen. What next steps should be taken to:

- Improve urban green planning in the city? or
- Initiate integrated urban green planning? or
- Start/improve urban green in a development project?

Exercise

1. Please choose one option and start to elaborate the first steps. Be as precise as possible.
2. Present your first steps to your colleagues and ask for feedback.
3. Identify the three most convincing arguments for SwM in the city.

Figure 18 First steps checklist ; own compilation

| Step | What exactly should be done | Who is responsible | Who else is involved | How to get started | When | Remarks, things to be considered |
|------|-----------------------------|--------------------|----------------------|--------------------|------|----------------------------------|
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| ... | | | | | | |

Reflection Exercise: Letter to my future self

A less formal approach to plan ahead and define some goals to work towards is to write a letter to your future self. A personal tone may be chosen, as well as writing in the style of a project report that summarizes the successful implementation of a plan to improve urban green. The template above may be used for brainstorming.

Such a letter can help define ambition with regards to SwM in the city, and a timeframe to achieve such goals. To create some level of public or peer pressure, the letter maybe shared within the planning department or other colleagues in advance. One option is to send the letter to yourself via email after a year (tooltip: <https://www.futureme.org/>), as a reminder in a calendar system, or to simply store it away for the appointed time.

Going back to the letter after the chosen time has passed (e.g., 1 year) helps to assess successes against the initial plans. If some parts did not work, reconsider what was initially planned and investigate the reasons for why it may not have worked this way.

The letter should contain certain elements:

Date in the future – decide on when the letter should arrive, depending on the type of action needed to achieve the defined goals. (e.g., 6 months to perform the CSCAF assessment, 1 year for implementing smaller projects, 5 years for major developments)

Goals –specify what the outcome to achieve is and how to get there. (e.g., advance one level on the CSCAF indicator on Flood/Water Stagnation and Risk Management by collecting all data required for a detailed risk assessment).

Actions – describe the activities that led to achieve the goals, and in which order they did occur. (e.g., in February, the new tree plantation plan was proposed to the council).

Next steps – describe how to move forward from previous success. What will be possible to achieve based on what has been built already?

Feedback Exercise

To solidify the learnings from this training, please briefly reflect on the content and structure of the sessions. This helps to identify specific learnings, where more information is needed and what may not be suitable for a particular situation. Sharing these reflections with the organisers serves to improve the training in the future.

An easy method to structure the reflection is the five-finger exercise (see figure 19). Each finger represents one aspect to consider, a full hand provides a comprehensive picture. Please write down your findings and share them with your colleagues and the organisers.

Thumb – thumbs up for something you really liked about the training.

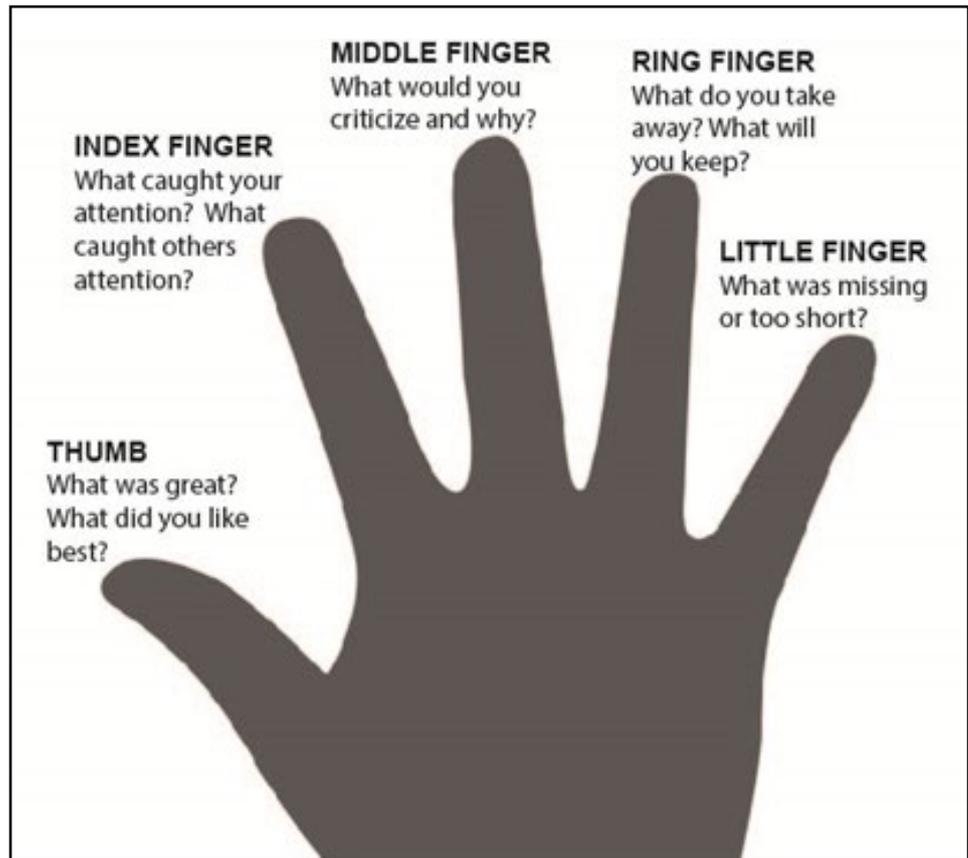
Index finger – point at something that you think was really important or surprising.

Middle finger – What did you not like or would like to challenge or criticise?

Ring finger – Define one specific aspect or practice you will integrate into your work in the future

Little finger – What did you miss or what has not been covered sufficiently?

Figure 19 : Five finger feedback method



Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

Climate Smart Cities Project
Second Floor, B-5/2
Safdarjung Enclave
New Delhi 110029, India

T + 91 4949 5353
F + 91 4949 5391
E giz-indien@giz.de
I www.giz.de

National Institute of Urban Affairs
(NIUA)

1st and 2nd Floor, Core 4B
India Habitat Centre,
Lodhi Road
New Delhi 110003, India

T + 91 11 2464 3284
F + 91 11 2461 7513
E niua@niua.org
I www.niua.de

German Institute of Urban Affairs
(Difu)

Zimmerstraße 13
10969 Berlin
Germany

T + 49 30 390010
F + 49 30 39001100
E difu@difu.de
I www.difu.de



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