

# Sustainable River-based Urban Planning *for Sub-Saharan Africa:* **GUIDELINES**



URBAN NATURAL ASSETS FOR AFRICA

## *Rivers for life*

Preliminary version developed for the UNA Rivers City-to-City Learning Exchange.

Please find the final version here: [www.cbc.iclei.org/una-rivers-guidelines](http://www.cbc.iclei.org/una-rivers-guidelines)



# SUSTAINABLE RIVER-BASED URBAN PLANNING FOR SUB-SAHARAN AFRICA: **GUIDELINES**

*Preliminary version*

Cape Town, May 2018

## **All rights reserved © 2018**

ICLEI – Local Governments for Sustainability – Africa Secretariat  
(ICLEI Africa) /ICLEI Cities Biodiversity Center (ICLEI CBC)

Knowledge Park III, Century City, Cape Town, South Africa  
[www.cbc.iclei.org](http://www.cbc.iclei.org)

## **ACKNOWLEDGEMENTS**

### Project Funder:

The Swedish International Development Cooperation Agency  
(Sida) through SwedBio at the Stockholm Resilience Centre,  
Stockholm University

### Project Coordinator:

ICLEI – Local Governments for Sustainability – Africa Secretariat  
(ICLEI Africa) /ICLEI's Cities Biodiversity Center (ICLEI CBC)

## **AUTHORS**

Jessica Kavonic, Professional Officer (Climate Change & Urban  
Biodiversity), ICLEI Africa & ICLEI CBC; Tarryn Quayle,  
Professional Officer (Climate Change & Water), ICLEI Africa;  
Claudia Schröder, Officer (Research & Communications), ICLEI  
Africa & ICLEI CBC

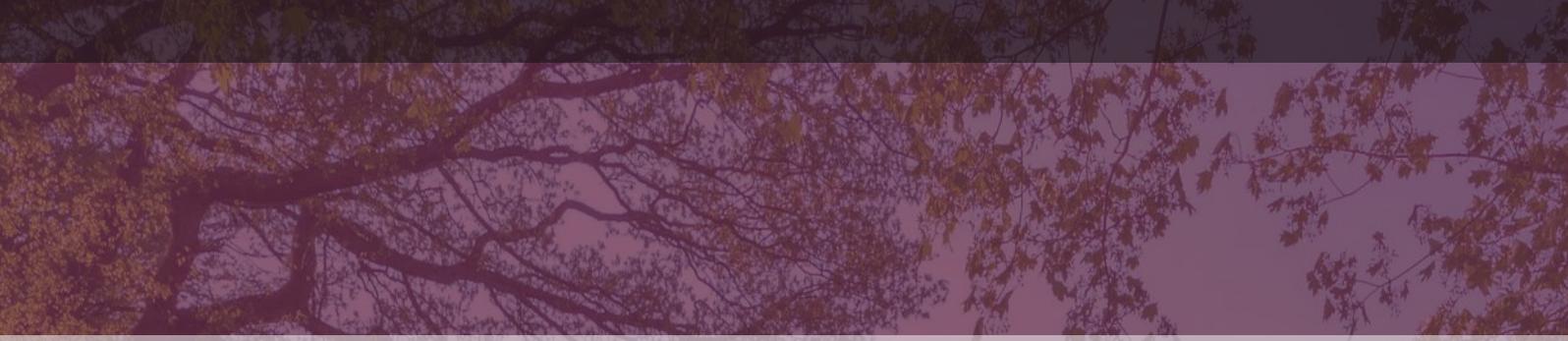
## **CONTRIBUTORS**

MCA Urban and Environmental Planners & Aurecon

Design & Layout: Thea Buckle

Illustrations: Duven Diener

This public should be cited as: ICLEI – Local Governments for  
Sustainability's Cities Biodiversity Center. 2018. *Sustainable  
River-Based Urban Planning Guidelines for Sub-Saharan Africa*.  
Cape Town, South Africa.





# Preface



The **Urban Natural Assets for Africa: Rivers for Life** (UNA Rivers) project, a four-year project (2016 – 2019) funded by the Swedish International Development Cooperation Agency (Sida), through SwedBio at the Stockholm Resilience Centre, and implemented by **ICLEI – Local Governments for Sustainability – Africa Secretariat** (ICLEI Africa), aims to mainstream biodiversity and ecosystem services into local land use planning and local government decision-making processes around urban river systems through better coordination and community based activation. Improved local planning for urban rivers contributes to strengthened sustainability, resilience to climate change, enhanced human wellbeing, and poverty alleviation.

Engagement with stakeholders in all project cities has revealed that planners in local government need assistance with planning for natural assets. It became apparent that the integration of rivers and river protection into urban planning is not adequately addressed in many sub-Saharan African cities. As a result, the need for this guideline arose.

The process of drafting this document attempted to use innovative practices, such as co-production, with an explicit aim of taking into account the local context in sub-Saharan African cities as well as co-design of the final product.

Stakeholders from various local governments across sub-Saharan Africa were invited to the 2017 LoCS4Africa congress (Local Climate Solutions for Africa) hosted by ICLEI Africa in Johannesburg in March 2017. A session specifically tailored towards the development of this guideline was organised. The discussions, recommendations and findings that resulted from this session have formed the basis of the principles and concepts outlined within this document. This guideline is one of the key outputs of the UNA Rivers project, with the aim of assisting planners, government decision makers and other stakeholders to better plan for and with rivers in sub-Saharan Africa.



# Who should use this report?

This document is produced for public officials, predominantly land use and environmental planners, who work in larger African cities, specifically those who have a focus on the natural environment or a mandate for greening or riverine restoration, planning, or management, whether in a political, engineering, technical or planning capacity. The aim is to arm practitioners with the ability to engage with rivers and include riverine considerations within their core competencies and planning processes. A further aim is to inform decision making among development practitioners in African cities about the need to consider rivers in decision making processes. It will be used to both respond to applications and the current contextual realities and guide strategic forward planning to improve the sustainability of African cities into the future.

*"Rivers have always been central to human development and have provided critical services up on which society depends. Urban rivers are critical for both development and livelihoods in cities, shaping how our cities grow and sustaining human well-being. Planning for rivers as well as planning with rivers underpins our ability to tackle the future challenges of urbanisation that face African cities. Developing integrated and transformative approaches to mainstreaming rivers and their associated ecosystem services is an importance paradigm shift needed to build dynamic and resilient cities."*

– Kobie Brand, Regional Director,  
ICLEI Africa



# ICLEI - Local Governments for Sustainability



 [iclei-africa@iclei.org](mailto:iclei-africa@iclei.org)  
 [www.africa.iclei.org](http://www.africa.iclei.org)  
 @ICLEIAfrica

## URBAN NATURAL ASSETS FOR AFRICA RIVERS FOR LIFE

 [biodiversity@iclei.org](mailto:biodiversity@iclei.org)  
 [www.cbc.iclei.org](http://www.cbc.iclei.org)  
 @ICLEICBC

ICLEI - Local Governments for Sustainability is the leading global network of over 1,500 cities, towns and regions committed to building a sustainable urban future. The ICLEI Africa Secretariat, the regional office for ICLEI in Africa, collaborates closely with the global ICLEI network and other regional offices around the world, in sharing tools, materials, strategies and good practice specifically designed and implemented at the local level. In addition, the Africa Secretariat is home to the ICLEI Cities Biodiversity Centre (CBC) which has ICLEI's mandate to engage globally with local governments on biodiversity-related matters. The centre's activities are based on promoting the concept of natural capital and addressing the degradation of ecosystem goods and services that underpin human well-being.

ICLEI CBC, together with project partners SwedBio and the Stockholm Resilience Centre, have designed and implemented a cutting edge programme – Urban Natural Assets for Africa (UNA) – to support the local implementation of the Aichi Biodiversity Targets to conserve and protect nature in cities in sub-Saharan Africa.

The UNA programme encompasses previous and current UNA projects such as the Urban Natural Assets for Africa (UNA Africa) project (2014 – 2015) which was successfully implemented in close collaboration with SwedBio. The UNA Africa project identified key themes and city needs (linked to challenges and opportunities around natural assets in the project cities) and therefore paved the way for the current Urban Natural Assets for Africa: Rivers for Life (UNA Rivers) project.

UNA Rivers aims to mainstream nature-based solutions into land-use planning and local government decision-making processes relating to urban river systems. The project is doing this through improved coordination and community-based activation, with the aim of building sustainability and resilience at the local level, for the enhancement of human well-being and poverty alleviation. The project works closely with the cities of Addis Ababa, Ethiopia; Dar es Salaam, Tanzania, Lilongwe, Malawi and Entebbe and Kampala, Uganda.

This guideline document is one output of the UNA Rivers project and arose from a needs assessment with all project cities.

**For more information on ICLEI Africa visit [www.africa.iclei.org](http://www.africa.iclei.org) and for more information of the UNA Rivers project visit <http://cbc.iclei.org/project/una-rivers-life/>**



# Table of contents

<b>PREFACE</b> .....	<b>i</b>
Who should use this report?.....	ii
<b>EXECUTIVE SUMMARY</b> .....	<b>vii</b>
Acronyms and abbreviations.....	ix
<b>1. INTRODUCTION</b> .....	<b>1</b>
Importance of rivers for healthy cities.....	1
The need for integrated planning.....	3
<b>2. UNDERSTANDING THE SYSTEM</b> .....	<b>7</b>
Setting the scene.....	9
Strategic approach.....	11
<b>3. CONCEPTUAL FRAMEWORK</b> .....	<b>15</b>
Planning with rivers as part of a nested system.....	15
Green, grey and blue Infrastructure.....	17
Key challenges in managing and planning for and with rivers.....	19
Structure of the guideline.....	22
Key principles.....	24
<b>4. APPROACH 1: IMPROVING RIVER MANAGEMENT: PLANNING FOR RIVERS</b> .....	<b>27</b>
The river management planning process tool.....	27
Dealing with river degradation.....	37
Find innovative ways of funding projects.....	38
Broad river management planning process at a local level.....	40



<b>5. APPROACH 2: RIVER-BASED URBAN PLANNING: PLANNING WITH RIVERS</b> .....	<b>43</b>
Integrated river-based land use planning .....	43
Dealing with informality through integrated service delivery and infrastructure planning .....	47
Integrated river-based urban planning interventions .....	50
Dealing with degradation through river-based infrastructural planning solutions .....	53
Improving policy and spatial integration .....	56
Make use of an interdisciplinary approach .....	58
Facilitating knowledge transfer .....	58
<b>6. MAINSTREAMING THE INTEGRATED APPROACH</b> .....	<b>65</b>
Mainstreaming policy integration .....	65
From planning to implementation .....	66
Capacity building .....	68
Participatory planning: integrating land use stakeholder needs .....	69
A flexible approach to planning within a complex system: scenario planning as a tool for decision making .....	72
Balancing competing interests/needs (trade-offs) .....	76
Facilitating meaningful stakeholder engagement .....	76
Creating an enabling environment .....	80
Understanding and improving institutional capacity .....	80
Financial considerations: accessing financing .....	82
Monitoring and evaluation: a culture of reflection and learning .....	83
<b>CONCLUSION</b> .....	<b>85</b>
<b>GLOSSARY</b> .....	<b>86</b>
<b>REFERENCES</b> .....	<b>89</b>







# Executive summary

The Sustainable River-based Urban Planning Guidelines for Sub-Saharan Africa aims to provide planners, and those working with rivers in a sub-Saharan African city context, with a strategic, practical and adaptive framework that outlines concepts around planning for and with rivers in cities for the purposes of integrating and mainstreaming river-based considerations into existing planning and developmental processes.

Rivers (and their associated water ways) play a critical role in African cities. Rivers perform a life sustaining role in supplying the ecosystem services on which many in African cities depend. As a result, maintaining and improving the quality of these ecosystem services, through integrated river management (planning for rivers) and river-based land use planning (planning with rivers) is imperative. Safeguarding rivers and improving the planning thereof can assist local officials to deal strategically with, and mitigate possible negative impacts of, the challenges that are faced in this context. For example, the integrated planning of rivers that may help contribute to the resilience of local livelihoods, can also contribute to improved climate change adaption and mitigation, and can improve the overall sustainability of African cities.

However, despite the growing recognition of the importance of rivers as a crucial part of the urban system, cities in Africa are faced with rapid rates of urbanisation and in many cases subsequent development and settlement patterns often reflect a lack of sufficient planning both for and with rivers. It is clear that the benefits of healthy rivers for African cities, achieved through ongoing strategic and integrated planning, far outweigh the negative impacts of a “business-as-usual” approach. A novel approach to planning and dealing with old challenges within African cities is needed – one that is integrated, flexible, context specific and responds to the needs of the city and its people.

African decision makers need to plan and design their cities so that they are able to cope with the immense challenges that urban environments currently are and will be subject to in the next 30 years. Decision makers will need to start thinking differently to the way they currently engage and plan their cities. This new way of thinking will require both a proactive and reactive approach. Although the former is advocated for, the current reality is such that reactive planning is also essential. In planning for both the current reality and future of rivers in the African urban context, a strategic and integrated approach is necessary.

The guideline presents ideas around both a strategic river management approach to planning for rivers and an integrated approach to planning with rivers. The two approaches form the basis for





idea sharing and tools for effective river management, river-based urban and land-use planning, and river-based decision making in African cities.

There are two possible ways to achieve this. One is an environmentally focused approach, whereby the river is the main element of the plan. The other is an integrated approach, whereby the river is seen as one element within a complex system. The guideline seeks to link these two approaches and show how each approach, or preferably both approaches, may begin to enable the shift in mindset that is needed to allow decision makers to mainstream the planning for and with rivers in the African context.

This guideline hopes to assist those working with rivers in African cities, by planting “seeds of thought” through presenting an approach to, and tools for, integrated planning processes. It aims to challenge decision makers to be both proactive and strategic. It presents ideas for working within a given context, which includes the need to creatively deal with what is already on the ground. Furthermore, it provides support for the mainstreaming of ideas around improved river management into existing plans and processes.

Key principles to inform river planning were co-produced as part of developing this guideline. These include (a) ensuring an integrated approach in terms of policy and spatial integration (see Glossary); (b) ensuring an integrated approach in terms of stakeholders and land use; (c) using a systems thinking approach (see Glossary); (d) encouraging flexible and proactive planning and policy systems; (e) integration of ecological, social and economic needs and; (f) making use of an inter-disciplinary and inter-departmental approach. Steps to undertake this integrated approach are presented, as well as ideas around how to facilitate an enabling environment to undertake planning for and with rivers.

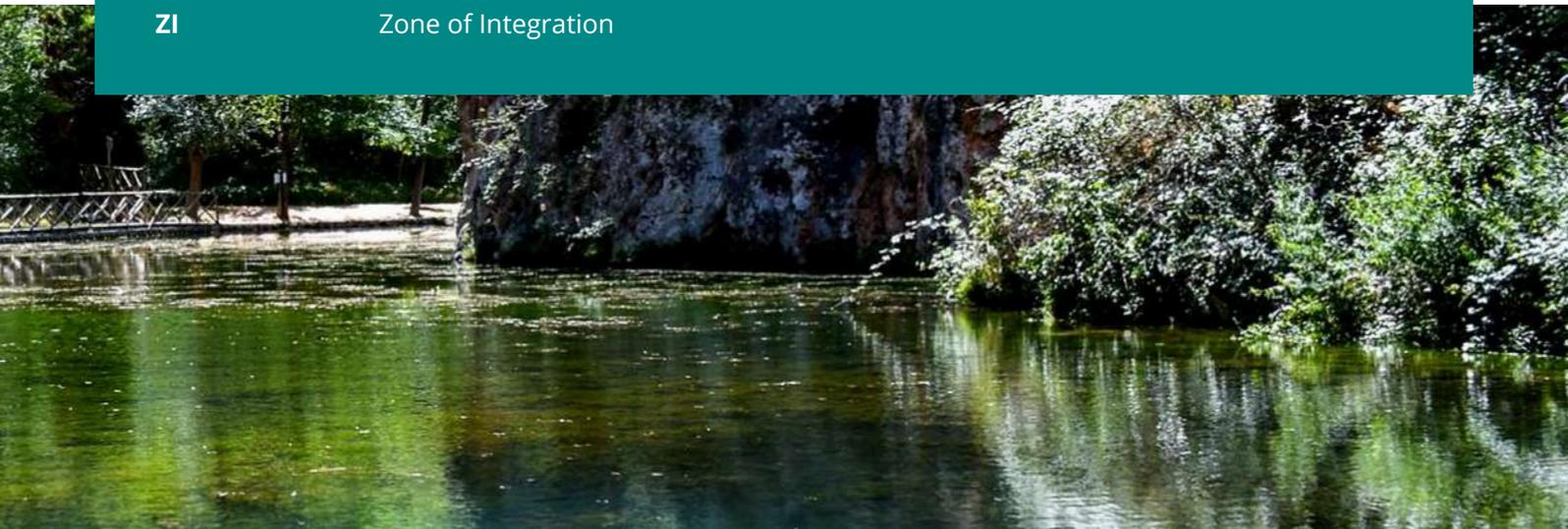
The guideline is not prescriptive and does not present a single concept or process for planning with rivers that is comprehensive and all encompassing. Instead, it seeks to explore broad principles that are applicable and adaptable to a variety of African contexts. It is intended that the sustainability of this guideline will be such that it will be applicable beyond just the current moment, or the length of ICLEI’s UNA project in the pilot cities. Instead, it is intended to be applicable to a wide variety of contexts, both for now, but also into the future.





# Acronyms and abbreviations

<b>CBC</b>	Cities Biodiversity Centre
<b>CBD</b>	Convention of Biological Diversity
<b>CEPA</b>	Communication, Education and Public Awareness
<b>CSO</b>	Community Society Organisation
<b>ESD</b>	Ecologically Sustainable Development
<b>FAO</b>	Food and Agricultural organisation of the United Nations
<b>GIS</b>	Global Information Systems
<b>ICLEI</b>	ICLEI – Local Governments for Sustainability
<b>M&amp;E</b>	Monitoring and Evaluation
<b>NGO</b>	Non-Governmental Organisations
<b>PES</b>	Payment for Ecosystem Services
<b>SDG</b>	Sustainable Development Goals
<b>Sida</b>	Swedish International Development Co-operation Agency
<b>UGI</b>	Urban Green Infrastructure
<b>UNA</b>	Urban Natural Assets for Africa
<b>UNA Rivers</b>	Urban Natural Assets for Africa: Rivers for Life
<b>UN</b>	United Nations
<b>UNCCD</b>	United Nations Convention to Combat Desertification
<b>UN-Habitat</b>	United Nations Human Settlement Programme
<b>USAID</b>	United States Agency for International Development
<b>WWF</b>	World Wildlife Fund
<b>ZI</b>	Zone of Integration







# 1. Introduction



## 1.1 Importance of rivers for healthy cities

Rivers and river corridors support human activity, development and community cultures around the world. Some of the largest civilisations settled along rivers, and cities have continued to develop along riversides due to the economic, transport and fresh water resources they provide (Phong, 2015; Abshirini & Koch, 2016). Rivers are considered to be critical in sustaining human livelihoods as they provide a significant number of “ecosystem services” to humans (CEPSA, 2008). Ecosystem services are defined by Aylward et al. (2005) as being the beneficial functions people obtain from ecosystems; and the goods and the products from these services. Ecosystem services can be classified into four main categories, namely provisioning, regulatory, supporting and cultural services (Table 1). Many communities still wholly depend on the ecosystem services provided by rivers to support their livelihoods and maintain their sense of cultural identity. As such, maintaining or rehabilitating riverine function and integrity is critical to ensuring sustainable development and continued support for livelihoods. Natural assets and the ecosystem services they provide are also critical in creating resilient cities by protecting against and reducing the impact of shocks and disasters. Nature provides natural barriers to disasters, such as forests reducing flood risks, mangroves providing coastal protection against storm surges and trees providing shelter from wind damage (UNISDR, 2012). Therefore, protecting the natural asset base is important in aiding communities and cities to prepare and deal with sudden and long-term climate changes.

Rivers not only play an ecological function in cities but river systems also have an impact on the spatial form of a city and can contribute either positively or negatively to city structure and function (Abshirini & Koch, 2016). River systems impact land use patterns in cities; where development does and does not take place; the location of different economic opportunities in a city; and the sense of place that a city provides. Planning for green corridors in a city can be based upon river systems. In densely populated African cities green open space is often scarce. Rivers and riversides present the opportunity to fill this gap, providing safe, multifunctional spaces that can meet the health and recreational needs of many segments of the population.

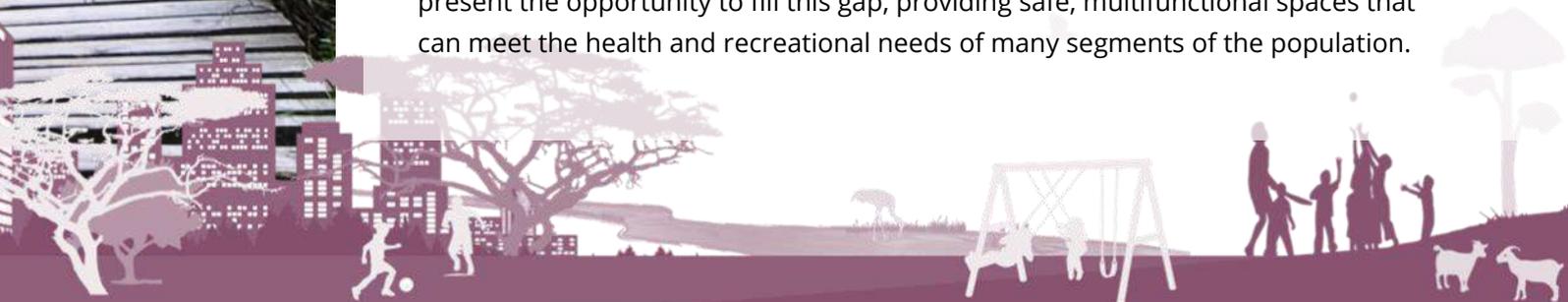


Table 1: Ecosystem services provided

Category of Function	Riverine Function	Goods and Services	Description
Production	Subsistence	Food	Conversion of solar energy into edible plants and animals.
		Water supply	Filtering, retention, and storage of fresh water. Infiltration of surface water that helps maintain baseflow. Water supply and ground water recharge.
		Raw materials	Conversion of solar energy into biomass for human construction and other uses.
Regulation	Flood Attenuation	Disturbance prevention	Influence of ecosystem structure on environmental disturbances such as, flood attenuation, ice damage control, stream bank stabilisation, maintaining channel morphology and biological control mechanisms.
		Water regulation	Role of riparian cover in regulating runoff and stream flow. Infiltration and maintenance of stream flow.
Regulation	Sediment Trapping	Filtration	Riparian buffers filter sediments, nutrients, pathogens, pesticides, and toxins in runoff. Infiltration of surface water that helps maintain baseflow. Water supply and ground water recharge.
		Soil retention	Role of vegetation root matrix and soil biota in soil retention. Reduce soil erosion and sediment control.
		Soil formation	Weathering of rock, accumulation of organic matter. Maintenance of top soil and soil fertility.
		Nutrient regulation	Storage and recycling of nutrients such as nitrogen and phosphorous and organic matter. Contribution of organic matter to stream from adjacent vegetation.
Regulation	Carbon Storage	Gas regulation	Role of riparian ecosystem in biogeochemical cycles. Provides clean breathable air.
		Climate regulation	Influence of land cover and biological mediated process on climate. Influence terrestrial and stream temperature, human health, recreation and crop productivity. Thermal refuge for aquatic species.
Regulation	Water Quality	Water filtration	Riparian buffers filter sediments, nutrients, pathogens, and toxins in runoff.
		Waste treatment	Role of riparian vegetation and biota in removal or breakdown of xenic nutrients and compounds. Storage and recycling of human waste.
		Pollination	Role of biota in pollination.
Information/ Cultural	Aesthetic/ Recreational/ Cultural	Aesthetic information	Attractive landscape features. Clear and clean water enhances sensory and recreational qualities.
		Recreation	Water quality for recreation, boating, swimming.
		Science and education	Variety in nature with scientific and educational value.
Habitat Provisioning	Habitat Provision	Refuge function	Suitable living space for wild animals and plants. Wood debris in the stream provides habitat and shelter for aquatic organisms. Terrestrial riparian ecosystem provides habitats for amphibians, mammals and birds. Habitat for natural communities, rare threatened and endangered species. Provide travel corridors for migration and dispersal.
		Nursery function	Suitable reproduction habitat for aquatic organisms and amphibians.



The importance of rivers for cities and the life that they support is increasingly being acknowledged and recognised. However, it is often the case that rivers are not seen as a priority in African cities. As a result, their strategic importance is generally underemphasised in local planning processes, often due to the fact that limited budget is assigned to other projects which are seen as urgent and more important. As a result of rapid urbanisation and sprawling development, which is often unplanned in Africa, rivers are under increasing threat within urban environments. This holds especially true where informal settlements have developed in close proximity to rivers because people depend on the services provided by the river for their livelihoods.

Therefore, a need exists for river management and river-based urban planning to be better strategically integrated and mainstreamed in African cities. Whilst there are important lessons that can be drawn from global experiences, this guideline for sustainable river-based urban planning is rooted in the African context, presenting strategic ideas and flexible guidelines for river management and integrated, river-based urban planning in sub-Saharan African cities.

This guideline is based on the understanding that space for settlement development in African cities is often limited. This is the contextual reality that underpins this approach. It is acknowledged that the space around and along rivers often succumb to development pressures, particular informal types of development. It is unlikely that this reality will change in the foreseeable future, especially given the high rates of urbanisation which African cities face and will continue to face going forward. As such, this guideline promotes a realistic view of this context, acknowledging the struggles which African cities and decision-makers face, in order to present solutions and techniques that are reflective of this context. The need to plan with what is already there is highlighted. In this way, the guideline does not seek to present an idealistic situation that gives planners and decision-makers a blank slate to work with. Instead, all of the ideas shared throughout this guideline seek to equip officials and decision-makers to respond to this contextual reality. Integrated planning within this context seeks to make the best with what is there on the ground, and to improve the conditions under which many residents of informal settlements live.

## 1.2 The need for integrated planning

While the health and wellbeing of riverine environments is the focus of all river restoration projects, there is a difference in an approach to planning for rivers, and planning with rivers. Planning for rivers focusses on the ecological wellbeing of the river and the ecosystem services that it provides. When planning for rivers, the river is seen as the main focus of the planning process and is to be managed as a relatively separate element to the more urban elements of the system. The thrust of the planning is usually largely focused on the nature-based considerations and catchment or regional scale river planning and management. However, this approach is also appropriate in developing strategic river management strategies at a local and city scale. As planning for rivers makes the river the focal point, the principle of ecological wellbeing can often supercede the principles of social or economic wellbeing. While this is not always a problem, it can lead to factors that impact riverine functions not always being taken into full account. For example, the impact of lack of service delivery or economic circumstances could be side-lined when they are in fact key to ensuring that a project is sustainable in the long term.

Planning with rivers identifies, however, identifies that rivers need to be planned in conjunction with all the other urban systems. Riverine function is not purely a result of environmental factors, there are significant negative impacts from social and economic factors too. **Rivers therefore need to be planned within the context in which they occur.** This context includes all the challenges and opportunities that urban elements may provide in ensuring the success of a project, for example the crucial role that local communities can play in the planning process. This does not mean that a focus on the environment should not be a priority or that environmental considerations should not be a part of a project or plan from the beginning, however in order to successfully plan with rivers, an integrated, holistic and systemic approach is needed.

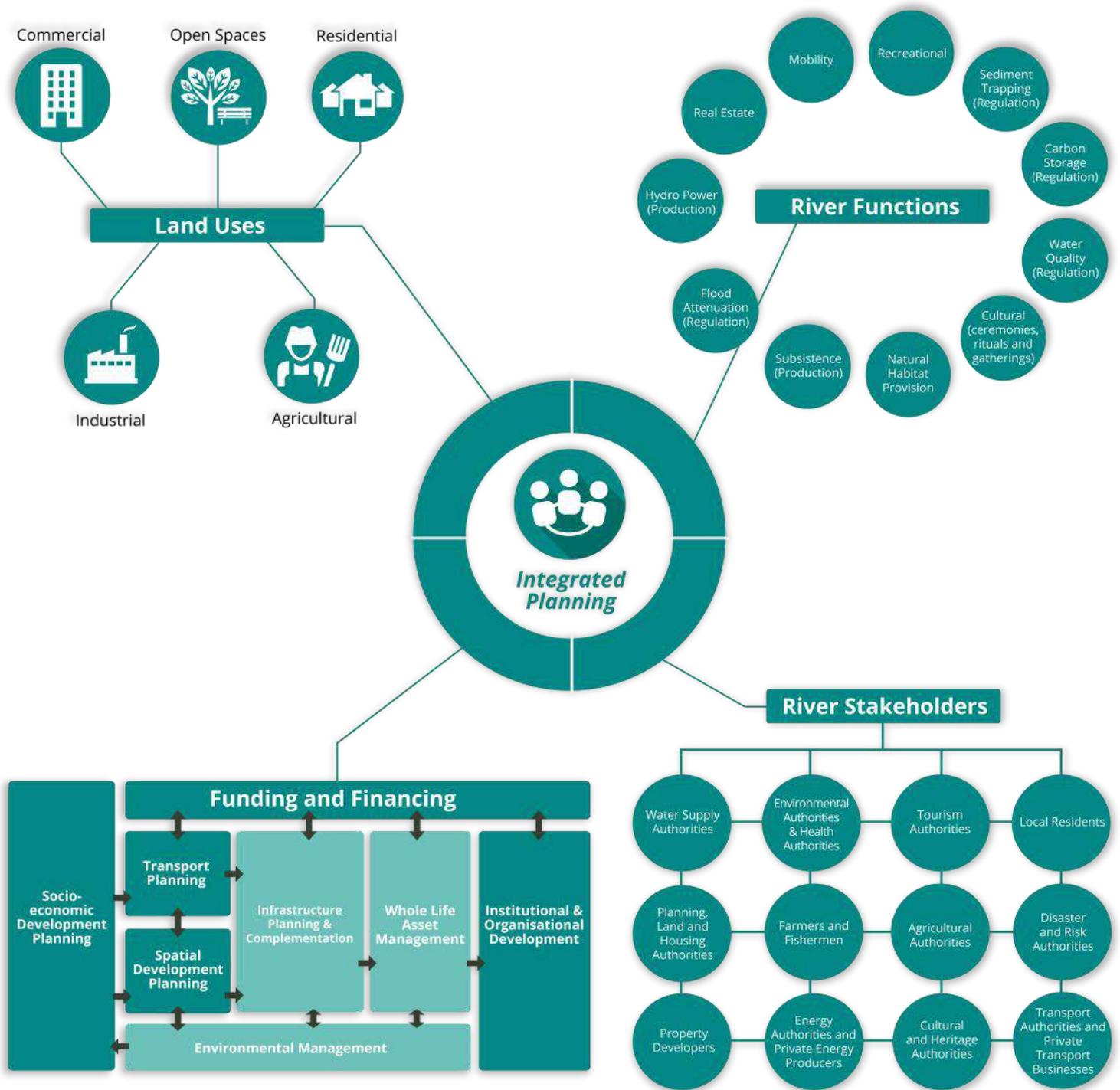


*"...the multi-sectoral nature of water resources development in the context of socio-economic development must be recognised, as well as the multi-interest utilisation of water resources for water supply and sanitation, agriculture, industry, urban development, hydropower generation, inland fisheries, transportation, recreation, low and flat lands management and other activities..."*

*- Agenda 21, section 18.3 (United Nations, 2002).*

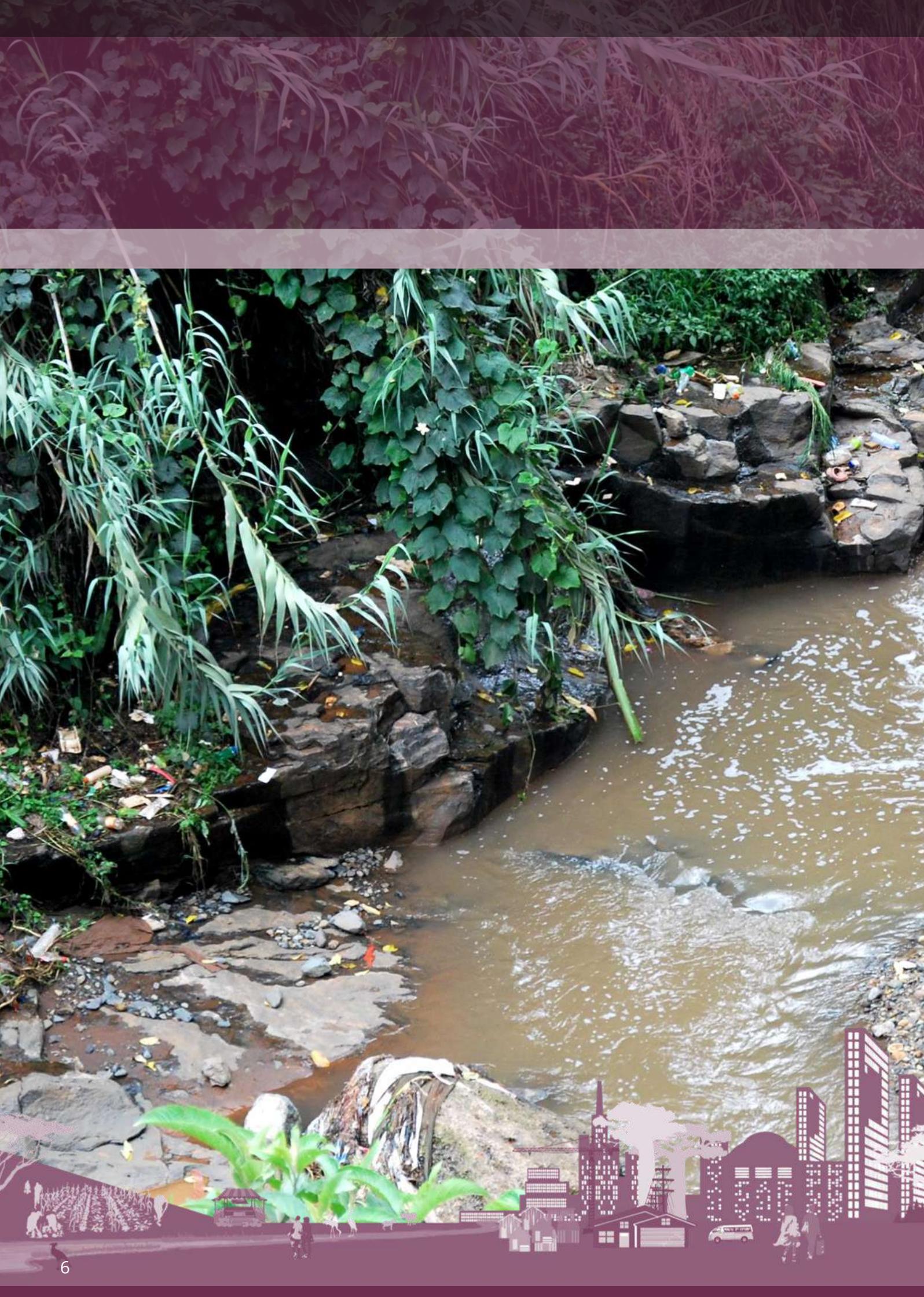
An integrated approach to urban planning is imperative, it brings together the economic, social, environmental and institutional dimensions of the urban environment in the development of plans. This approach seeks to mainstream river-based planning and is synonymous with, and essential in, the rationale for the very nature of planning. The approach aims to understand the urban environment as a system, taking cognisance of the interdependencies and interconnectedness of the complex systems and sub-systems within this, rather than taking a sector- or silo-based approach (United Nations, 2015). Undertaking this approach to river-based urban planning provides the opportunity to develop holistic strategies and plans that are better able to achieve the aims of sustainable development (See case study 3.1 & 3.2 in The Sustainable River-based Urban Planning for Sub-Saharan Africa: Case Studies Document). The idea of integrated planning is illustrated in figure 1.





**Figure 1:** Integrated planning: Incorporating land uses, stakeholders, and river functions





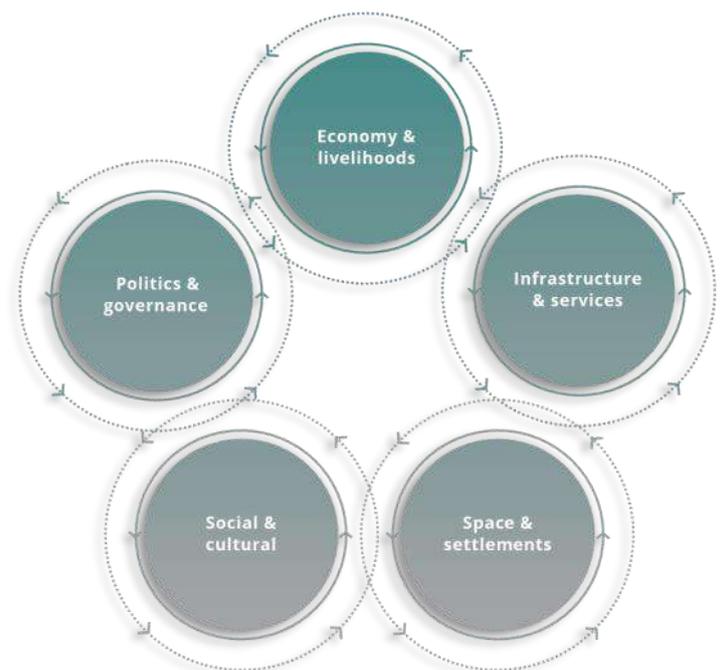
## 2. Understanding the system

### **Recognising the city as a system is crucial to the proposed approach of planning with rivers.**

A systems thinking approach recognises that all the elements making up a city – infrastructure, land use, housing, transport, politics, social environments, to name a few, are all intricately and intrinsically interconnected and affect each other, often in unpredictable ways. A systems thinking approach to planning in sub-Saharan Africa can account for the complexities and uncertainties of the African context. This requires multiple perspectives and modes of working from different stakeholders.

The integrated approach to planning with rivers recognises that the city is a complex system made up of other complex systems all of which influence each other in differing, sometimes unclear and unpredictable ways. Campbell (2016) proposes that there are five key elements to an urban system as shown in figure 2.

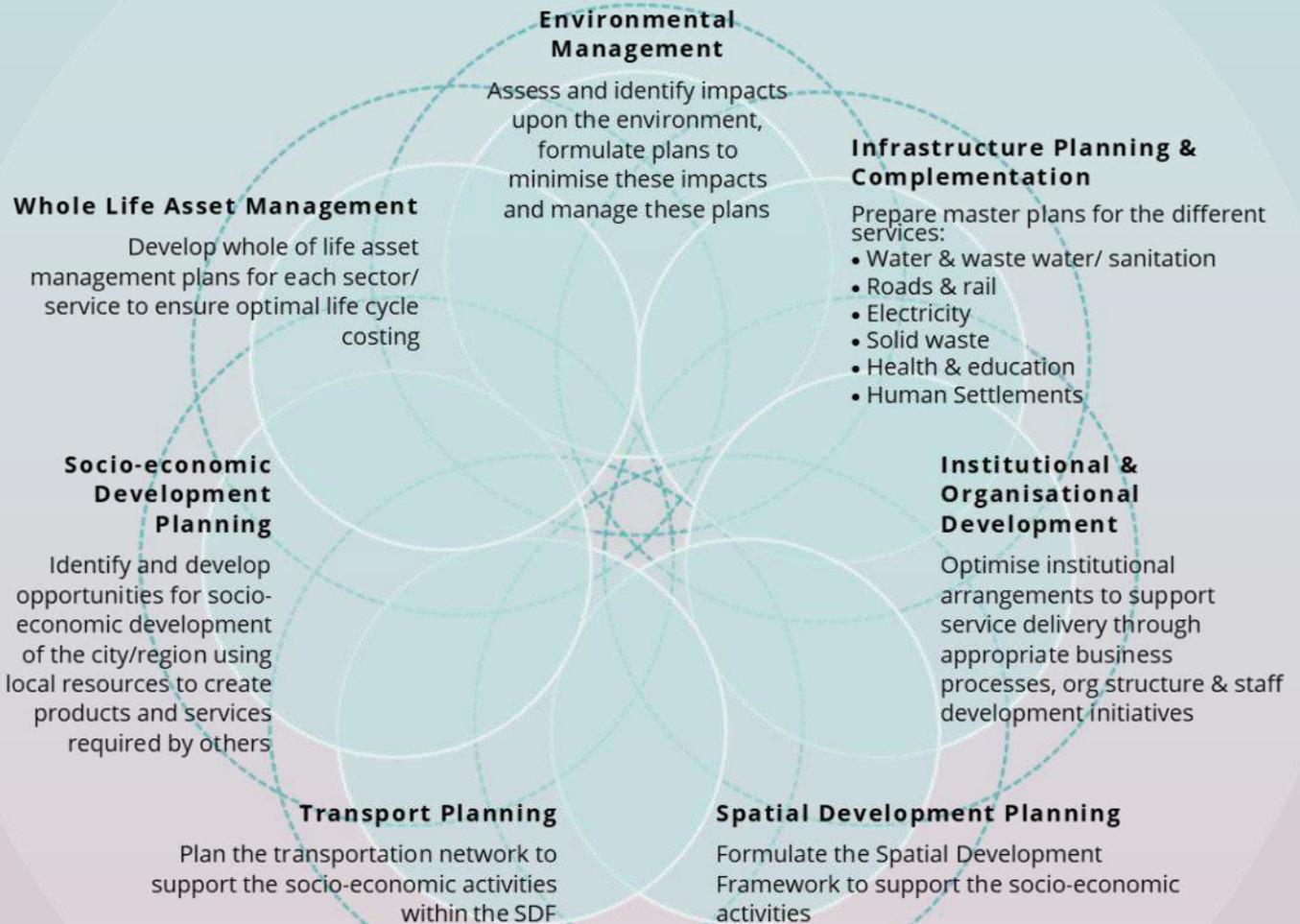
Rivers in urban areas do not function in isolation from the other elements that make up the urban system. An example of how urban elements are related is that rivers are impacted by the socio-economic activities and livelihood activities that rely on and are located in close proximity to them. Economic activities and livelihood strategies can be linked to the availability or lack of infrastructure services, for example where a lack of electricity exists, selling of fire wood (resulting in deforestation) may be a livelihood strategy. The social and cultural elements are intertwined with this through gender roles, as well as the location and type of settlement, and all of the above are influenced by politics and governance structures, both formal and informal. While understanding each element alone can be useful, to work within a systems thinking approach when planning for rivers there is a need to understand how each of these elements is intricately linked as part of the whole, how they interact and how a change in one component can affect other components to various degrees (Figure 3). Understanding this approach is essential for highlighting the important role of rivers within the system of a city or local area, and how it, as an element of the system, is interconnected with (and therefore needs to be planned in conjunction with), the other parts.



**Figure 2:** Elements of an urban system  
(Source: Campbell, 2016)

## Funding & Financing

Develop budgets, funding and financing plans for long term service provision, identify revenue (tariffs & charges, grants etc)



**Figure 3:** Systems thinking approach

The systems thinking approach involves not only assessing the relationship between elements within the urban area, but also between the urban area and the wider spatial area. This could be the city-region, catchment or regional level. A systems thinking approach in urban planning can be improved by assessing and identifying the impacts that interventions will have on the environment and other elements, and formulating plans to minimise these. Plans and policies should have a long-term strategic focus and should address the whole life asset management to ensure optimal life cycle costing. Lastly, much like the foundation of integrated planning, a systems approach to river planning should plan and prioritise with the co-dependency of the social, economic, environmental, planning sectors (spatial planning, transport planning etc.) and institutional components in mind. Understanding the system within which a river occurs in a city is vital in providing a basis for how and where the need exists to intervene in the system, based on the various impacts on the system, as shown in figure 4.



**Figure 4:** Understanding the system

# 2.1 Setting the scene

In understanding why rivers need to be prioritised and mainstreamed with other planning processes, it is useful to understand the context within which this planning occurs. This section briefly outlines the global and African contexts as a means of establishing a rationale for the guidelines that follow. Rooting the guideline in its specific context allows for proposed approaches to river-based urban planning to have a positive contribution to both African cities and the broader global objectives.

## 2.1.1 Global context

Agenda 2030 (United Nations, 2015), adopted in September 2015 by leaders around the world, identifies 17 sustainable development goals (SDGs), of which three (6, 8 and 11) outline the importance of an integrated approach to protect and mainstream rivers and watercourses within urban planning and urban environments. The aim of Agenda 2030 is to mobilise countries to tackle climate change and end poverty and inequality. While the goals are not legally binding, they should advise all city officials in their day-to-day work. For city officials planning for rivers or in areas where rivers are located, these goals should form the pillar of their decision-making processes and plans.

In the context of river planning, and urban planning in general, SDG 11 is especially important. SDG 11 is to “make cities and human settlements inclusive, safe, resilient and sustainable”, and is the only SDG that focusses specifically on the urban environment (UN General Assembly, 2015). It also speaks to the importance of integrated planning, a key principle of this document.



### Sustainable Development Goal 6

Ensure availability and sustainable management of water and sanitation for all.

- Equitable access to safe and affordable drinking water for all;
- Improve water quality by reducing pollution, promoting appropriate waste disposal processes, and increasing recycling and safe reuse globally;
- Increase water use efficiency;
- Implement integrated water resources management, including trans-boundary cooperation;
- Protect and restore water-related ecosystems;
- Expand international cooperation and capacity-building support to developing countries in water and sanitation-related activities and programmes; and
- Support and strengthen the participation of local communities in improving water and sanitation management.

**Key Words from Sustainable Development Goal 6:**

Access, quality, pollution reduction; integrated management; restore water sources; strengthen participation of local communities.



### Sustainable Development Goal 8

Promote sustained, inclusive and sustainable economic growth, full and productive employment and dignified work for all.

- Sustain per capita economic growth in accordance with national circumstances;
- Promote development-oriented policies that support productive activities, job creation, entrepreneurship, creativity and innovation; and
- Improve global resource efficiency in consumption and production and endeavour to de-couple economic growth from environmental degradation.

**Key Words from Sustainable Development Goal 8:**

Economic growth, development-oriented policies, resource efficiency.



### Sustainable Development Goal 11

Make cities and human settlements inclusive, safe, resilient and sustainable.

- Access for all to adequate, safe and affordable housing and basic services, and upgrade slums;
- Inclusive and sustainable urbanisation and capacity for participatory, integrated and sustainable human settlement planning and management in all countries;
- Protect the poor and people in vulnerable situations;
- Reduce the adverse per capita environmental impact of cities, paying special attention to air quality and municipal and other waste management;
- Provide universal access to safe, inclusive and accessible green and public spaces, in particular for women and children, older persons and persons with disabilities;
- Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning; and
- Integrated policies and plans towards holistic disaster risk management at all levels.

**Key Words from Sustainable Development Goal 11:**

Sustainable urbanisation, disaster risk management, environmental impact, access to public spaces, strengthen planning capacity, integrated policies, resource efficiency.

**Figures 5, 6 & 7: SDG 6, 8 & 11 (Source: UN, 2018)**

## 2.1.2 African context

The increasing impact of urbanisation on land use, rivers and green spaces in African cities warrants significant attention by development and planning practitioners, governments and society at large.

However, most planning practices that inform how to plan for and with natural assets in African cities are based on those developed in the Global North (Bolay, 2015). Planning in the Global South, however, needs to respond to the “[Global South] urban reality... demographic growth and territorial expansion, poverty, environmental degradation, and informality of a significant portion of urban activities” (Bolay, 2015: 417). Planning for natural assets in African cities therefore needs to be locally appropriate and recognise that African cities are dynamic, often changing in unpredictable ways. **A novel approach is needed for natural asset planning**, one that is integrated, flexible, adequately relates to the local context and responds to the needs of the urban poor. Given the unique characteristics of the African context, it is often the case that planning cannot accurately account for the growth of urban areas proactively. As such, a reactive approach is often the norm, considering the river after it has been affected by land-use changes and settlement growth. However, a combination of a proactive approach, which is realistic about expectations around future population and settlement growth, and a reactive approach, which acknowledges current realities, is needed. It is often necessary for local governments to react to rapid changes which are often beyond what could have been proactively planned for. Strategic planning will look to the future, and the future needs of African cities, without discarding the current situation faced in urban areas in Africa.

In planning for and with rivers, it is important to work with what exists and the current reality of any context. **It is vital to understand that incorporating rivers into urban, spatial, and land-use planning does not require the development of new plans or planning processes.** This would be counter-productive to the already complex context within which officials work in African cities. The aim is not to burden decision-makers with more onerous planning processes. Instead, **it is proposed that rivers simply need to be better considered and mainstreamed into existing planning processes.** In this way, it is about integrating a river-based focus with existing planning processes, in order to enhance and improve the ability of existing plans to better plan for and with rivers, thereby improving African cities’ ability to respond to their contextual realities and improve the health and resilience of their rivers.

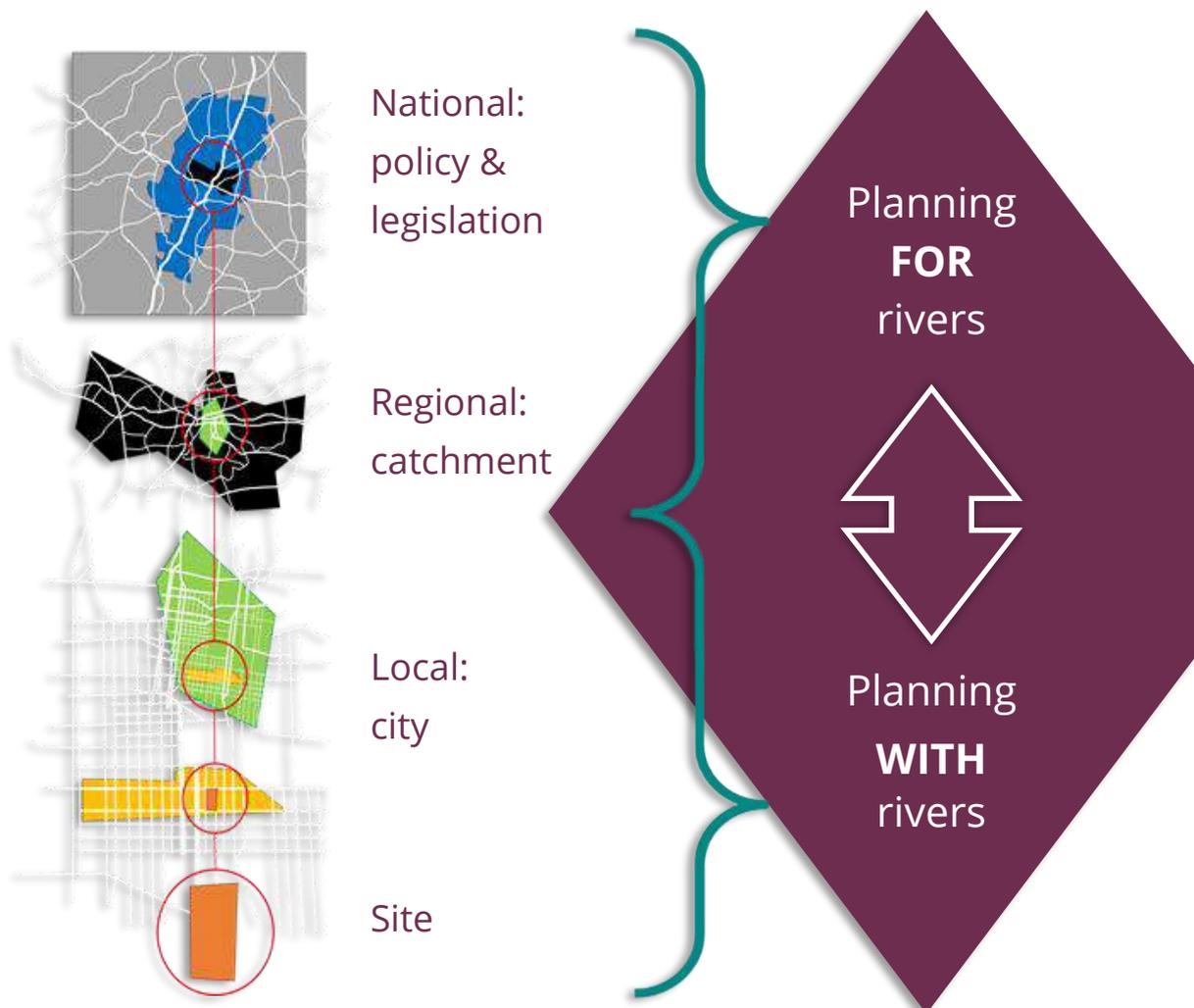




## 2.2 Strategic approach

### 2.2.1 The package of plans approach

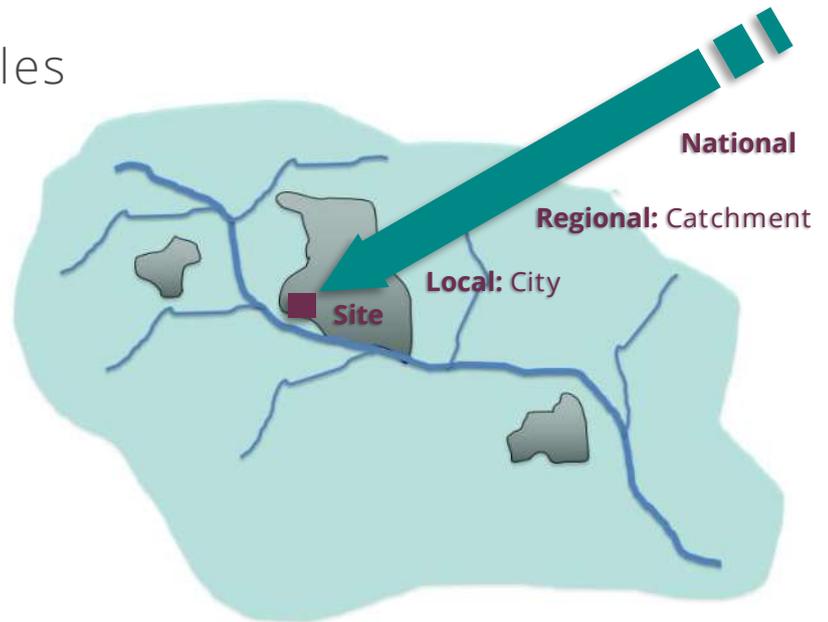
The concept of the package of plans approach simply acknowledges that **any urban or river management plan can be situated within a given policy** context. In this way, rivers can be integrated into almost every plan and at every scale of governance. In order to mainstream rivers into land use and urban planning, the different scales at which this integration will take place need to be understood. The aim of the package of plans approach is to ensure that policies and plans at various scales are strategically aligned. In the case of rivers, this would involve the representation of rivers in urban plans not just at a local or site scale, but also at a more strategic, larger scale. The means of achieving this alignment involves both a top-down and bottom-up approach. This concept seeks to build understanding of how an intervention at a local scale (as is the focus of this guideline) can have an impact on the larger system through integration with plans at other scales. The typical scales in planning are discussed in the next section. The package of plans is illustrated in figure 8 below.



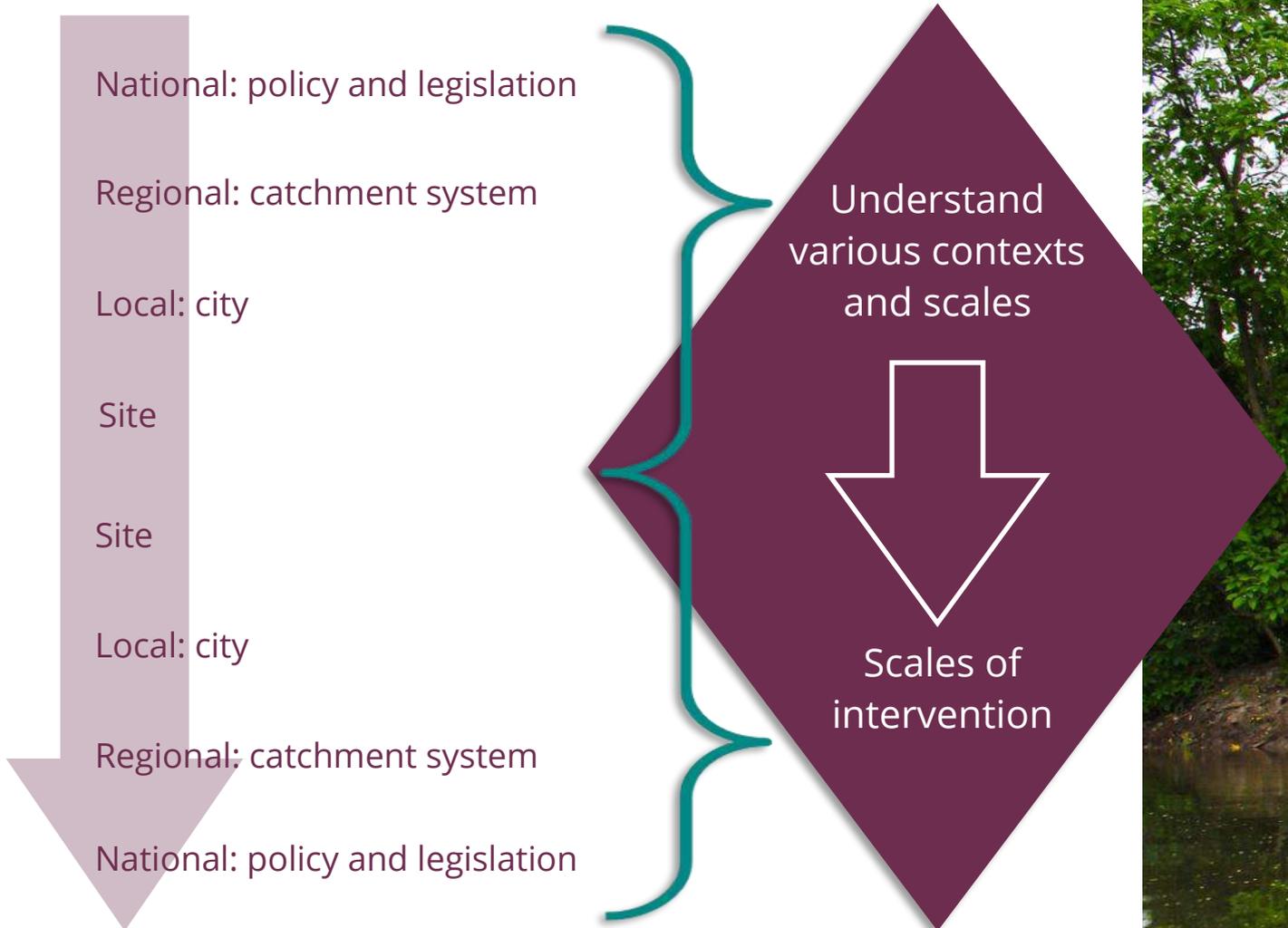
**Figure 8:** The package of plans approach

## 2.2.2 Planning units: scales

This section provides a brief overview of the scales at which planning typically occurs (shown in figure 9) in order to understand the key points where integration of rivers could be accommodated in the system. It is essential that river management and river-based urban plans, once formulated at any scale, filter both up and down into plans at all scales, to ensure the protection and conservation of rivers at all levels of government. Understanding the scales of planning will be useful in identifying local and site-level points of intervention which then filter through the package of plans, back up to the national level, as shown in figure 10.



**Figure 9:** Typical planning scales at which river planning takes place



**Figure 10:** Scales of intervention

## National: governance

At a national scale, the focus is on the policy and legislative environment. Due to the fact that many African governments are often generally centralised at a national level, the establishment of a strong rationale for the mainstreaming of rivers at this scale is important. In national plans and policies, it is essential that a broad approach to integrated planning is advocated for, which will inform overarching national objectives and form the basis for planning at more local scales.

## Regional: catchment

It is at a regional or catchment scale where considerations around water and river catchment management are most relevant. This is due to the fact that in order to plan effectively for any river, an understanding of the river's drainage and water catchment area is essential. This is because impacts at one point in the catchment are evident at another part of the catchment, even if it is geographically far away. A bio-regional approach to planning at this scale allows a comprehensive management process to be undertaken, which considers the river and its various sources, tributaries, and impacts holistically. This scale generally focuses on natural resource management. As a result, at both the national and regional scales, planning for rivers is enabled, with the river as the focal point of the system.

## Local: city

Although these guidelines present an approach to planning with rivers that is applicable to a number of scales, as described above, it is at the local scale that these guidelines focus their attention. Arguably, it is at the local and city scale where the need to plan with rivers becomes most important, with rivers forming a core component of the urban system, as described above.

At the local and city scale, planning for rivers, often without being able to consider the river's entire length, full extent, or whole catchment area, is difficult. At this scale, the extent to which land use, urban development and rivers are connected is most apparent. It is at this scale that balancing competing needs and various interests is of vital importance in achieving an integrated approach to river management and river-based urban planning. At this scale, it is essential that river management plans consider land-use and socio-economic factors, and how they interact and impact on each other. Additionally, urban, spatial, and land-use plans should consider the river as an essential element in the urban system, where land-use and urban planning decision making should be undertaken in a way which prioritises rivers.

## Site: riverside

At a site level, the focus is geared more towards land-use and engineering service considerations. It is at this scale that the effect of individual developments and settlement patterns on riverine environments is most evident. In making decisions around site-level developments, it is essential that development is sensitive to the river, its banks, and its appropriate buffer zones.





# 3. Conceptual framework

## 3.1 Planning with rivers as part of a nested system

In order to understand the importance of rivers in urban areas, the interplay of urban development, land use and rivers, and the need to plan with rivers using an integrated, systems approach, it is essential to understand the two broad systems within which this planning takes place.

The first system, and broadest of the two, is the water cycle, shown in figure 11 below.

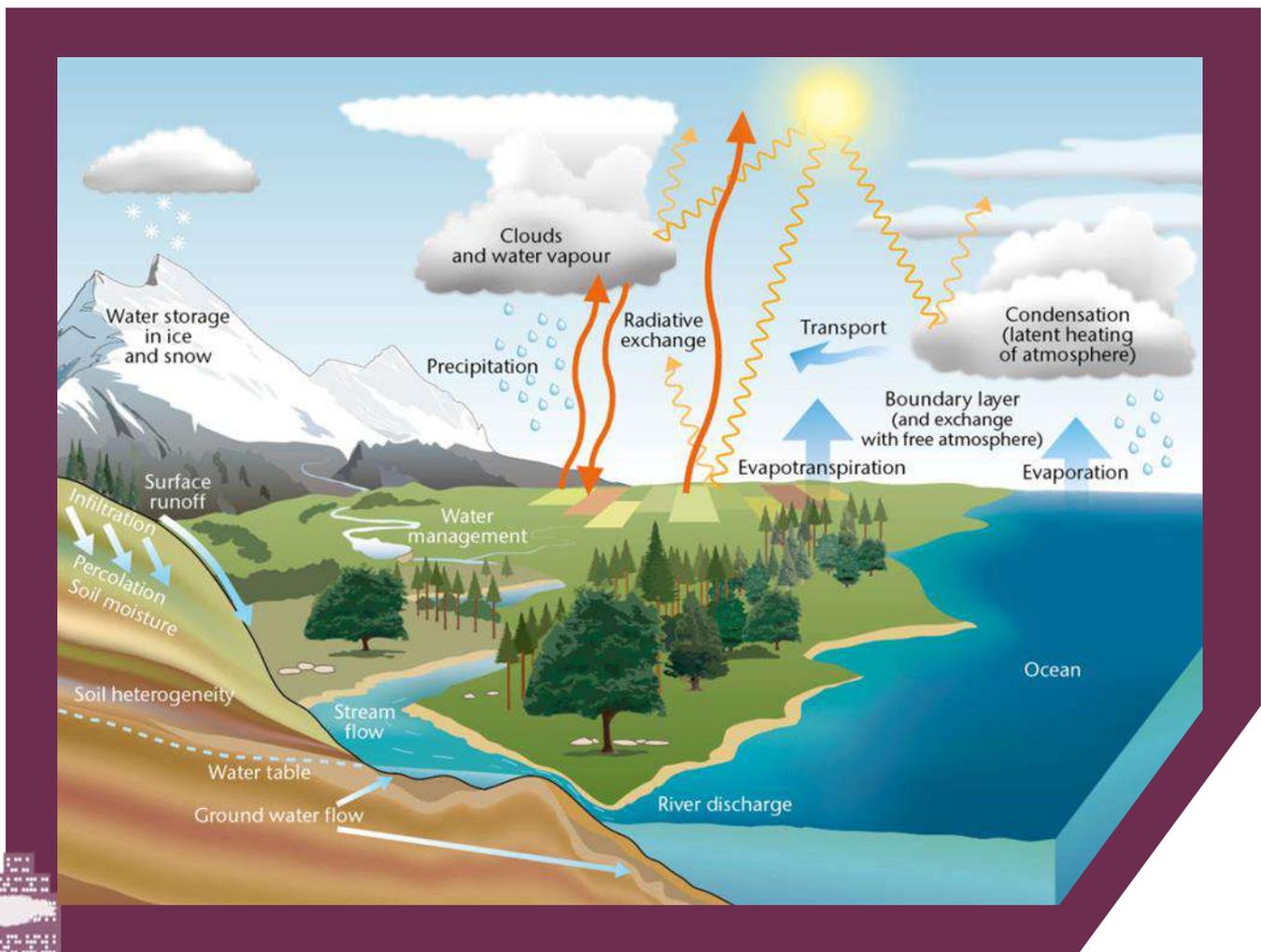


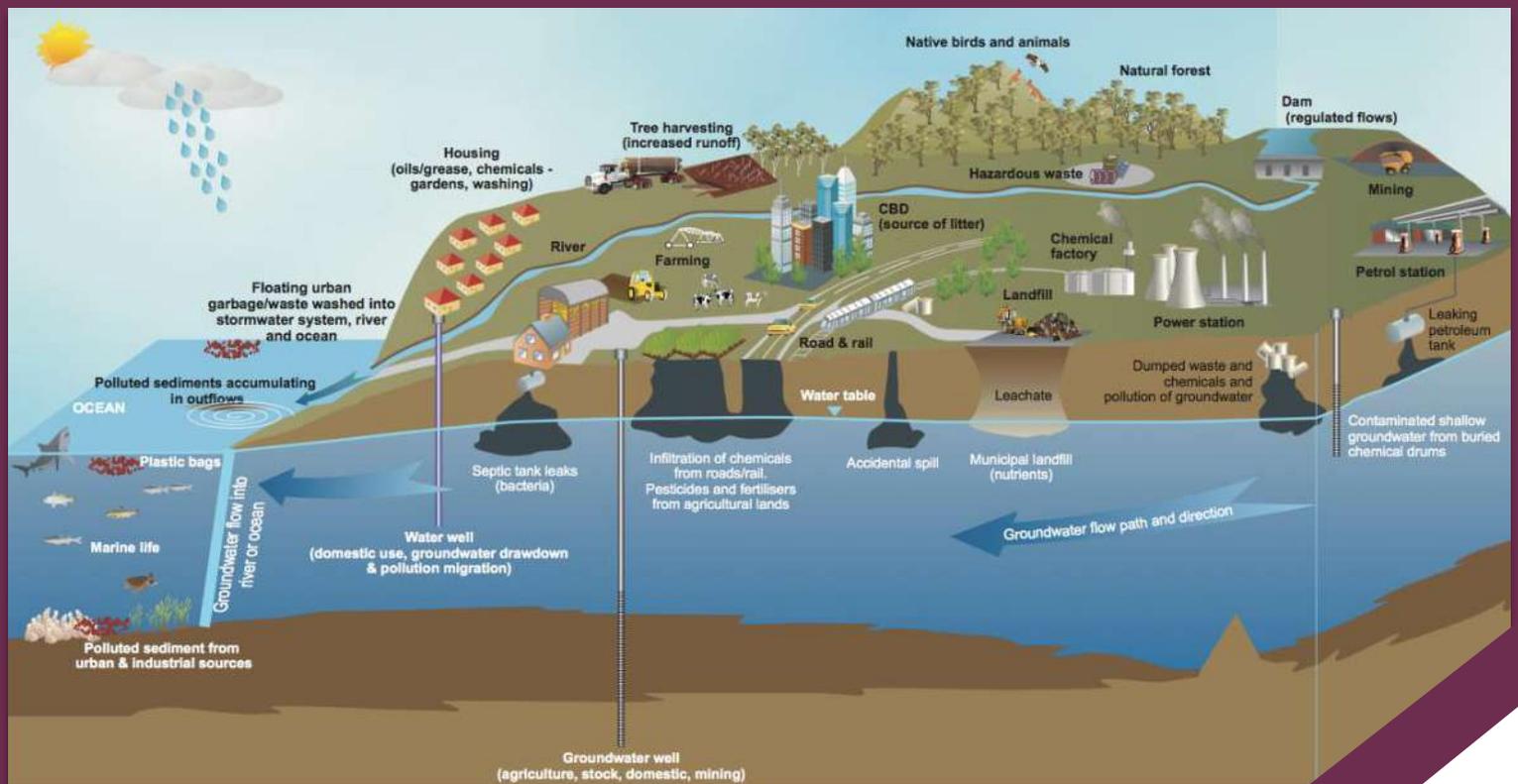
Figure 11: The water cycle (Source: Met Office, 2018)

The water cycle provides a broad overview of how water moves through the earth, changing from one form to another as it evaporates, and precipitates off of and on the land on which cities are built and developed. Since water is the basis for all life, it is logical that historically cities have been built in close proximity to the water sources which enable them to function.

Figure 11 shows that water management forms an integral part of the water system, as any interference at any point along the length of the river will impact on the entire water system which is delicately balanced.

The impact of cities and urban development on this system is best illustrated in figure 12 below, which shows the urban water system at a local scale. This urban water system sits nestled within the broader water system described above, but provides an example of some of the common impacts of cities and urban environments (the more urban elements in the system) on rivers, highlighting the need for strong water management through urban and spatial planning both for the sake of the quality of the rivers in cities and the quality of the larger water system.

Figures 11 and 12 illustrate the systems involved in advocating for a systems thinking approach to planning with rivers. The river as one element of an urban ecosystem is evident. An example of the various elements which make up the urban system is shown in figure 12 below.



**Figure 12:** The urban water cycle (Source: Earth2Water, 2018)

## 3.2 Green, grey and blue infrastructure

In the urban context, concerns have been growing about the loss and degradation of natural resources, including rivers. This has given rise to the “recognition of the central role that green space networks (which include rivers) have to play in cities and city regions” (Mattijssen et al., 2017). This recognition can be incorporated into planning processes through an urban green infrastructure (UGI) planning approach. UGI is defined in figure 13 and the four principles on which it is based are shown in figure 14. “Due to its integrative, multifunctional approach, UGI planning is capable of addressing a broad range of urban challenges, such as conserving biodiversity and rivers, adapting to climate change, supporting the green economy and improving social cohesion” (Mattijssen et al., 2017).



*Urban green infrastructure (UGI) is described as an interconnected network of green and blue spaces, which together deliver ecosystem benefits to society.*

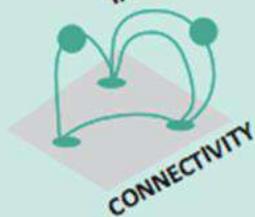
Figure 13: UGI Definition (Source: Mattijssen et al., 2017)

### THE FOUR CORE PRINCIPLES OF UGI PLANNING<sup>1</sup>



*Green-grey integration – combining green and grey infrastructure*

*UGI planning seeks the integration and coordination of urban green spaces with other infrastructure, such as transport systems and utilities.*



*Connectivity – creating green space networks*

*UGI planning for connectivity involves creating and restoring connections to support and protect processes, functions and benefits that individual green spaces cannot provide alone.*



*Multifunctionality – delivering and enhancing multiple functions and services*

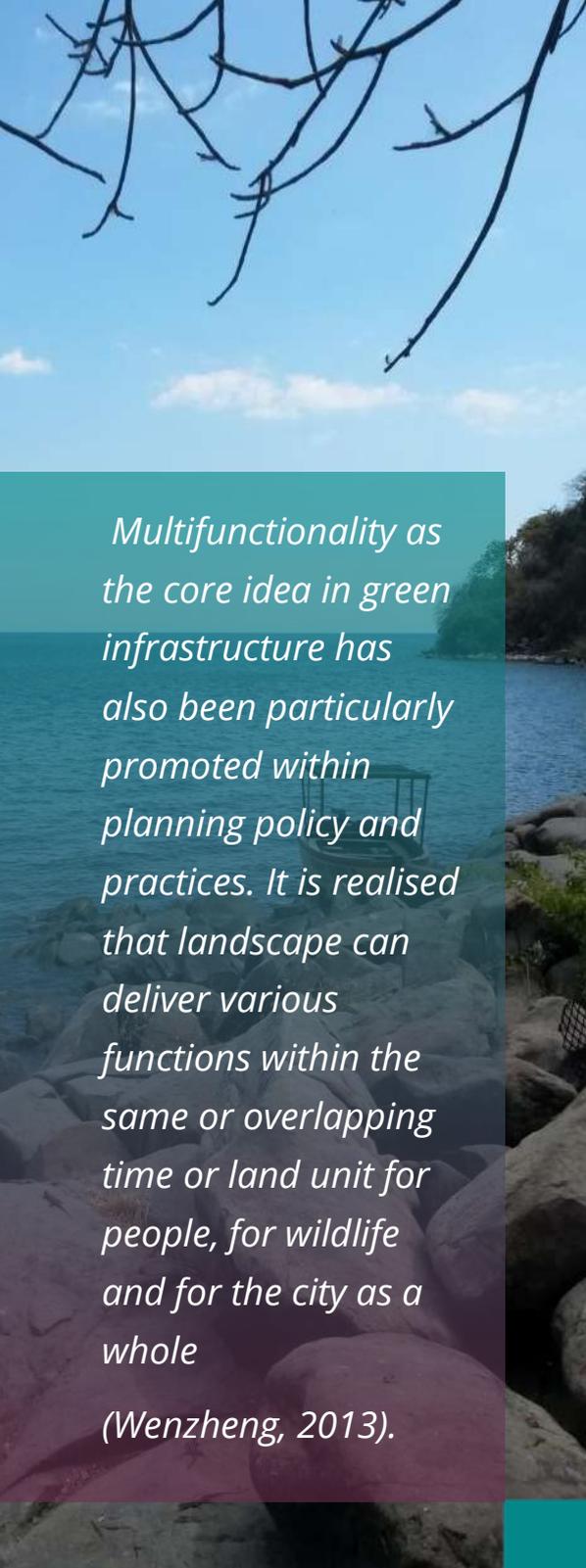
*UGI planning aims at combining different functions to enhance the capacity of urban green space to deliver multiple benefits – creating synergies, while reducing conflicts and trade-offs.*



*Social inclusion – collaborative and participatory planning*

*UGI planning aims for collaborative, socially inclusive processes. This means that planning processes are open to all and incorporate the knowledge and needs of diverse parties.*

Figure 14: Principles of UGI (Source: Mattijssen et al., 2017)



*Multifunctionality as the core idea in green infrastructure has also been particularly promoted within planning policy and practices. It is realised that landscape can deliver various functions within the same or overlapping time or land unit for people, for wildlife and for the city as a whole*

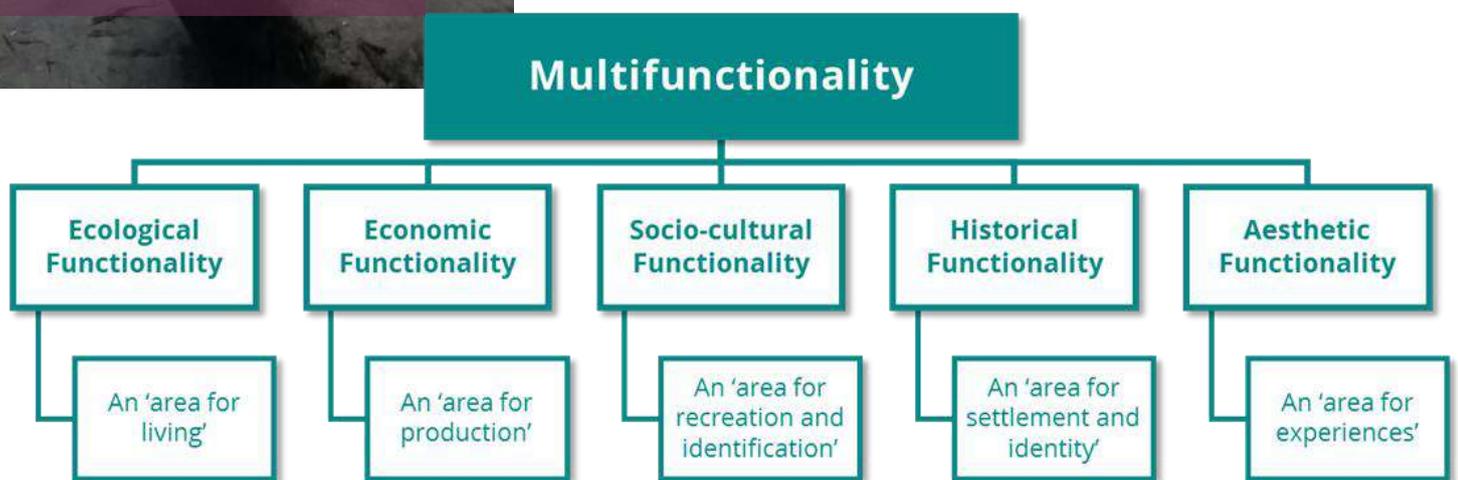
*(Wenzheng, 2013).*

Essentially, the strategic approach that these guidelines promote seeks to integrate the three infrastructure networks and ensure that they are all cohesively planned together by planning for multifunctional spaces which balance competing interests and needs through trade-offs and the prioritisation of activities through various planning processes.

**Multifunctional spaces need to be developed using an integrated planning approach and an interdisciplinary team.**

Again, the only way in which multifunctional spaces that cater to the needs of the community can be developed is through an intensive consultative process. For the mainstreaming of riverside planning to be adaptable and flexible to change over time, multifunctional spaces are required. Multifunctional spaces are those that integrate a wide range of uses for different types of users, and can be easily altered over time to meet new needs (Figure 15).

Multifunctional spaces are important as they provide a more efficient use of space, which can cater to a number of needs. In Africa, riversides are ideal to fulfill this function. The development of multifunctional spaces should be driven by the needs of multiple stakeholders to provide co-benefits and to ensure different values are taken into account. In this way, the activities provided for in the space will be of the highest value and best usage. The number and types of uses on the riverside will depend on the size and location of the space. Landscape architects, planners, architects and environmental specialists will all need to be involved from the beginning of the planning process.



**Figure 15:** Multifunctional spaces (Source: Wenzheng, 2013)

## 3.3 Key challenges in managing and planning for and with rivers

There are numerous challenges faced by sub-Saharan African cities regarding planning for rivers. If not addressed, these challenges undermine a city's ability to receive the full benefits that urban rivers can offer. With integrated and collaborative planning processes these can be mitigated or even overcome. It is important to state these challenges upfront, as it is useful for anyone working with rivers in the African context to understand the reality of the environment in which they work. These challenges also assist in building the rationale for the need to intervene and improve river management and river-based urban planning in African cities. This guideline proposes that **despite these challenges, much can still be done in the way of mainstreaming rivers with other planning processes.**



### 3.3.1 Government & institutional challenges

#### **Working in silos**

A lack of institutional integration and collaboration can result in limited opportunities for innovation and collaborative problem solving. This can be caused by a lack of cross-pollination of ideas between different stakeholders and departments, limited knowledge and experience sharing, and a lack of alignment of plans between the various levels of government. Important in enabling integrated river-based urban planning is continuity in relationships between officials in different departments and spheres of government.

#### **Capacity & financial constraints**

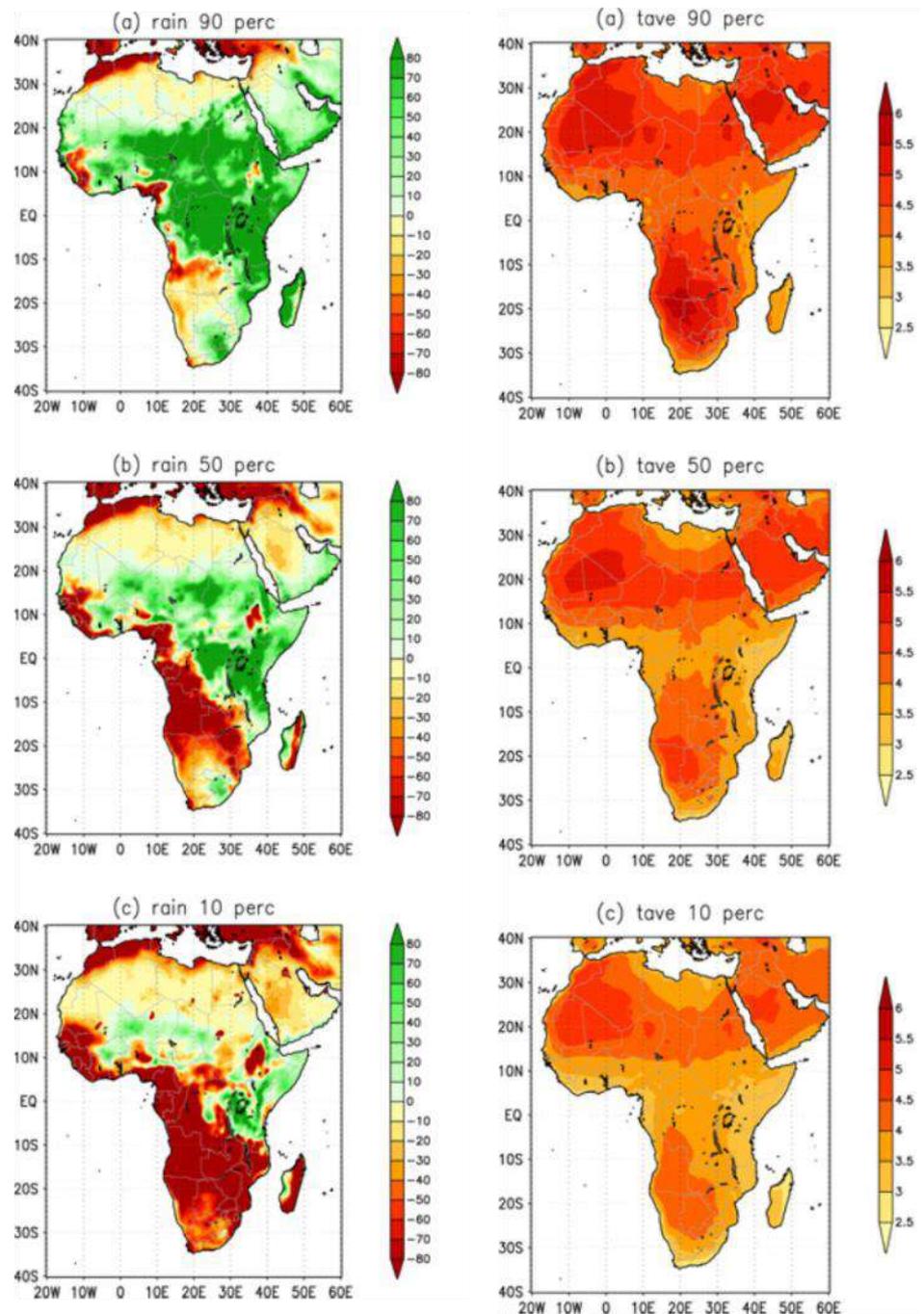
Capacity constraints are at times faced in local governments in terms of limited numbers of staff, a lack of appropriate skills and training to enable staff to work on projects within their scopes of work, and limited availability of resources and finances. These constraints often result in a lack of river management and river-based urban planning and development due to the fact that there is low awareness of the importance of rivers and the advantages of healthy rivers for African cities.

#### **Lack of political support**

The lack of political support for river management and river-based planning is a critical constraint in accessing finance and buy-in for riverine projects and plans. Political support can help ensure that the financing and implementation of plans occurs timeously. Political support can also aid efforts to increase capacity in local government to enable them to better provide service delivery and enforce and ensure alignment between policies, plans and by-laws. (See case study 3.5 in *The Sustainable River-based Urban Planning for Sub-Saharan Africa: Case Studies Document*).

### 3.3.2 Climate change

Climate change is currently, and will in future, have a big impact on African cities. Goulden et al. (2008) predict that rainfall is going to decrease in southern and sub-Saharan Africa. This will place even more strain on already scarce water resources. The poor will be most affected by climate change due to their reliance on rivers, and the limited capacity they have to adapt (USAID, 2012). Uncertainty around the impacts of climate change can make it tricky for long-term interventions and strategic plans to ensure that they will be adequately able to manage the effects of climate change on urban populations. Predictions of rainfall and temperature patterns in Africa are shown in figure 16. The two maps at the top of the figure show rainfall and temperature patterns from 2015, and the bottom two maps show the respective projections for 2100.



**Figure 16:** Predicted climate Change 2015 - 2100  
(Source: Engelbrecht et al., 2015)

### 3.3.3 Urbanisation and land reform

It is predicted that by “2050 the global urban population is estimated to be 6.3 billion, nearly doubling the 3.5 billion urban dwellers worldwide in 2010” (Secretariat of the Convention on Biological Diversity, 2012: 7). In Africa, the urban population will increase from 300 million in 2000 to 750 million in 2030 (Secretariat on the Convention on biological Diversity, 2012). As the population grows, urbanises and consumes more, the impact of human settlements on the natural environment increases. Urban and rural sprawl, housing demand and basic service infrastructure have a noticeable impact on urban natural assets, including rivers. Currently one way in which this is evident is in the amount of pollutants being disposed of in urban rivers due to difficulties in providing basic services for waste collection and removal.

Based on the current increase in urbanisation, rates of land reform and increases in densities are also rising significantly. In Africa, the rate of increase in urban land cover is predicted to be the highest in the world at 700 percent between 2000-2030. Land in well-located areas is diminishing and this is resulting in the higher densities currently present in African cities. These factors, coupled with poor planning capacity and development controls and poor river management, lead to developments and housing taking place on river banks and within flood plains. As people move into the river's natural buffer zone, the ability of rivers to provide the ecosystem services required is impeded, leading to increased flooding, erosion and loss of recreational and green space.

### 3.3.4 Legislation and policy gaps

At times legislation and policy gaps, and misalignment between plans and policies and between spheres of government are present, and as a result these planning instruments do not always support one another. The consequence can be a lack of focus on restoring and protecting natural assets and a misunderstanding of responsibilities and the need for river integrated management and river-based urban planning and development in this regard. For instance, this could result in natural assets not being adequately represented and accounted for in legislation and plans across departments and competencies.

### 3.3.5 Service delivery and infrastructure

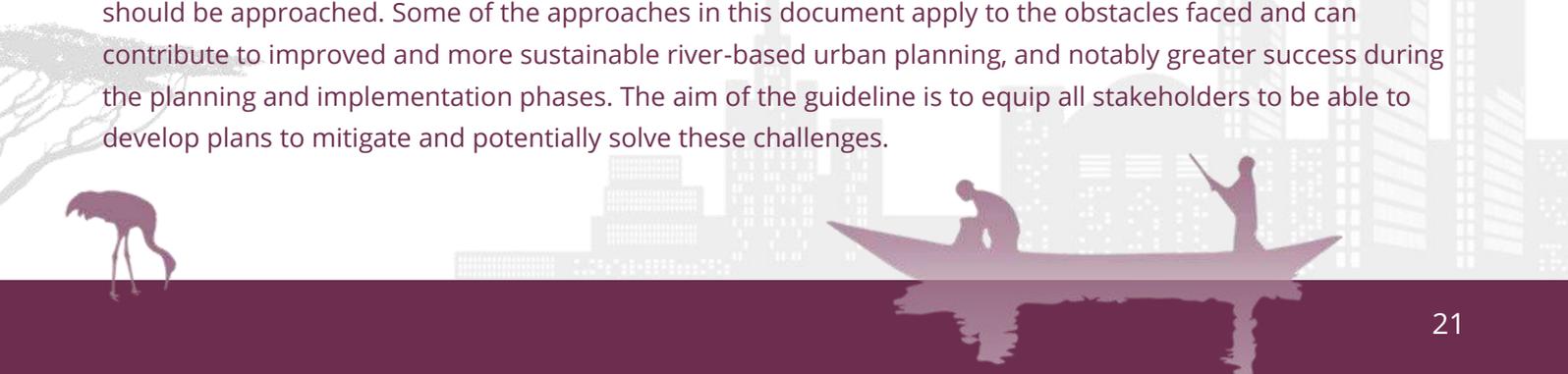
The rapid rates of urbanisation and the increasing number of people needing access to services places strain on the resources of local government. Capacity constraints (human and financial) also lead to infrastructure aging further, limiting its ability to cope with increased population growth.

### 3.3.6 Unsustainable livelihood strategies

A high proportion of communities living in sub-Saharan African cities still meet their resource needs directly from urban natural assets, rather than municipal services provision. Unsustainable use of these natural assets both in rural and urban areas impacts the health and wellbeing of rivers. Examples of this include:

- ◆ Agriculture can have negative effects on rivers when it results in the clearing of floodplain habitats and the ecosystem services that they provide, and the disposing of pesticides and chemicals in rivers.
- ◆ The loss of riparian habitats due to livestock overgrazing occurs. The loss of vegetation can impact the flow of rivers and the buffering role they play in preventing flooding when water cannot infiltrate, run off, and be carried away.
- ◆ Overexploitation of fish and plant life needed by rivers to sustain ecosystem processes.
- ◆ The introduction of alien vegetation for livelihood strategies impacts the natural state of the riverine environment.

The solutions to the challenges outlined are complex and there are many differing opinions on how they should be approached. Some of the approaches in this document apply to the obstacles faced and can contribute to improved and more sustainable river-based urban planning, and notably greater success during the planning and implementation phases. The aim of the guideline is to equip all stakeholders to be able to develop plans to mitigate and potentially solve these challenges.



## 3.4 Structure of the guideline

Having shown the various scales at which river management planning, ecological planning, and spatial and land-use planning generally take place, this guideline proposes **two broad approaches for the possible mainstreaming of rivers into planning processes within a local area of jurisdiction**. These two approaches essentially present two different ways of achieving this mainstreaming. However, it is important to note that the two are not mutually exclusive, but depend on each other to a large extent. As such, the two approaches together provide a holistic picture of how the mainstreaming of rivers in planning might be achieved. The exact approach undertaken by a local government will have to be determined by adapting a combination of the two approaches to the specific context.

The first approach that these guidelines will present is that of **establishing a strategy for sound river management**. This approach involves planning for rivers within an urban context. Ideally, the output of this approach would be some form of a River Management Plan. However, this will not always be the case. The level of sophistication of the output of this approach will be context dependent. This approach aims to establish a baseline for the river and its characteristics and a roadmap to a desired future state, while still considering the broader urban system and its various elements (even though the focus is on the river and its conservation). This approach aims to understand and analyse the river, and create a vision, goals and objectives in order to establish specific management actions and strategies to inform interventions in the broader planning system later on. This approach is strategic in that it focuses on the river as the main element of the urban system, but seeks to plan for the river in a way that is integrated with social and economic considerations. Essentially, it provides the leverage for achieving buy-in and support from all stakeholders so that rivers can be mainstreamed in other planning approaches through an integrated and collaborative approach later on (in approach 2). It aims to establish a strategic plan for the river, which is integrated, flexible and adaptive, thereby creating an enabling environment for the plan to be aligned with other planning approaches on a number of scales.

The second approach seeks to give effect to the idea of planning with rivers. This approach **focuses on the integration of river management planning with other local planning approaches** in order to promote river-based urban planning. In this approach, the work done in Approach 1 can now be used as a part of the puzzle in undergoing broader, river-based urban planning. This involves mainstreaming the vision, goals, objectives, and actions from Approach 1 (or the river management plan) into existing planning approaches and other urban plans.

Approach 1 depends on Approach 2 in order for the desired state of the river and its management to be mainstreamed into other plans. Approach 2 depends on Approach 1 because, if Approach 1 has not been adopted or considered at all, there is no content with which to engage in Approach 2, and therefore there



would be a need to undertake Approach 1, or an iteration thereof, within other planning processes in order to meaningfully integrate rivers into other plans.

Underpinning both approaches is the need for an integrated approach to the alignment of land use and spatial planning with rivers in order to mainstream rivers in existing planning approaches through the principles of integration, which include collaboration, participation, and stakeholder engagement. The third section, as such, presents the “how to” in terms of the broad guiding principles of both approaches. This section seeks to identify essential principles and considerations for effective implementation of the mainstreaming of rivers through integrated planning.

Essential in both approaches, is the recognition that urban natural assets (such as rivers) form the underlying foundation of our cities. It is also essential to recognise the context in which planning in African cities occurs. As such, it is not always appropriate, or necessary, to follow both approaches in their entirety. The choice and capacity to follow these approaches will be determined by each specific context. The aim is that this body of work will contribute to ICLEI’s broader work around the mainstreaming of UNA (of which rivers are one) into local planning in African cities. The approach is shown in figure 17.

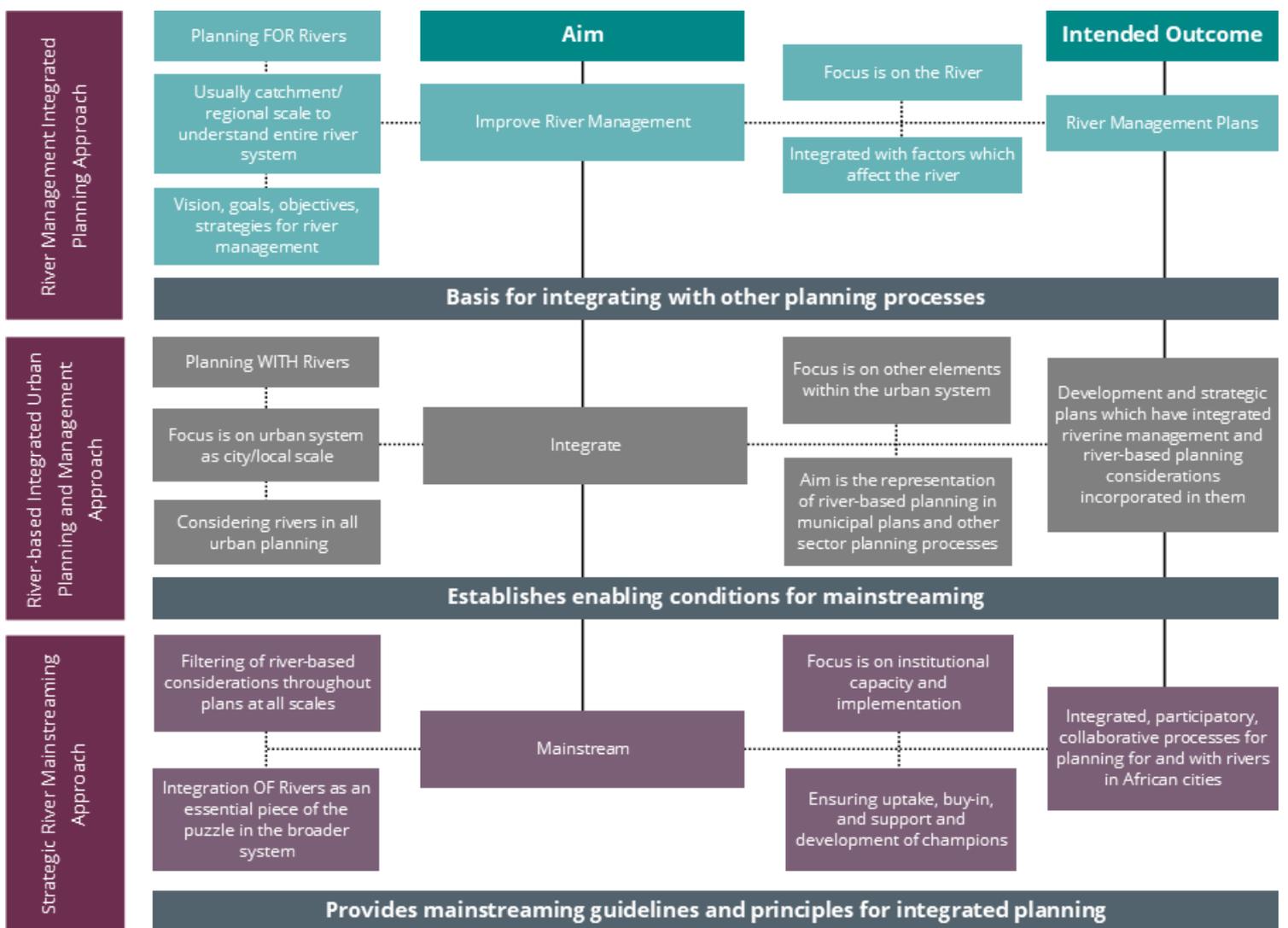


Figure 17: Structure of the guideline

## 3.5 Key Principles

The primary principle to be followed when planning for and with rivers is ensuring total quality of life, both now and in the future, in a way that maintains the ecological processes (See Glossary) on which life in cities depend. This includes (a) ensuring individual and community well-being by following a path of economic development that safeguards the welfare of future generations that; (b) providing equity within and between generations; and (c) protecting biological diversity and maintains essential ecosystem services and ecological processes (University of Wollongong ESD Strategy, 2001).

When planning for and with rivers city officials and decision makers should work within a set of guiding principles (Figure 18). These include:

- ◆ The need for a local authority which is well capacitated to enable river-based planning
- ◆ Participatory planning and meaningful engagement
- ◆ In some instances planning occurs in a top-down manner where community input into plans is limited. Through extensive community participation and the inclusion of all stakeholders in the planning process the disjuncture between the needs and desires of planners and the communities can be addressed. Buy-in and ownership of plans can then be fostered by all parties.
- ◆ Often, planning is seen as the sole responsibility of planners. A shift in thinking to an interdisciplinary approach can contribute towards sustainable plans and interventions that ensure resource optimisation.
- ◆ The need for an integrated planning approach
- ◆ Multidisciplinary approaches are required
- ◆ Balancing social, ecological, economic and environmental needs
- ◆ Promoting sustainability and ecologically sensitive design
- ◆ The need for a people-centred approach
- ◆ Using visioning as a tool to understand trade-offs involved in multifunctional spaces



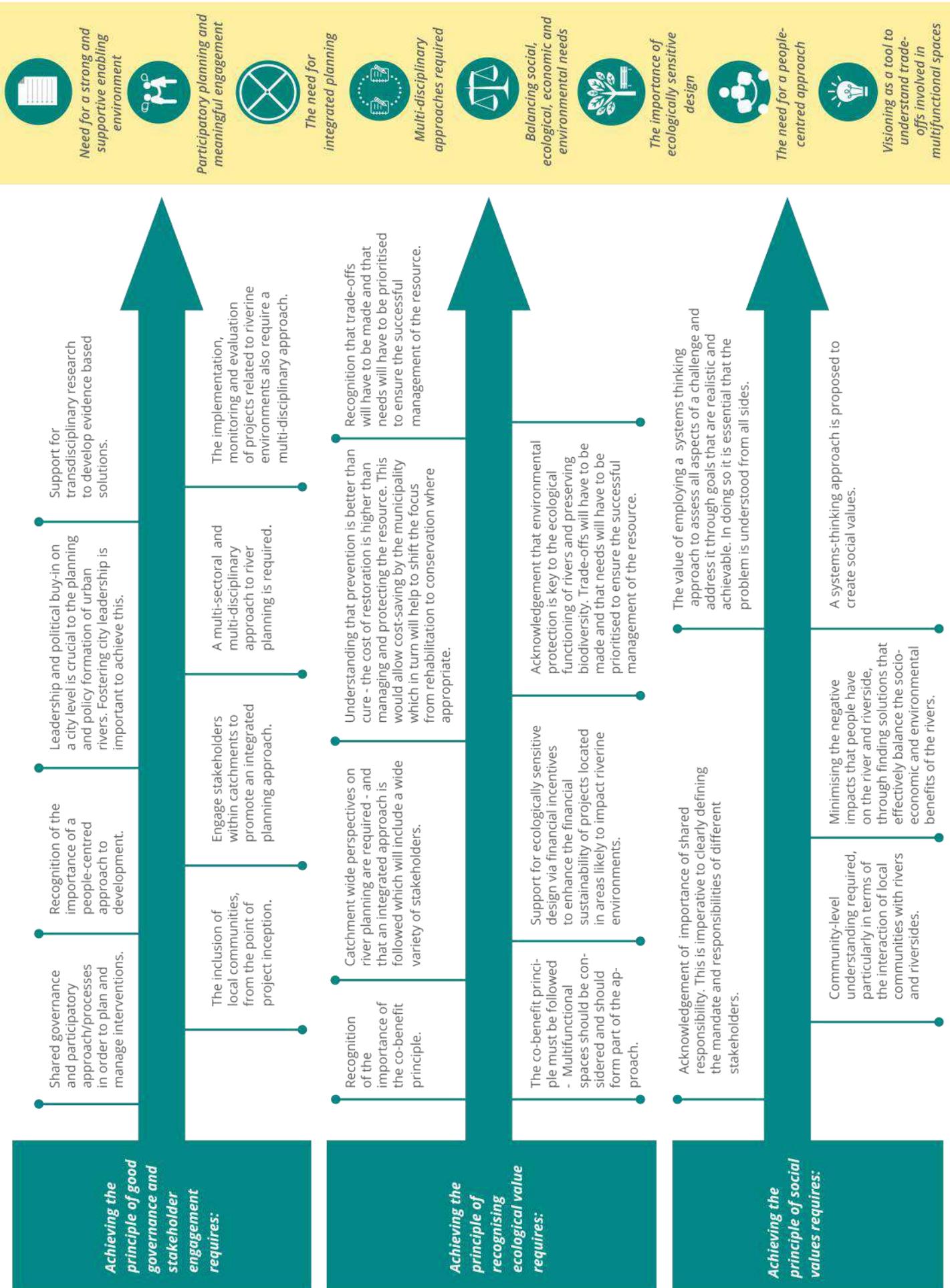
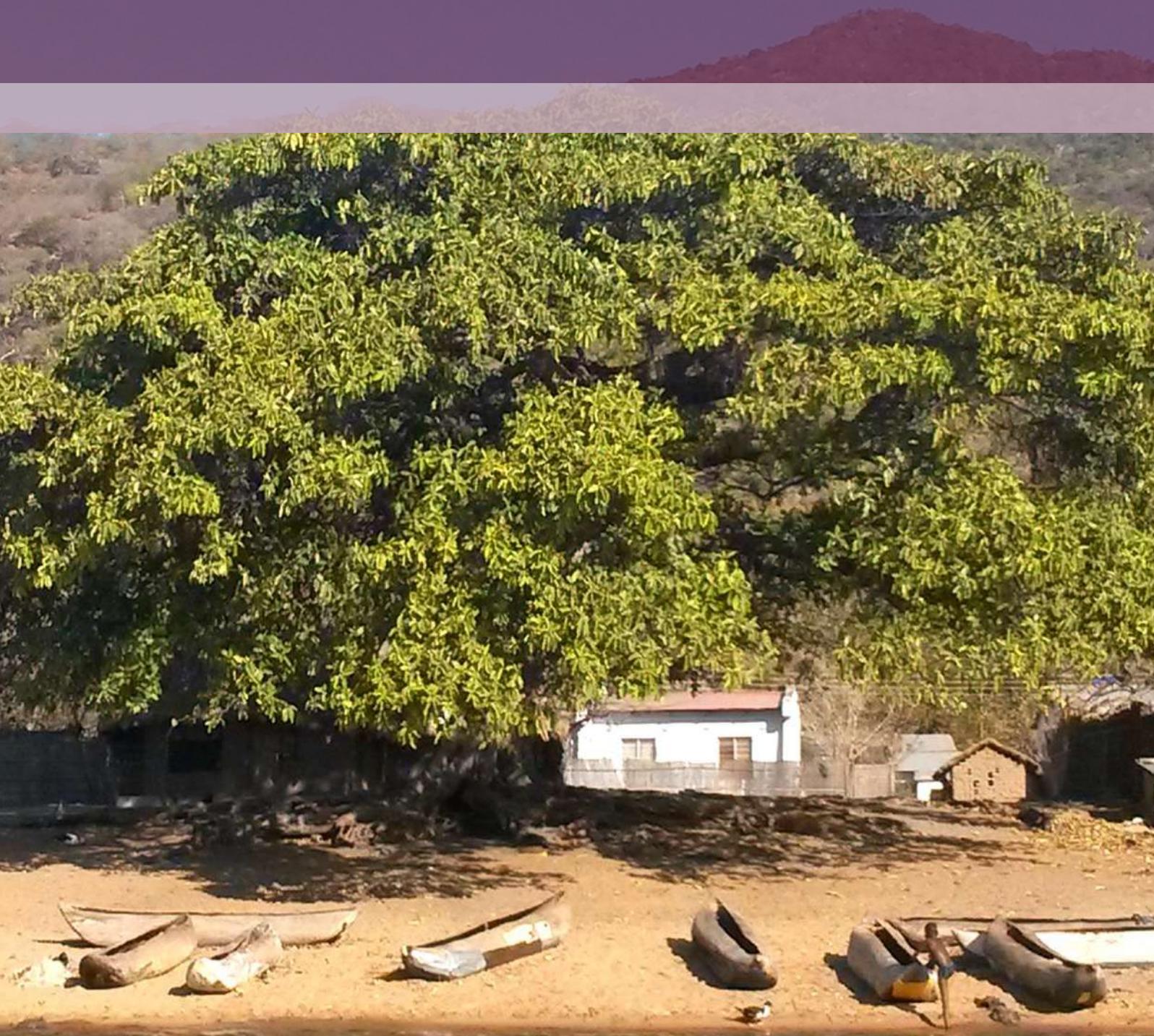


Figure 18: Principles for river planning



# 4. APPROACH 1

## Improving river management: planning FOR rivers

### 4.1 The river management planning process tool

Below is a process tool to provide a brief overview of the proposed integrated river management planning process.

#### 4.1.1 Actor Mapping

To understand who needs to be part of the river management planning process, it is important to understand who will be impacted by the plan and its implementation, as well as who can and will be involved in implementing the plan.

Consider the following questions to make a list of people and organisations who need to be invited to participate in the planning process:

- ◆ Who lives and works along the river?
- ◆ Who uses the river or the land next to it to play sport, undertake important religious activities, or engage in important cultural activities?
- ◆ Who makes use of the river's resources: plants, animals, water, or soil?
- ◆ Is there a community leader or organisation that the local authority can work with?
- ◆ Which departments will need to undertake projects to implement the plan or manage the area once developed? E.g. stormwater, roads, water and sanitation, waste, environmental, parks and recreation, economic development.
- ◆ Who, from outside of the study area, has decision-making power over the river or areas next to it? This could be private land owners, regional or national government, utilities companies, etc.

An actor mapping exercise such as the one described above will inform who the various stakeholders will be throughout the planning process.



## 4.1.2 Analysis

Once consensus on the need for the plan has been reached and there has been relevant buy-in and support, the first broad stage in the river management planning process is usually to undertake a status quo analysis of the river and the various elements that affect it. Some broad guiding thoughts and ideas are shared below:

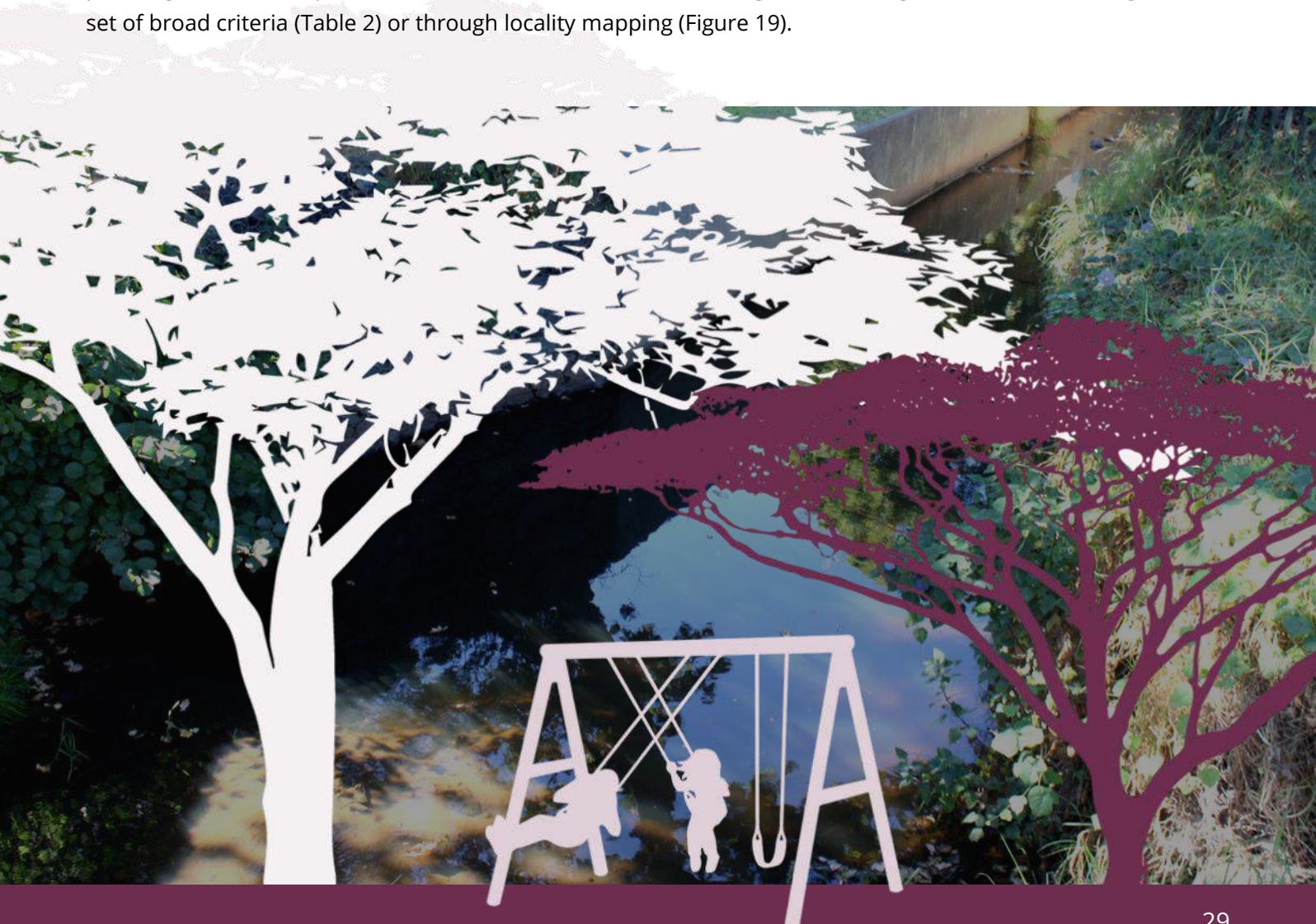
- ◆ For planning with rivers, it is important to start with an understanding of the water catchment in which the city is located.
- ◆ Cities that have a river flowing through them often do not have full control over the river from source to sea, but rather only a part of it. This means that the way in which water, energy, and land is managed upstream or downstream can have a direct impact on the health of a river in a city.
- ◆ This means that cities need to develop good relationships with their neighbouring municipalities and regional and national governments, and possibly even neighbouring countries, who share the river as a resource.
- ◆ The first step is to obtain a map of the water catchment, with all rivers shown, and locate the municipal boundary on it. This will help planners and environmental practitioners to see how the municipality fits in to the broader water system, what part of the river they are located in to plan appropriately, and who they might need to work with outside of their municipal boundary.
- ◆ Once the catchment has been mapped, an appropriate scale for the plan needs to be decided on. Deciding this scale could be determined by jurisdictional boundaries, catchment extent, or could be done at a local or city scale. This will give you the study area with which you are planning for the management of, and subsequently the priority actions and vision for the river for the purposes of mainstreaming integrated river-based planning across scales.
- ◆ Having chosen a study area and scale, make sure that the map you are working with for your study area has all rivers and their floodlines shown.
  - Identifying floodlines are important as sometimes there can be many decades between significant floods. Planning for development or open space often does not take these floodlines into account and allows development to take place in these areas. When a large flood happens, then this development can be severely damaged. Damage can be avoided by taking floodlines into account and flooding proactively planned for.
  - Defining floodlines requires technical expertise, so this work needs to be planned for and budget allowances made by the city administration. Where there is little financial resources for such a task, external funding should be sought through innovative means.
  - Flood lines can change over time so this will need to be updated regularly. The health and/or modification of a river can affect how or if a river floods so changes to the river need to be taken into account too.



- As a first step, municipalities can speak to those living or working along the river to find out where flooding takes place from their experience and how often this happens.
- ◆ A spatial analysis of the various layers which impact on the river system, including adjacent land use, land ownership, water quality, floodlines etc, would be useful at this stage. Overlaying these layers of spatial data might enable the identification of trends and areas requiring certain interventions.
- ◆ As part of the analysis phase, it may be useful to ask the following questions:
  - Are there plans/policies for the river at various other scales that need to be consulted and aligned with? This might require a desktop study to engage with other existing plans.
  - Where has the river been modified and where is it in a natural state? This analysis may be necessary and useful in developing the plan.
  - What is the quality of the water in the river? This should be determined to inform management and conservation responses.

The answers to these questions might be different along the river, so it is important to make a note of these answers on a map. The product of this step in the process is some understanding of the status quo of the river and the different aspects, elements, and stakeholders which impact on it. These are guiding considerations, and this process is not prescriptive.

This step in the management planning process aims to establish a baseline of data and information regarding the river, its threats, opportunities, state, and projected reality if no management interventions or strategic planning were to take place. Baseline data can be obtained through undertaking a river assessment against a set of broad criteria (Table 2) or through locality mapping (Figure 19).



**Table 2: River assessment criteria**

		Guidance on River Assessment Criteria	
		Description	Responsible Authority
Biota	Bio-physical Assessment Criteria	Plant communities, vegetation zones and structure (including comments on particular rarity, etc.); Animal communities (including comments on particular rarity, etc.); Main species present (including comments on particular rare/endangered species, etc.); population size and proportion where known, seasonality of occurrence, and approximate position in distribution range (e.g., whether near centre or edge of range)	Botanical Specialist
Ecosystem services		Understanding the various local ecosystem services in the area as well as the ecosystem services at a basin level	Freshwater Specialist; Environmental Specialist
Land Use	Land and Legal	It is of high importance to understand Land Uses adjacent to rivers, both locally, and in the river basin and or coastal zone. Different Land Uses will have different effects on rivers and river zones and therefore should be well understood and managed. Should include Mapping local communities located in or within close proximity to the land	Relevant Urban Planning Department; Professional Urban Planner/s. GIS practioners
Conservation and management status of the Rivers		Including legal instruments and social or cultural traditions that influence the management of the Rivers; and including protected area categories according to any national system	Local Authority; High Level Government Authority; Environmental Consultant
Socio-economic and risk assessment		Understanding the developmental and socio-economic context of communities located in riverine environments based on identification of these communities as part of the land and legal assessment. The Sustainable Livelihoods Framework approach can be used	Social facilitators, disaster risk and resilience experts, town planners

		Guidance on River Assessment Criteria	
		Description	Responsible Authority
Site Name	Locality Mapping	Official name of the site and catchment/other identifiers. This includes the neighbourhood through which this river flows or the nearest village to the river. The site name is important as it becomes a reference point when referring to specific parts of the river.	Local Municipal Authority; Local Community
Area, Boundary and Dimensions		Site shape (cross-section and plan view), boundaries, area, area of water/ wet area (seasonal max/min where relevant), length, width, depth (seasonal max/min where relevant).	Local Municipal Authority; Freshwater Specialist; Surveyor
Location		Projection system, map coordinates, map centroid, elevation. This mapping should be done electronically, preferably on a Geographic Information System (GIS) based interface. This would allow for the data captured to be shared and manipulated as necessary.	Surveyor; GIS Specialist
Geomorphic Setting	Bio-physical Assessment Criteria	Setting in the landscape/catchment/river basin – including altitude, upper/ lower zone of catchment and distance to coast where relevant. This could also form part of a greater location analysis as mentioned above. A good Geomorphic analysis would provide a platform for other types of analysis following on from this Geomorphic analysis.	Surveyor; GIS Specialist
Climate		For climate, it is necessary to do an overview of the prevailing climate type, zone and major features (Precipitation, temperature, wind).	Environmental Specialist; Environmental Consultant
Water Regime		Water source (surface and groundwater), inflow/outflow, evaporation, flooding frequency, seasonality and duration; magnitude of flow and/or tidal regime, links with groundwater.	Freshwater Specialist; Environmental Specialist
Water Chemistry		Here it important for the relevant stakeholder to analyse the temperature, turbidity, pH, colour, salinity, dissolved gases, dissolved or suspended nutrients, dissolved organic carbon and conductivity of the river. A combined analysis of these elements will provide a reflection of the water quality in the river.	Freshwater Specialist; Environmental Specialist; Chemical Engineer

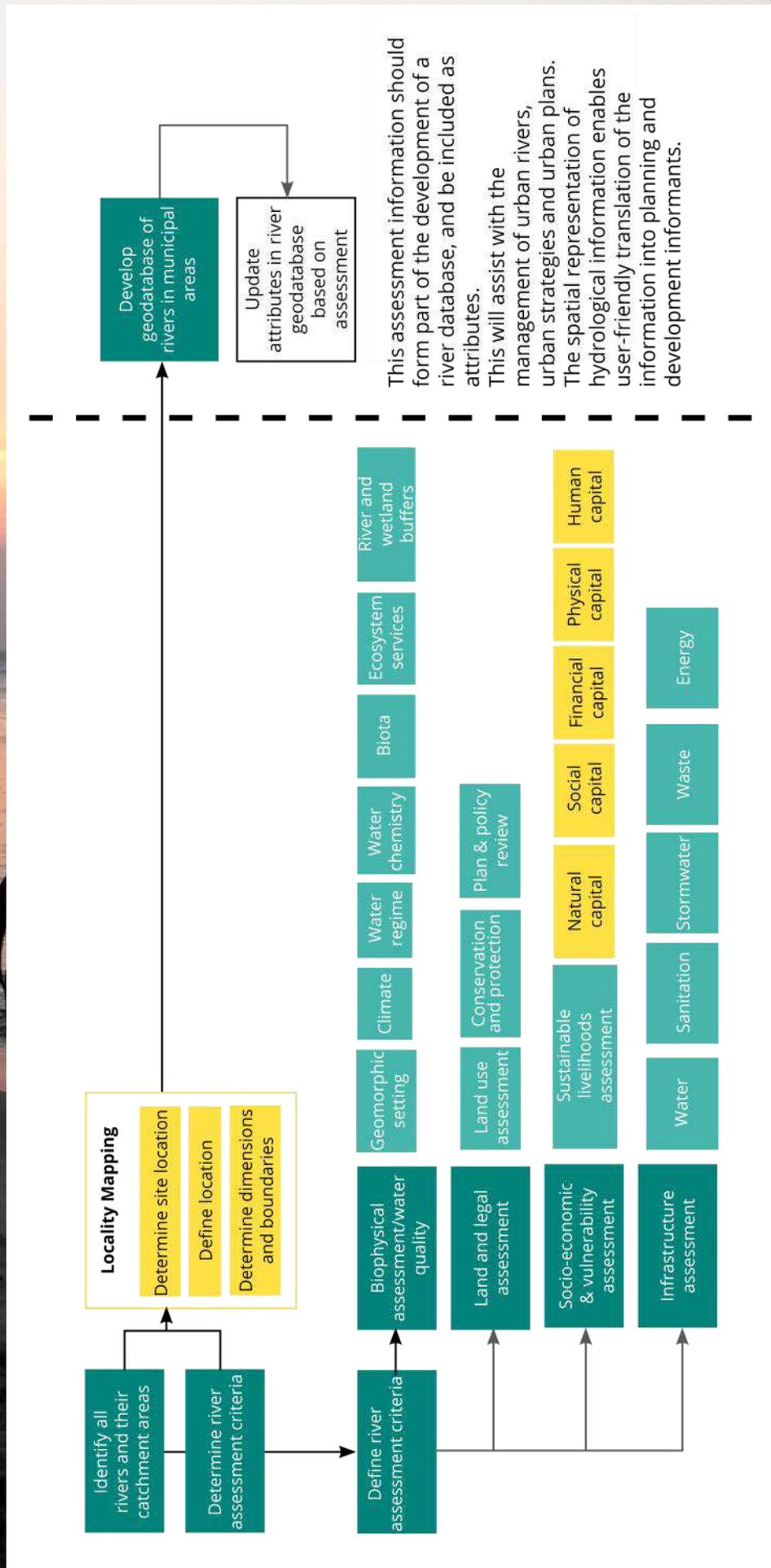


Figure 19: Locality mapping

## 4.1.3 Creating a vision, goals, objectives, and activities

In creating a vision for a city that actively plans for its rivers, the aim is the imagining of a possible future state of the urban environment, including the future state of its river and is usually a statement of long-term intent. As part of the planning process it entails the identification of a high-level statement of goals and priorities for the restoration of a river (WWF, 2013: 50). Riverine environments are multifunctional, complex and there are competing demands placed on rivers. The visioning process will provide the normative platform for the different values and priorities of various stakeholders to come to light and inform the prioritisation process and prevent conflict between stakeholders. A vision is not the end goal, but can be revisited and adapted during the planning phases of river management (Pegram et al., 2013). The long-term nature of the vision will enable a proactive, evidence-based, strategic approach to river management planning. **The focus of any visioning exercise should be on the process of creating a vision and not necessarily only the vision itself.** The process allows for and fosters a systems approach and allows for dialogue to take place in support of integrated river-based urban planning. In this way, it is a useful exercise.

The overarching process of designing a vision that all stakeholders can agree on can be unpacked into three levels:

- ◆ The first level is the visioning level, also known as normative planning, and entails creating a long-term vision, usually 20-100 years, identifying guiding principles which have to be adhered to when formulating plans and strategies which aim to improve and enhance river management.
- ◆ The second level is strategic planning. This entails the formulation of broad objectives, strategic action and institutional arrangements (5-10 years) that will contribute to achieving the vision's objectives under potentially different scenarios and with available capacity.
- ◆ The third level is operational planning. The aim here is to develop short to medium-term plans that achieve the above mentioned strategies in an incremental manner. Operational planning occurs for the three to seven year period and includes short to medium-term targets and may include: business planning, programme planning and project planning (Pegram et al., 2013).

Guidance on creating a vision:

- ◆ A vision should ideally be worded in such a way that all stakeholders have a clear picture of what it aims to achieve.
- ◆ It should be easy to understand, ambitious yet achievable and have social, environmental and economic relevance.
- ◆ It should be relatively short. Ideally two to three sentences.
- ◆ It should be specific to rivers and the respective city.
- ◆ A question that could be posed is "What is your dream for rivers in your city?"
- ◆ A vision should be developed in such a way that every stakeholder agrees upon it because trade-offs will have to be made in terms of social, economic and environmental values and priorities.



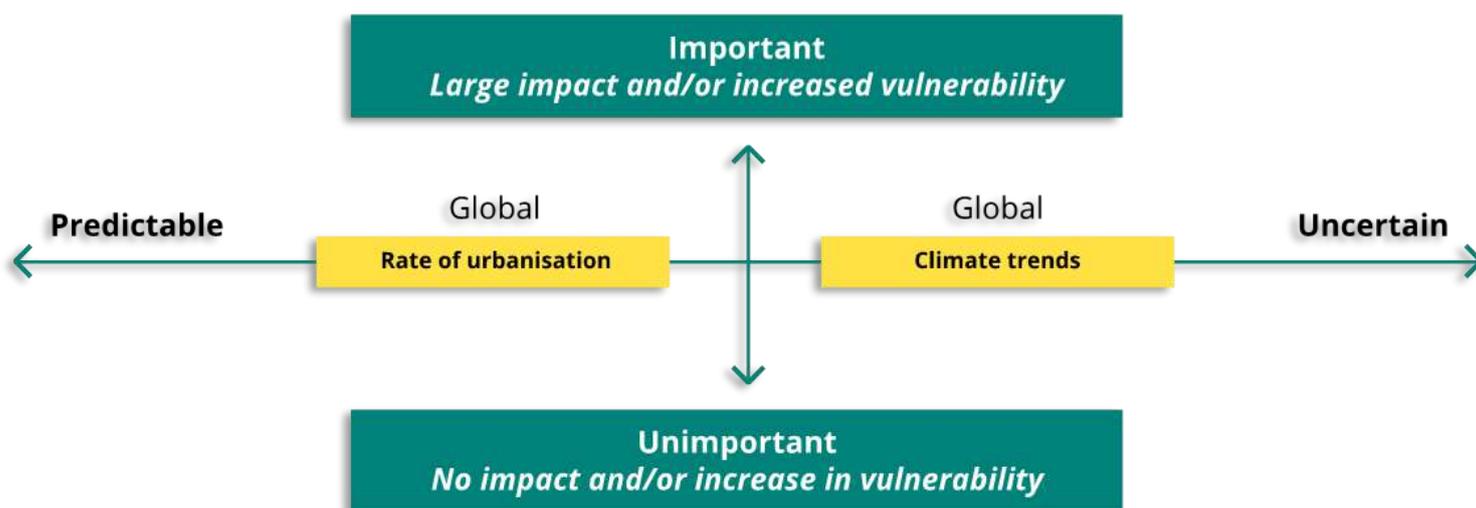
Drafting a vision can follow a number of different processes, some of the individual steps could include:

- ◆ Consider a future state for the river
- ◆ Provide stakeholders with a platform to share knowledge across various perspectives, and to formulate shared values in a contested space
- ◆ Demonstrate that various perspectives can be pursued in parallel
- ◆ Raise awareness of the significance of planning for urban rivers (Pegram et al., 2013)
- ◆ If needed, use a facilitator, with mediation skills of a high standard to manage this process in an impartial way
- ◆ It should be ensured that any political tensions that come to light are managed effectively

**In the visioning process, through a scenario planning approach,** a number of strategic plans can be developed in relation to different variables that may influence the river in the long term. In this way, flexible and adaptive plans can be developed which account for unexpected change in a city. The vision for the river can remain the same, but how the vision will be achieved over the long term may differ according to the unexpected changes and forces of change.

In scenario planning, plausible scenarios are created based on a vision using key uncertainties which are important and unpredictable. The scenarios should include important, predictable and uncertain elements; however, the focus should be on the uncertain elements. Any scenarios which are impossible should not be developed (Addison & Ibrahim, 2013). A scenario planning matrix is shown in figure 20. Once each scenario has been developed, steps in which the end goal of the scenario can be reached should be outlined. This can take the form of identifying the objectives, goals, actions and relevant role-players over a period of time to achieve the vision or end state of the scenario. The impacts, risks and opportunities for each should be assessed and this should be used to provide insight as to which scenario is going to form the basis of the plan at the present time (Addison & Ibrahim, 2013).

It is also important to note that if one is undertaking a scenario planning methodology, there can be more than one future aspiration to be considered. When a desired state is identified, a number of plans or strategies will be identified, each with different objectives, goal and actions to reach each vision depending on the variable/s used in the scenario planning process. When a scenario planning approach is taken, plans will need to be regularly reviewed, monitored and evaluated to confirm their appropriateness over time. This approach is expanded on later in this guideline.



**Figure 20:** Scenario matrix (Source: Adapted from Addison and Ibrahim, 2013)

## 4.1.4 Setting goals, objectives and activities

From the vision, stakeholders need to define goals and objectives required in order to meet the desired vision. Flowing from that, stakeholders need to agree on the specific actions needed and the responsible party for each of the actions. Prioritisation of the actions or projects will then need to take place. Through this, the way forward and mandates of different parties involved in the river planning process will be well defined.

**The goal in river planning** should answer the question of what the desired change would be or what is needed to achieve the vision (Speed et al., 2016).

When developing a goal it should be asked:

- ◆ What is wanted or what is required from a river?
- ◆ What is feasible? (Speed et al., 2016)

**The objectives in river planning** are measurable targets outlining actions needed to achieve the goals. Often they are quantifiable.

Objectives may be based on:

- ◆ Achieving a particular state
- ◆ The previous condition of the river in terms of the natural state or at a point in time
- ◆ Maintaining or improving a particular function or ecosystem service
- ◆ Restoring resilience (Speed et al., 2016)

Flowing from the objectives, specific actions will be detailed. Actions detail how the objectives will be met. The actions include responsibilities, management structures, where an intervention is needed, which sectors are affected, and what timeframes are envisaged (Speed et al., 2016).

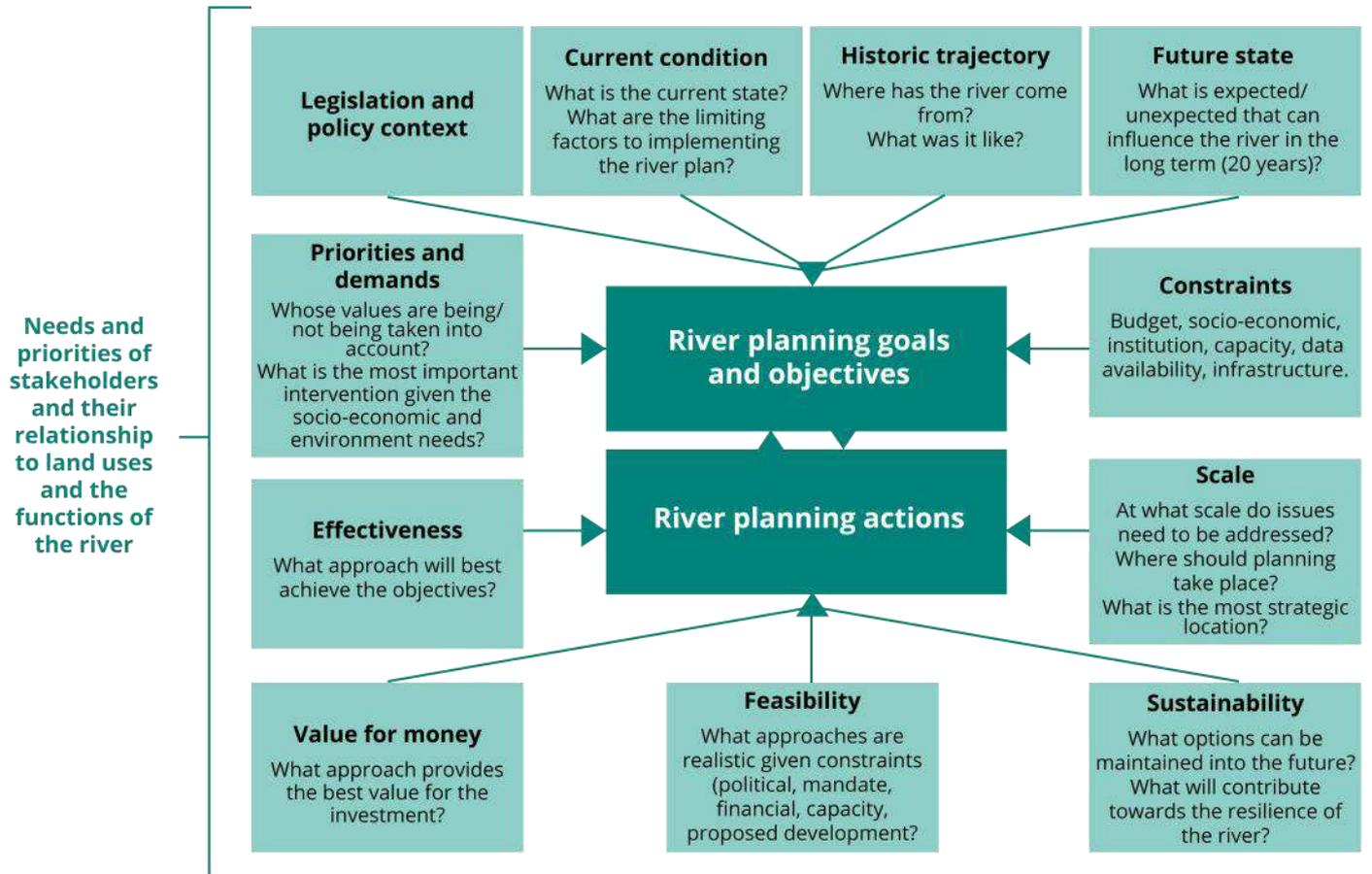
While there is no set method for setting goals, objectives and actions, as this will change depending on the participatory planning method being used, some guidance includes:

- ◆ Prioritisation of the values, functions, and services of an ecosystem should take place.



- ◆ Agreement between stakeholders on what levels of improvement constitute success should be facilitated.
- ◆ Interventions identified should be assessed according to which is the best approach to achieve multiple goals and objectives (Speed et al., 2016).

The diagram below (Figure 21) outlines the criteria to be taken into consideration when setting goals, objectives and actions.



**Figure 21:** Criteria to be considered in developing goals, objectives and actions  
(Source: Adapted from Speed et al., 2016)



## 4.1.5 Prioritising activities

Prioritising the implementation of activities in river management plans helps slipstream activities which alleviates challenges such as capacity and minimum resources. The priorities of each city and plan will inform this process as each has different trade-off requirements for ecological, social, cultural and economic values and needs. For each river, the relationship between stakeholders, functions of the river and land uses changes.

Fundamental in prioritisation is that all stakeholders and the relevant communities buy into the priorities identified, to foster a sense of ownership. The prioritisation process could take the form of a feasibility study or could be based on a set of criteria. These criteria can either be identified by experts and then presented to the relevant stakeholders for their input, or can be developed with the community from the beginning. Political will and agendas can have a significant influence on prioritisation and therefore it is important to include political stakeholders throughout the whole planning process.

The **steps in the prioritisation** process are outlined below:

- 1) **Identifying the needs of role players and understanding the context:** Before any outcome, activity or prioritisation process can be undertaken, a well-rounded understanding of the context of the river is needed. An integrated and systems thinking approach should be used the needs and values of the relevant role players and the role players' relationship to and dependencies on the functions of the river should be a focus.
- 2) **Develop vision, objectives and goals:** Based on the context and values of role players, a vision can be developed. Goals and objectives to achieve the vision can be identified in collaboration with stakeholders. Activities to achieve the objective are then decided in collaboration with stakeholders.
- 3) **Criteria** against which the activities should be prioritised need to be developed and agreed upon by all stakeholders. These criteria may differ according to the site. Proposed criteria include:
  - The effectiveness of the activity in achieving the objective
  - The efficiency of the activity in terms of providing the best return on investment
  - The feasibility of the activity taking into account constraints such as political desires, available capacity and finances, and institutional constraints.
  - The sustainability of the activity to make change for the long term and contribute towards resilience
  - The location of the activity and the implications of developing this area (Speed et al., 2016)
- 1) **Each activity should be assessed** in terms of each of the above criteria (and any other criteria developed).
- 2) **An assessment of the implications of each of the preferred activities** needs to be undertaken. This should include both the positive and negative implications, taking into account both the site and a wider focus on ecological, social and economic implications.
- 3) **The trade-offs** needed to achieve the preferred activities should be discussed and agreed upon by all stakeholders. Conflict that arises may need to be mediated so that common agreement and buy-in can be achieved.

In each plan or project, the return on investment desired will differ depending on the needs of stakeholders. Before prioritisation can take place, the return on investment needs to be agreed upon. The return on investment could be financial returns, looking for an intervention with the highest impact at the lowest cost, community benefits, ecological benefits or economic benefits. Understanding what return on investment the plan is aiming to achieve will influence the prioritisation of activities. Having outlined ideas for a potential process for undertaking integrated river management, some broad management approaches are now discussed in the sections that follow.





## 4.2 Dealing with river degradation

There are four main nature-based management approaches to dealing with river degradation to sustainably manage river resources. These include conservation, restoration, rehabilitation, and remediation (Table 3). These all interact with each other in various ways as different parts of a river will probably require a different approach depending on the context. It is vital to maintain a balance between these strategies and to attempt to understand which is the most appropriate given the context.

Table 3 illustrates the difference between the different approaches. From the point of a degraded ecosystem, undertaking **restoration** will return the ecosystem to its original state pre-development. The ecosystem structure will significantly change from the present state and the ecosystem function will drastically improve. This differs from **rehabilitation** where measures are implemented to address some elements within the degraded ecosystem, but not all. The aim is to restore the ecosystem closer to the natural state. **Remediation** differs from these two approaches as while the aim is to improve the functioning of the ecosystem, the ecosystem is changed into an alternative condition differing from both the original and current state. **Conservation** is usually implemented in areas where an ecosystem is already in its original state, with the aim of preventing any unnatural degradation or changes to take place proactively (Speed et al., 2016). It is important to note that the cost of restoration is almost always higher than that of conservation. Practitioners in the African context tend to favor a restorative approach, without fully acknowledging the benefits of conservation. A restorative approach is often necessary, however, especially when reactive planning is aiming to deal with what is already there, or what has already altered the natural state of the river. This strengthens the need for a combination of proactive and reactive approaches in the African context.

**Table 3:** Four approaches to river degradation

Drivers	Details
<b>Restoration</b>	Condition of bringing a system back to its improved or original condition
<b>Remediation</b>	The action of reversing or stopping damage
<b>Conservation</b>	The action of prevention or protection
<b>Rehabilitation</b>	Enhancing the functional ability of a natural system

**Rivers that have been impacted by urban development already are unlikely to be restored to their “original” state, but must be embraced, enhanced and improved in their current state.** Understanding when to use each of these approaches will depend on the context, the needs, and the priorities of the various stakeholders. There is no set methodology for identifying which approach should be undertaken, however tasks such as mapping where development should and shouldn’t take place, the vision developed for a river, as well as the goals and objectives set will indicate which approach is more appropriate, and when. The measures implemented to achieve each approach will also vary depending on the context and the vision for the river. Land use changes may be required, such as implementing no development zones or setting conditions for specific land uses next to a river. In some cases nature reserves are constructed for conservation. Other measures may be in the form of infrastructure investments or policies that need to be put in place, for example waste management strategies. There are also a number of nature based and planning based solutions that are available, which are discussed in more detail later in this guideline.



# 4.3 Find innovative ways of funding projects

For successful river planning, innovative mechanisms for obtaining finance for the capital and maintenance costs of projects is needed. Funding sources can be broken down into three main categories (shown in figure 22): namely, the polluter pays, the beneficiary pays and society pays (Speed et al., 2016).

## Polluter pays:

Restoration bonds: Before undertaking an activity, a bond is paid by a business where it is predicted that damage to the environment may occur. In this way funding is available for any restoration measures needed in the case of environmental damage (FAO & Global Mechanism of the UNCCD, 2015).

Fines and taxes: Ecological compensation fines can be issued to companies to compensate for the negative impacts they have had on the environment. The fines are usually used as a last resort when avoidance or reduction of negative impacts has already been tried unsuccessfully. Tax incentives can be issued to encourage businesses and non-governmental organisations (NGO's) to engage in river conservation and rehabilitation projects.

## Beneficiary pays:

Resource taxes: can be imposed on those who benefit from environmental degradation such as industry disposing of their waste into rivers.

Impact taxes: can be added to the utility bill for those who use the river resources and can be linked to the amount a river resource is being used (FAO & Global Mechanism of the UNCCD, 2015).

Payment for Ecosystem Services: Payment for Ecosystem Services (PES) involves businesses, the beneficiaries or "buyers" of ecosystem services (usually downstream) paying the sellers of ecosystem services (usually upstream), such as farmers engaged in river restoration projects e.g. practices that prevent soil erosion.

Water stewardship initiatives are a form of PES where businesses benefiting from ecosystem services can engage in river restoration projects or invest in other river plans and projects to "off-set" the environmental damage they have caused. For example, they may work with an NGO to improve the impact of pollution or invest in infrastructure projects that assist with river restoration or water provision (Speed et al, 2016).

## Society pays:

Public-sector funding: Public-sector funding from national, regional or local government can be used to finance river plans and projects. Usually this funding is raised from the tax base of the population.

Donor funding: In Africa, donors play a large funding role in river planning. The donor funding is administered through the public sector and can take the form of a loan or investment for a project. Where a loan is provided to government, the finances for repaying the loan often come from tax collection.

Private funding: Private funding for river plans and projects can come from philanthropic sources or non-governmental organisations. Non-governmental organisations can include civil society organisations (CSOs), community based organisations, local and international institutions and foundations.

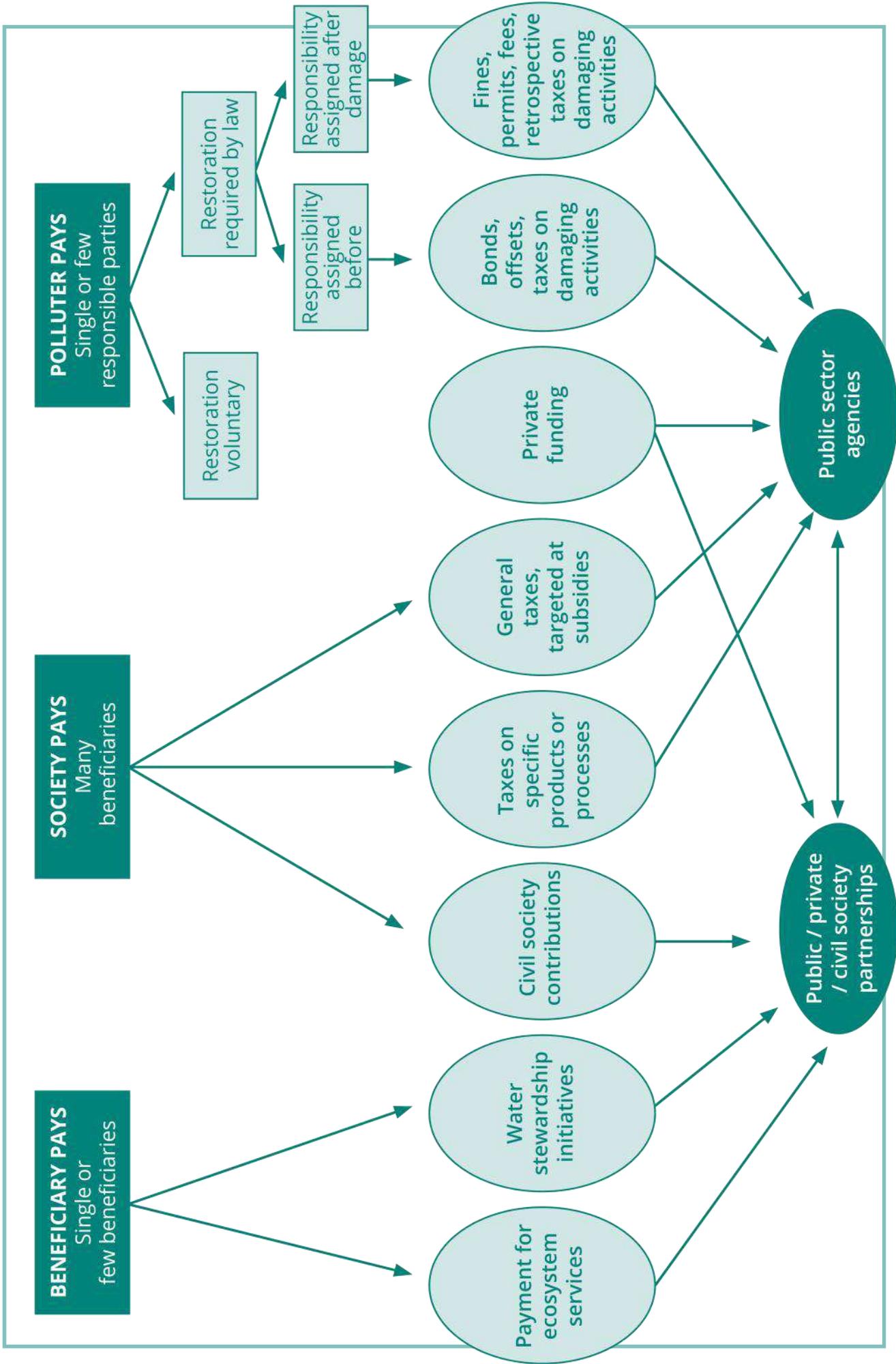


Figure 22: River development innovative financing opportunities (Source: Speed et al., 2016)

# 4.4 Broad river management planning process at a local level

The aim of city level management planning is to develop an overall strategy, guidelines or river management plan for rivers in the city. This management document needs to outline (a) the vision for city level riverine environments (b) broader projects and (c) strategies to be implemented, (d) provide guidance into where site specific planning needs to be prioritised and (e) a framework through which site level planning should take place. Of key importance in any city level river planning strategy document is ensuring that data on various elements of the city are up to date and that a database of this information is kept. A well-developed, strategic and relevant city management plan is equally dependent on a comprehensive understanding and assessment of the current state of rivers in the urban area. Many of these have already been outlined. However, **figure 23 outlines the broad methodology to be followed when undertaking integrated river management planning for rivers on a city scale.**

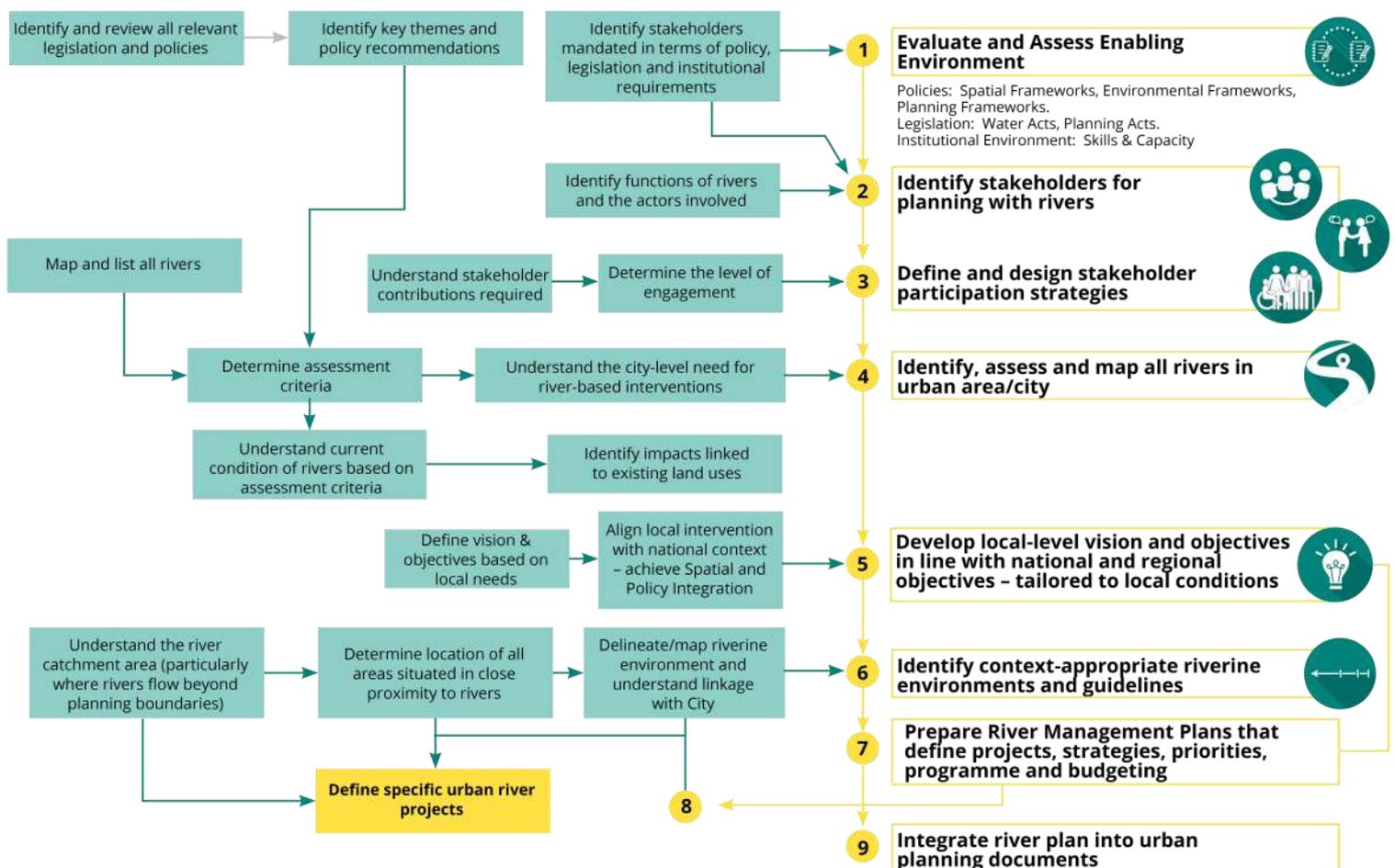


Figure 23: City level planning process



This section of the guideline has outlined the broad and adaptive process and shared some ideas around how to undertake an integrated river management approach to planning for rivers. It provides the content which other planning processes can incorporate to align their plans to the vision, goals, and strategies of the nature-based river management plan. Figure 23 shows that once the process of preparing a management plan has been undertaken, the integration of the elements of the river management plan into urban planning policies and documents can be achieved. The next section of this guideline outlines broad ideas around how planning with rivers through river-based urban planning processes could be achieved.





# 5. APPROACH 2

## River-based urban planning: planning WITH rivers

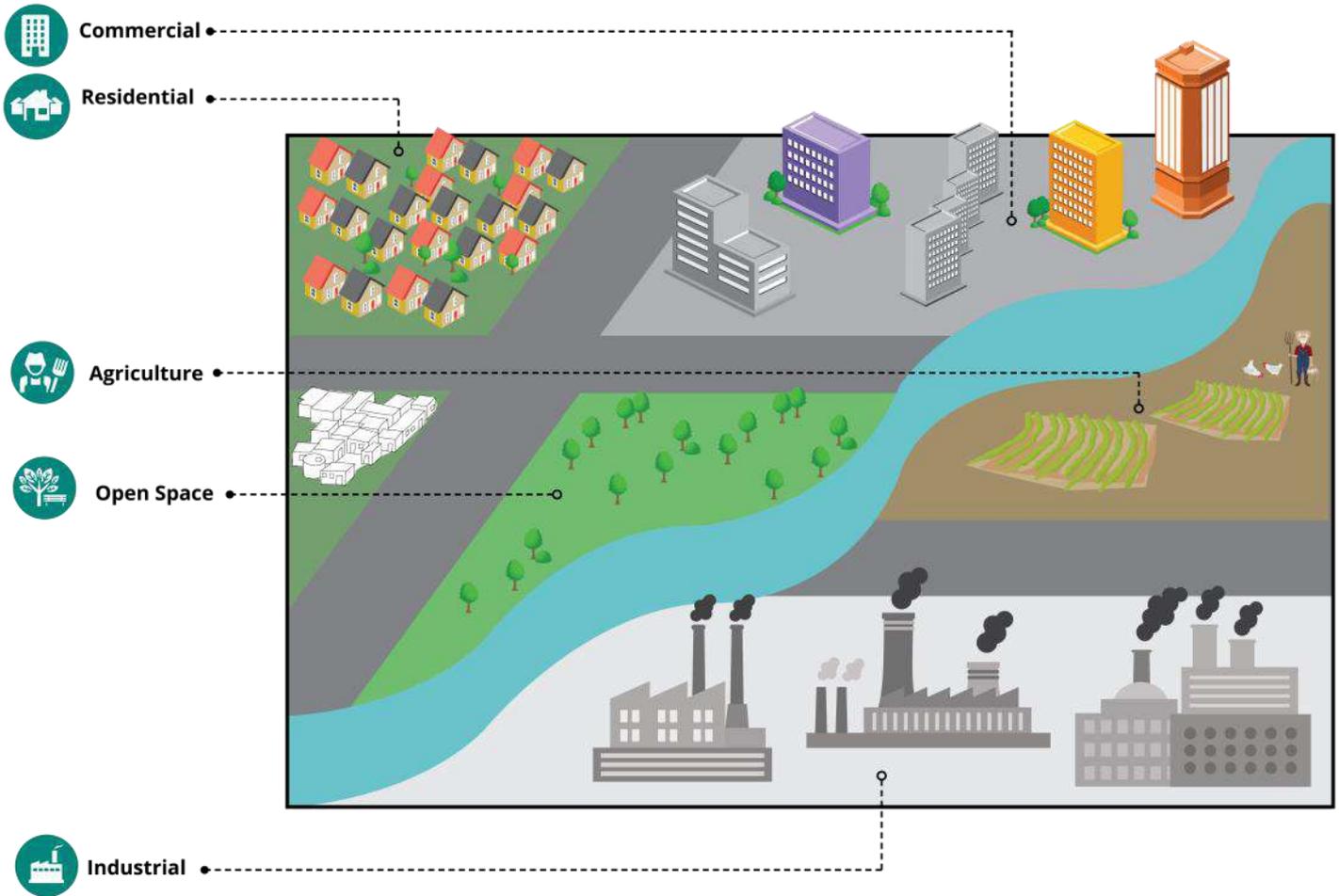


This section of the guideline aims to share some ideas of how river-based urban planning can be enabled through other planning processes which are not necessarily only focused on nature-based or management planning. Instead, this section shares ideas around how land-use urban planning processes can integrate the considerations developed in the previous section within their plans. In this way, it provides strategic and flexible guidelines on how to plan with rivers through a river-based urban planning approach.

### 5.1 Integrated river-based land use planning

As discussed previously, poor planning practices and poorly planned land uses can have major impacts on the riverine environment. The different land uses generally found in urban areas near rivers are shown in figure 24, and figure 25 conceptually illustrates and defines the main areas of intervention that are dealt with in this guideline. It illustrates the ideal zones adjacent to the river where all proposed actions should occur. It is important to note that these are defined here at a conceptual level. Integrated land-use planning gives consideration to not only protecting the river itself, but also the communities and desired land uses alongside the river (explanations of each are provided in table 4. River-based land-use planning seeks to build on the broad principles of management outlined in the previous section by providing a set of tools for how river management planning can be integrated with land-use planning. Now that a baseline for an urban river has been established, it is important that the river management plan is integrated with land-use plans. One way in which this can be achieved is through the designation of different buffer zones within a land-use scheme that provide guidelines for the types of development and land uses which are appropriate within them. This tool is outlined ahead.





### Commercial

A commercial land use zone consists of real estate intended for use by for-profit businesses for wholesale, retail and service activities, such as office complexes, shopping malls, service stations and restaurants. While commercial activities typically take up a relatively small amount of land compared to other types of land uses, they are extremely important to a community's economy.



### Residential

Residential land uses are predominantly allocated to housing. Residential land uses vary in intensity and thus consists of low, medium and high density residential developments. Lower density residential land uses typically consist of single family units on individual lots. Higher density residential land uses typically consist of duplexes, townhouses or apartment buildings. In the African context, there are a number of unplanned or informal settlements. In this settlements, the de facto land use is also predominantly residential.



### Agriculture

Agricultural land, which is used for growing crops and rearing animals, is the oldest human use of land. Thus, agricultural land uses are generally synonymous with farmland or cropland. Irrespective of the type of agricultural practices undertaken on the land, all areas used for agriculture is zoned under Agricultural Land use.



### Open Space

Open space land use zones are land which is essentially unimproved and devoted to open space use, including areas for conservation of natural resources and habitat values, for protection of public health and safety such as areas subject to flooding, steep or unstable slopes, and for compatible outdoor recreational uses such as access-ways, trails and scenic enjoyment.



### Industrial

Industrial land use is the use of land dedicated to industrial activities such as manufacturing, processing, storage and mining of products. There is a wide range of industrial activities that fall under industrial land use. However, due to the industrial sector being a bigger threat to the environment and people's amenities, the location and integration with other zones within the city must be carefully considered. Industrial uses can generally be split into noxious and non-noxious, and heavy and light industries.

Figure 24: Land uses generally found around rivers

Buffer zones are areas of natural land between rivers and development. They are used to separate land uses to protect rivers from the negative impacts of development and inappropriate land use. They provide environmental benefits such as habitat protection and flood attenuation; and social benefits such as spaces for recreation. It must be understood that each city has differing legislation outlining the width of different areas of intervention.

While there are international best standards, each riverside requires an assessment of the correct buffer zone to be set, given the ecological and social context. The task of identifying the right buffer width for a river is a complex task and thought needs to be given to the process of identifying appropriate buffers. The suggested widths outlined in this document are generally proposed buffer measurements based on international best practice examples (Figure 25 & Table 4). Integrating these buffers within land use and urban plans and processes will ensure that rivers are proactively and strategically aligned to and represented in various urban plans and will aid in the mainstreaming of river-based urban planning, which will be explored later in this guideline.

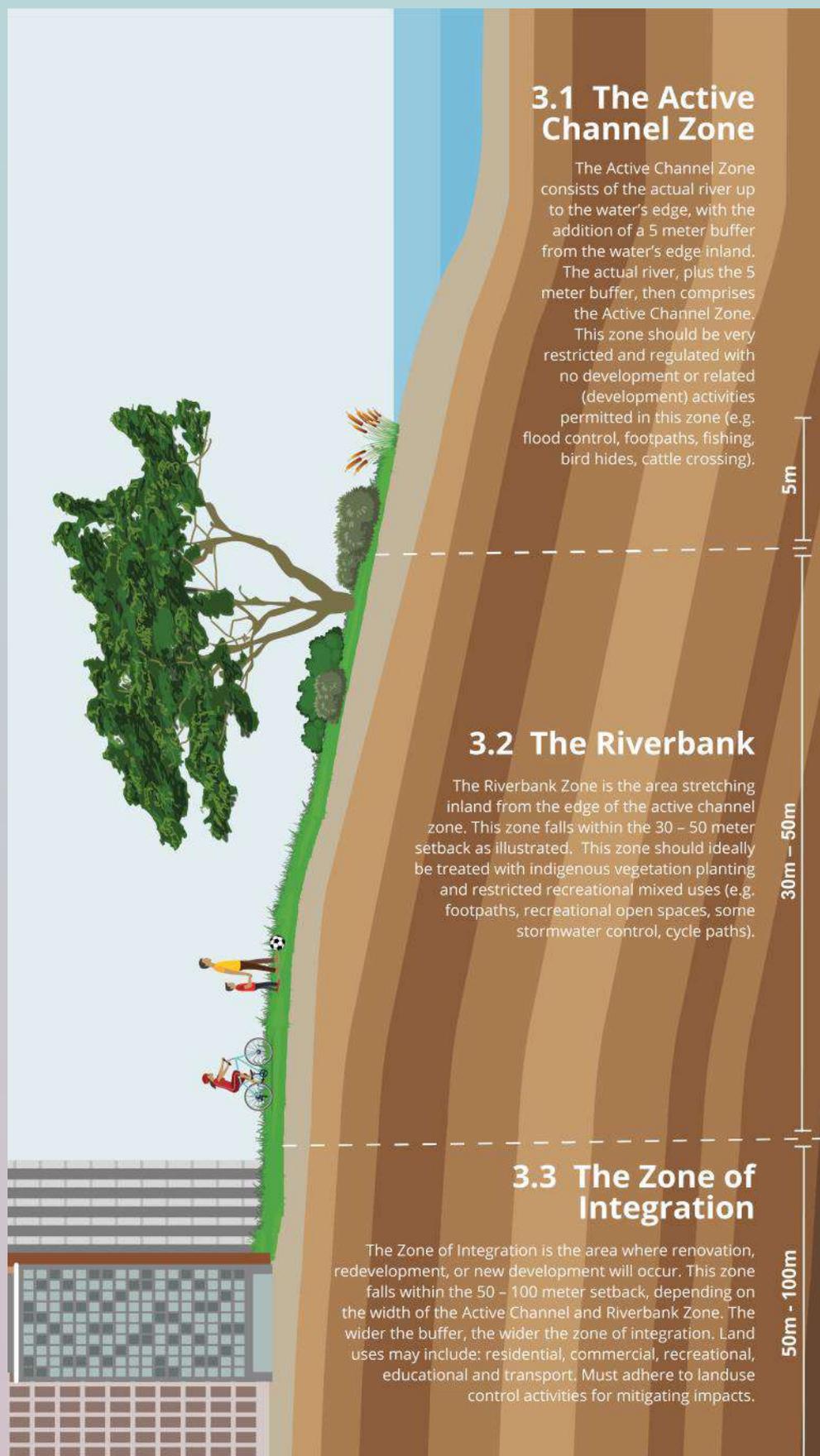


Figure 25: Areas of intervention

**Table 4:** Explanation of river buffer zones

	The Active Channel	The Riverank Zone	The Zone of Integration
Width	<ul style="list-style-type: none"> <li>5m measured inland from the end of saturation zone (includes 1:2 year floodline).</li> </ul>	<ul style="list-style-type: none"> <li>Depends on width of river.</li> <li>1-3m wide river = 15m buffer.</li> <li>&gt;3m river = 30-50m (approx.1:100 year floodline or macro-channel bank whichever is greatest).</li> </ul>	<ul style="list-style-type: none"> <li>50m – 100m depending on width of riparian buffer. The wider the buffer, the wider the zone of integration.</li> <li>Measured inland from the macro-channel bank or 1:100 year flood line, whichever is greatest.</li> </ul>
Vegetative Target	<ul style="list-style-type: none"> <li>Perennial grasses on steep slopes, promotes slope protection and stabilisation.</li> <li>Undisturbed mature forest.</li> <li>Reeds.</li> <li>Natural riparian vegetation.</li> </ul>	<ul style="list-style-type: none"> <li>Managed forest, reeds and grasses. Mix of riparian and terrestrial species.</li> <li>Must be indigenous species – clear alien, invasive and opportunistic species or sustainably manage.</li> <li>Exposed soils must be covered by ground cover beneficial plants such as vygies (family of Aizoaceae), nasturtium, creeping vegetables.</li> </ul>	<ul style="list-style-type: none"> <li>Promote indigenous vegetation. Terrestrial species.</li> <li>Exposed soils must be covered by ground cover beneficial plants such as vygies (family of Aizoaceae), nasturtium, creeping vegetables.</li> </ul>
Allowable Uses	<ul style="list-style-type: none"> <li>Very restricted and regulated (e.g. flood control, footpaths, fishing, bird hides, cattle crossing).</li> <li>Vegetation clearing limited to identified sites only.</li> </ul>	<ul style="list-style-type: none"> <li>Restricted activities (e.g. some recreational uses, some stormwater control, bike paths, footpaths).</li> <li>Recreational areas with floodwater attenuation e.g. depressed soccer field.</li> <li>Must be pervious surfacing, silt-trapping activities.</li> <li>Constructed wetlands for pre-treatment of runoff.</li> <li>Limited farming activities in specific identified sites. Must comply with climate-smart farming and sustainable land use practices – no tillage, use of mulching, and sediment trapping. Must include flood protection farming e.g. regular vegetation barriers, flood resistant crops e.g. hardy trees.</li> <li>Use a road, footpath or flood berm to demarcate the upper edge of the buffer area.</li> <li>No formal structures in this area.</li> </ul>	<ul style="list-style-type: none"> <li>Land uses may include: residential, commercial, recreational, transport, education. Must adhere to land use control activities for mitigating impacts.</li> <li>Must include waste and pollution minimisation activities.</li> <li>Farming practices must include silt-trapping, erosion protection, minimal tillage, and other soil conservation and climate-smart farming practices.</li> <li>Must be pervious surfacing, silt-trapping activities, constructed wetlands for pre-treatment of runoff.</li> </ul>

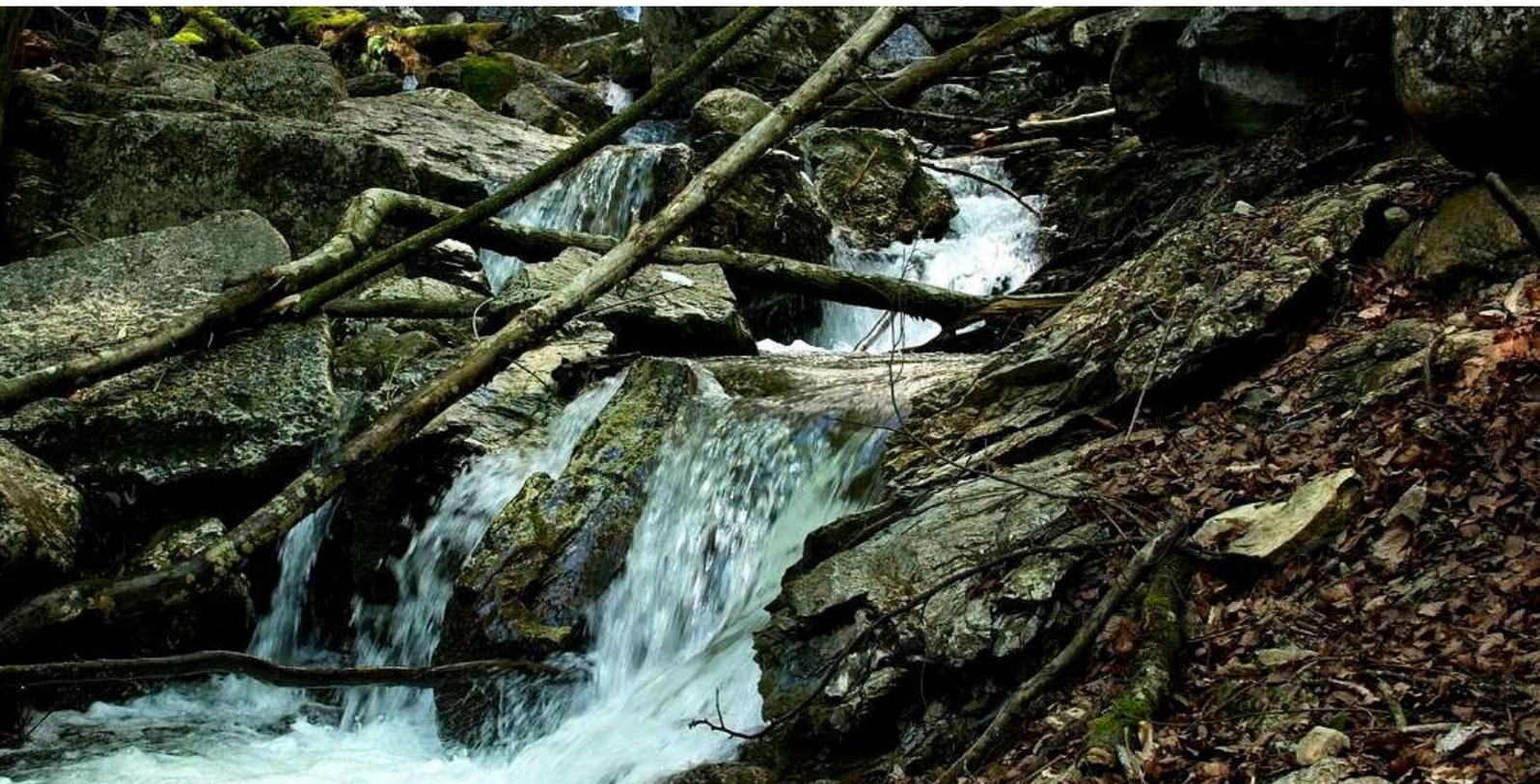


## 5.2 Dealing with informality through integrated service delivery and infrastructure planning

The provision of water, sanitation and waste services affect the urban poor and those living in informal settlements the most. As these settlements are frequently located next to riverbanks, rivers are often highly polluted and used as a sink for human and solid waste. The lack of service delivery is also at times due to the fact that informal settlements are viewed as unplanned and therefore are an unserved part of cities. Providing services may at times be seen as legitimising informality and potentially encouraging it further. A shift in thinking in local government to view informal settlements as unserved rather than unplanned might ameliorate this. Ensuring local governments have adequate human and financial capacity and the right skills is crucial in their ability to provide services to the growing urban population. Providing these services is one way through which river management objectives can be met through river-based urban planning. The overall aim of providing sufficient and appropriate infrastructure and services and undertaking integrated river-based urban planning is to increase the resilience of a city and mitigate against the risks of potential disasters which could be avoided through strategic and proactive mainstreaming of rivers in planning.

It must be acknowledged that in certain instances, communities will need to be/will already be located in high-risk areas, such as those who are located in high-risk flooding zones and within important ecological buffer zones. The process of resettlement, if necessary, needs to be approached with absolute caution and sensitivity, with community engagement being a priority throughout the process. A flow diagram to assist with decision making for settlements in high-risk areas is shown in figure 26 on page 49.

New housing developments should be provided in the zone of integration or in strategic locations within the urban area that support the livelihoods of those being relocated.





**To follow best practice based on past examples of successful resettlement, the checklist below can be used:**

- ◆ A Resettlement Action Plan should be prepared for any project that involves the relocation of people from their homes
- ◆ Participation of the affected communities starts at the early stage of the relocation process. The community should be involved in the decisions regarding site selection, identification of basic needs, settlement layout, housing designs, and the implementation phase
- ◆ Communication with target groups is frequent and transparent, and mechanisms to resolve disputes are effective
- ◆ The resident community should be informed about the reason why they need to be moved to a new area, and the risks and hazards of living on the riverbank should be explained to all residents
- ◆ The affected community should be assured of the suitability of the relocation site
- ◆ Services such as water, energy, public transport, health services, markets, and schools in the new resettlement site should be accessible and affordable
- ◆ The livelihoods and standards of living should be improved or, at least, maintained when the residents move to the new site
- ◆ People belonging to the same community should be resettled together on the new site
- ◆ The Zone of Integration (ZI) adjacent to the area where the community is being displaced should be prioritised, since some of the livelihoods can be site-specific and thus relocation will cause minimal disruption. However if there is conflict with the land use zoning, or if the ZI is already a high-density area and there is no land available to expand the area, the new site should have similar characteristics.



Advocating for an integrated and proactive, strategic approach to river-based urban planning aims to eradicate the need for resettlement and even the settlement of communities in high risk areas. However, in rooting this guideline in the African context, it is acknowledged that in many cases a reactive and informal approach is more appropriate. Overall, the mainstreaming of rivers in urban planning aims to enable rivers in urban areas to provide the ecosystem services which cities rely on and need. In this way, river-based urban planning aims to increase the resilience of urban areas.

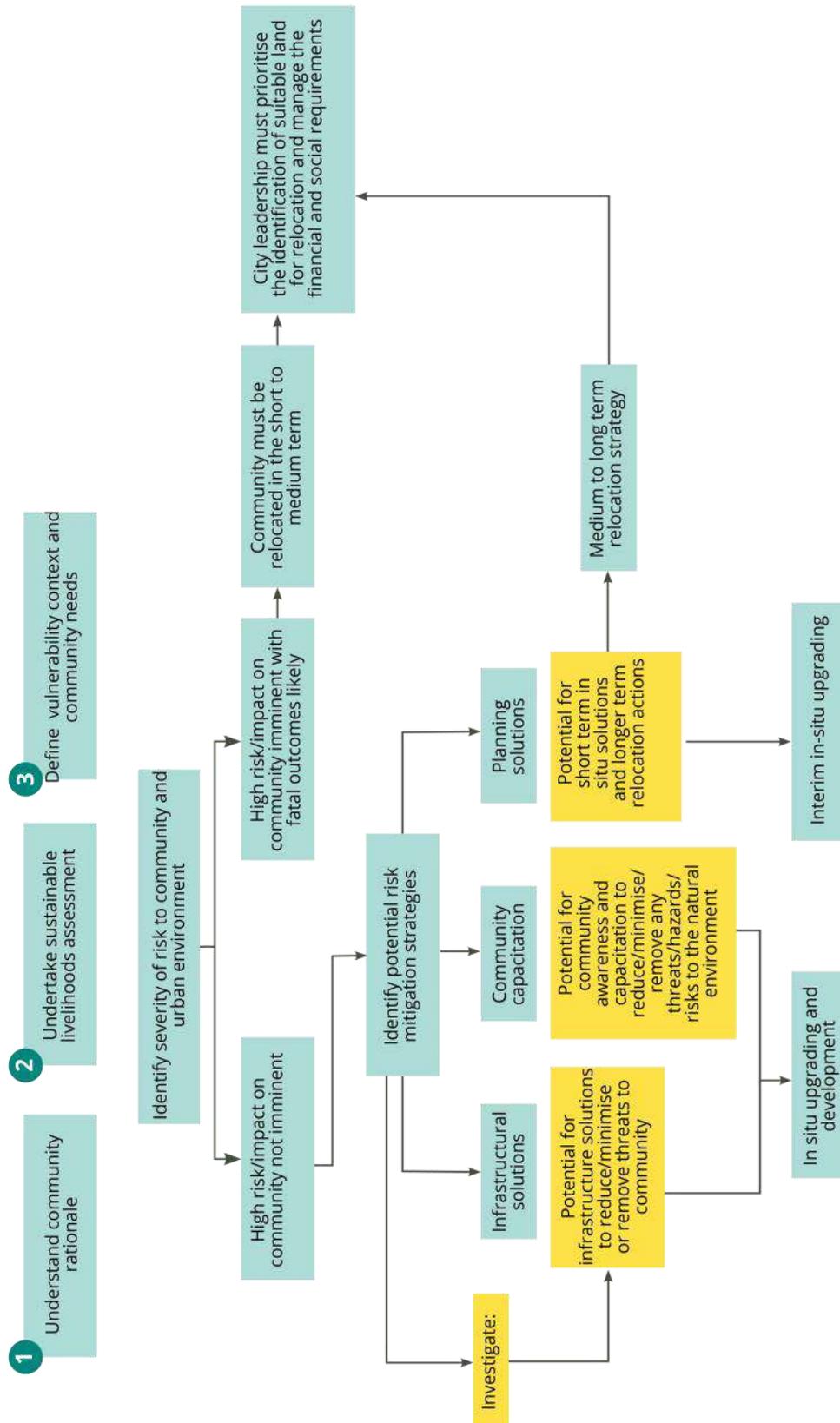


Figure 26: Decision-making matrix for managing settlements in high-risk areas

## 5.3 Integrated river-based urban planning interventions

Unlike some of the nature-focused ideas presented in the previous section, planning-based preventative solutions (see the tables that follow) occur over the entire riverbank setback zone (active channel, riverbank zone and zone of integration), and do not distinguish between the various sections as in the previous tables – although, the preferred zone of intervention is still listed in Table 5. The table explores some of the common impacts of urban development on rivers and how these can be prevented through river-based urban planning interventions.

When **undertaking river-based urban planning, an understanding of the livelihoods dependent on a river is required.** Through collaboration with stakeholders, the focus should be on the ways in which these livelihood options can be accommodated in river-based urban plans and projects in a sustainable manner. Land use planning is the main influence that planning can have in preventing unsustainable livelihoods. New land uses next to a river, closing off a part of a river for conservation or putting in place development controls may be needed. How planning should approach unsustainable livelihoods through land-use controls will need to be considered on a case-by-case basis.

**Resilient cities are crucial in ensuring that cities and communities can withstand shocks, changes and disasters. Various measures can be taken to build city resilience. These include physical planning, engineering and construction, economic, management and institutional and societal measures** (Table 6). All of these measures are evident of an integrated, “planning with rivers” approach.



**Table 5: Planning-based interventions**

Challenge	Planning Based Preventive Interventions	Description	Area of Intervention
<ul style="list-style-type: none"> <li>Lack of affordable land and formal housing resulting in the proliferation of informal settlements.</li> </ul>	<ul style="list-style-type: none"> <li>Designation of residential land use areas.</li> <li>Target government funding for social housing projects.</li> <li>Target government funding for informal settlement upgrading.</li> </ul>	<ul style="list-style-type: none"> <li>Social housing could be provided in a range of typologies, such as single residential, multi-storey walk-up flats or row housing.</li> <li>Provision of basic services and place-making interventions should be considered for informal settlements.</li> <li>Consider the implementation of rainwater harvesting tanks once appropriate hydrological studies have been done to determine feasibility.</li> <li>Re-blocking of informal settlements to improve drainage.</li> <li>Implementation of composting toilets or communal ablution facilities where appropriate.</li> <li>Consider solar lighting and solar energy as a potential off-grid solution.</li> </ul>	<ul style="list-style-type: none"> <li>Residential development zones.</li> </ul>
<ul style="list-style-type: none"> <li>Lack of proactive spatial planning, land use regulation and enforcement, leading to unplanned development not suitable for its location</li> </ul>	<ul style="list-style-type: none"> <li>Develop a city-wide spatial development framework/ master plan to guide development and strategically plan land uses in the municipal area (where this is not in place)</li> <li>Once an area is designated for a selected land use, municipal stakeholders should apply laws and regulations to dismiss any uses not intended for the relevant land</li> <li>Desired densities must be clearly defined and communicated to ensure that designated land does not exceed its carrying capacity and infrastructure must be carefully designed to cater accordingly</li> </ul>	<ul style="list-style-type: none"> <li>Regular reviews of the Master Plan/ Spatial Framework to align this critical document with short and long-term trends and development projections</li> <li>Municipal by-laws and relevant land use regulations are some of the tools that planners can use to ensure that state-owned land is only used for its intended land use</li> <li>A densification and upgrading strategy must be developed at a local level - in general, in areas of higher densities, sufficient land and resources must be made available to ensure that natural resources are not depleted</li> </ul>	<ul style="list-style-type: none"> <li>Municipal-level intervention.</li> <li>Targeted areas will be context specific.</li> </ul>
<ul style="list-style-type: none"> <li>Residential zones located on the periphery of the city - situated far from economic and/or transport opportunities causes unemployment due to inaccessible opportunities and increased travel costs for residents may force individuals to illegally occupy better located land, which may not be suitable for habitation.</li> </ul>	<ul style="list-style-type: none"> <li>Residential land uses should be strategically located in close proximity to commercial, industrial and agricultural land uses as these land uses are often responsible for the employment of large portions of a country's population. In addition, transport infrastructure must be provided to and from such areas to ensure affordable and accessible mobility.</li> </ul>	<ul style="list-style-type: none"> <li>Development of local-level, context-specific policies and precinct plans to optimise land use.</li> </ul>	<ul style="list-style-type: none"> <li>Residential development zones.</li> <li>Commercial development zones.</li> <li>Industrial development zones.</li> <li>Agricultural development zones.</li> </ul>
<ul style="list-style-type: none"> <li>Lack of service delivery and capacity of infrastructure leading to pollution and illegal acquisition of such services, such as illegal electricity and water connections and its associated environmental and safety risks.</li> </ul>	<ul style="list-style-type: none"> <li>Infrastructure capacity assessments must form part of the feasibility phase of every project.</li> <li>Prior to development taking place, proper services must be installed and formal service points must be strategically located.</li> </ul>	<ul style="list-style-type: none"> <li>Institutional capacity must be ensured, such that local officials are aware of all the assessments required.</li> <li>Training officials to ensure that they are aware of the core team members required to conduct a services assessment.</li> <li>Providing all existing development areas with the necessary waste disposal infrastructure such as bins, skips and landfills.</li> <li>Install formalised electricity connections and water points such that they are accessible to all in the designated areas.</li> </ul>	<ul style="list-style-type: none"> <li>Residential development zones</li> <li>Commercial development zones.</li> <li>Industrial development zones</li> <li>Agricultural development zones.</li> </ul>

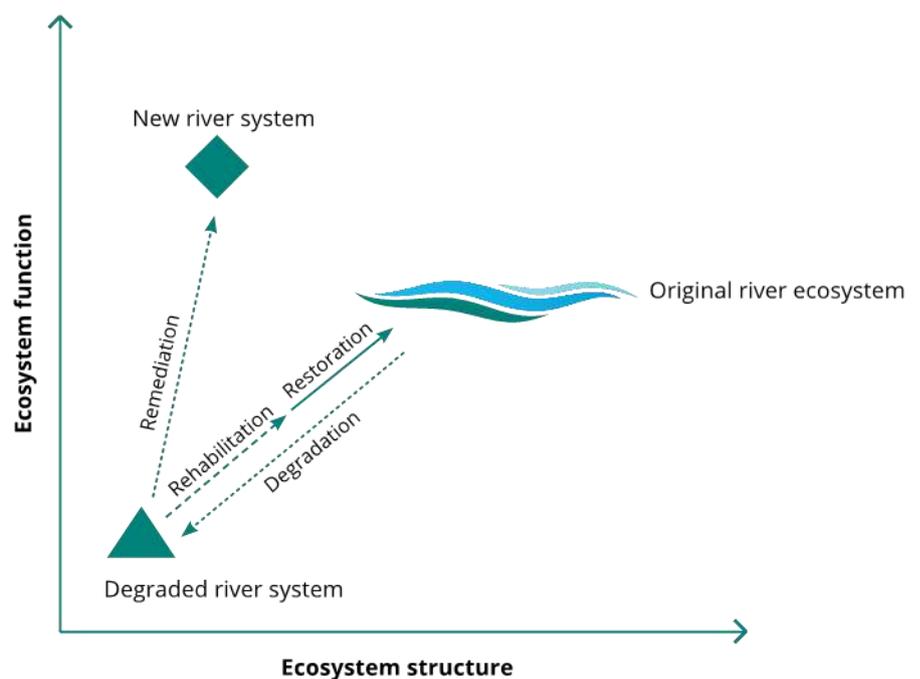
**Table 6:** Disaster risk reduction strategies for increased resilience

Ensuring Disaster Risk and Resilience Considerations at a City Level through Risk Reduction Project Proposals	
<b>Physical Planning Measures</b>	Identify risk areas as part of the city-wide strategic plan
	Undertake spatial assessments and avoid any expansion/construction projects in vulnerable areas
	Ensure compliance with all relevant environmental legislation before undertaking any construction projects
	Plan for the upgrading of existing infrastructure to cope with potential increases in rainfall
	Identify alternate suitable venues/facilities for emergency services
	Study and understand the impact of climate change on the city in general and on disaster management operations, in order to prevent the impacts of climate change through formulation of adaptation and mitigation strategies
	Manage and adequately maintain disaster management assets to reduce impacts of flooding such as emergency vehicles, built structures, and storm-water network
	Ensure the timely removal of vegetation and other debris from river courses and dams to prevent potential blocking of culverts and other flow-regulating structures, and thereby impacting on property and operations
<b>Engineering and Construction Measures</b>	Ensure compliance with all relevant environmental legislation before undertaking any construction projects
	Plan and build retention dams to reduce the risk of flooding
	Build retaining walls to protect buildings
	Improve and upgrade stormwater reticulation systems regularly
	Develop and maintain early warning systems
	Identify and quantify current erosion challenges and, based on this information, implement appropriate erosion control measures
<b>Economic Measures</b>	Plan and erect visible flood warning signs in low-lying areas
	Make provision for flood relief funds
	Make adequate provision for the maintenance of stormwater systems
	Ensure cover is adequate
<b>Management and Institutional Measures</b>	Provide incentives for residents and businesses to strategise and mitigate risks by, for example, strengthening resilience through ongoing consideration of alternative livelihood options
	Enforce relevant by-laws
	Plan for the support of affected communities such as providing emergency flood kits
	Plan, rehearse and exercise flood emergency and disaster response
	Take climate change into account when developing plans and protocols
	Develop and maintain flood emergency response teams
	Develop and supervise programmes for storm water system maintenance and the removal of debris
	Ensure that Standard Operating Procedures for disasters are developed and maintained
	Explore opportunities for collaboration with governmental stakeholders
	Plan and ensure strategic distribution of disaster management resources across disaster management region
	Establish mutual aid agreements for relief and response between public sector stakeholders as well as private sector NGOs
<b>Societal Measures</b>	Ensure availability of command centre vehicles
	Conduct quality assessments of risk reduction projects
	Develop community awareness training and workshops in high risk areas
	Develop and inform personnel of response actions to early warning systems and evacuation drills
	Promote community awareness through radio warnings announced before the onset of flood season
Implement community-based adaptation strategies	

## 5.4 Dealing with degradation through river-based infrastructural planning solutions

In urban areas in sub-Saharan Africa rivers are often already degraded, therefore restoration or rehabilitation of rivers is needed. Local governments need to realise, however, that conservation of rivers is the most cost-effective option. Costs for conservation would include setting up the infrastructure to prevent or limit human access to the river such as fencing, which entails far less than the non-recurring costs of restoration (such as paying professionals to design plans for restoration, implementation of hard and soft infrastructure, financing for resettlement or relocation of houses located on riverbanks and construction). Maintenance of hard infrastructure and soft infrastructure in restored areas also costs more than maintenance of conserved areas where financing is only needed for monitoring the state of the conserved area. Conservation is also more cost effective due to the fact that if the ecosystem services that a river provides and its role in building resilience in a city are diminished, infrastructure needs to be provided to

make up for these deficits (See case study 3.2. & 4.2 in The Sustainable River-based Urban Planning for Sub-Saharan Africa: Case Studies Document). The relationship between different approaches to sustainably managing urban natural assets is shown in figure 27.



**Figure 27:** Different approaches to managing natural assets (Source: Speed et al., 2006)

River-based  
infrastructural

planning solutions are implemented to restore degraded environments. They are vital in a) reducing sedimentation (Table 7); b) preventing erosion (Table 8); c) reducing run-off (Tables 9 & 10). Implementing nature-based planning solutions applies to all new developments as well as to existing developments, with particular emphasis on the Zone of Integration. These interventions speak to ecologically sensitive and resource-efficient development practices. **The broad process for undertaking site-level planning can be seen in figure 28.**

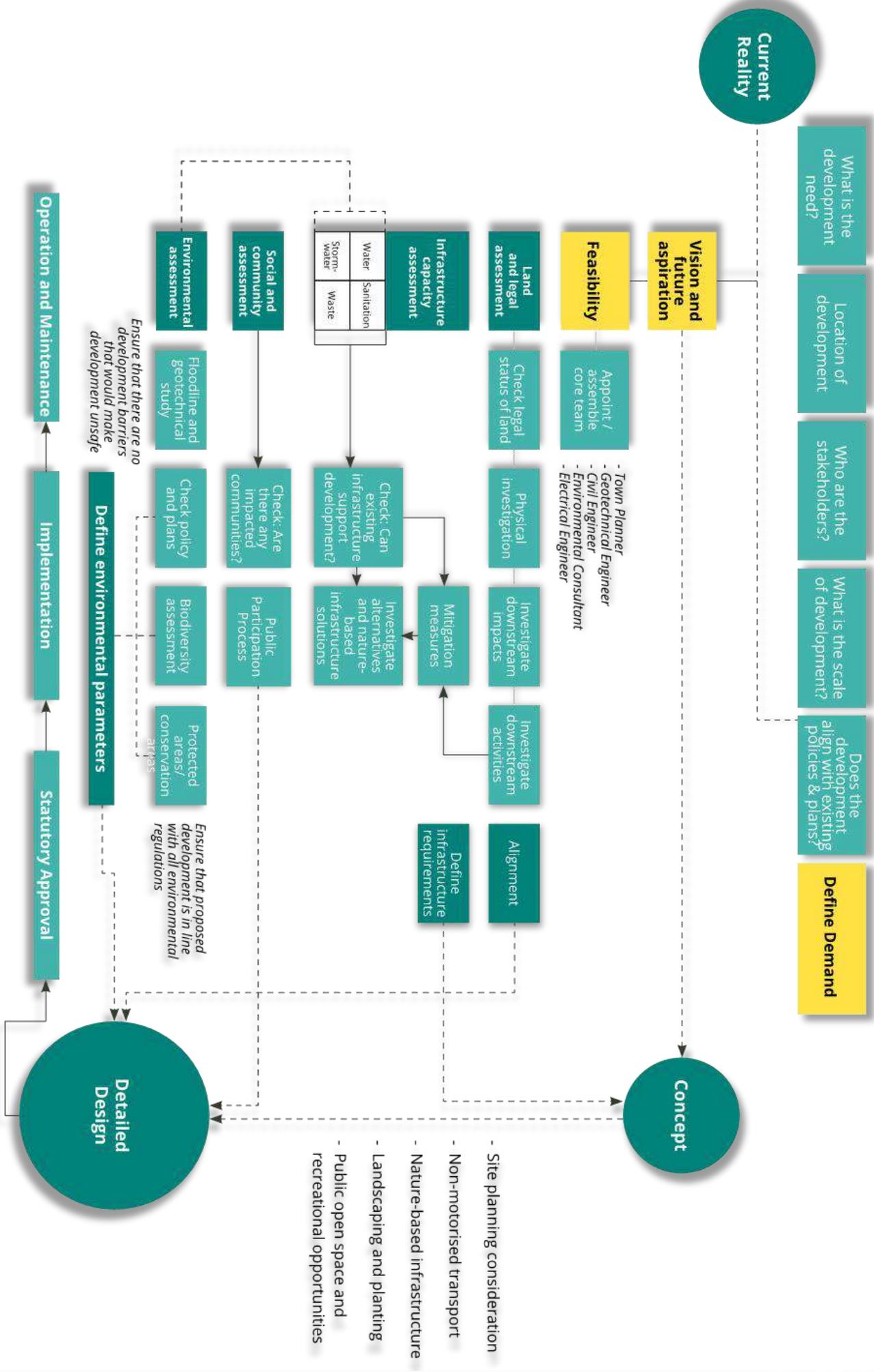


Figure 28: Process for undertaking site-level planning

The aim of implementing nature-based preventative solutions is to a) address challenges and risks posed by urban development to the health and functioning of rivers; b) to increase the resilience of rivers and minimise the risks they pose to the urban environment when not functioning in their ideal state; c) to protect the long-term health of the river; and d) to guarantee water quality.

Implementing these solutions is not usually the responsibility of planners in local government, however **planners should aim to integrate nature-based solutions into river strategies, plans and projects where possible.** These interventions can influence planning significantly, for example, in the decision of whether hard infrastructure or resettlement of communities is needed, river-based solutions can mitigate the need for either. Implementing river-based solutions can often be the preferred option as they are easier and more cost effective to implement and maintain, and more ecologically friendly. (See case study 4.2 & 1.4 in The Sustainable River-based Urban Planning for Sub-Saharan Africa: Case Studies Document) Additionally, implementing these solutions would demonstrate a mainstreaming of rivers into infrastructure planning processes for improved integration.



**Table 7: Nature-based solutions for reducing sedimentation**

Nature-Based Preventative Infrastructural Interventions		Description	Area of Intervention
	Check dams	Covering exposed soils with growing vegetation e.g. ground covers, or by mulching, to reduce runoff from exposed soil.	Riverbank Zone Zone of Integration (Green spaces; Agricultural / Rural)
	Silt curtains	Similar to check dams, using geofabric across flow paths to trap sediment.	Riverbank Zone Zone of Integration (Agricultural / Rural)
	Vegetation barriers	Similar to contour bunds, using dense vegetation such as Vetiver grass to trap sediment and reduce runoff. Can be implemented across a slope, parallel with contours, or in riparian buffer areas perpendicular to flow of water.	Riverbank Zone Zone of Integration (Agricultural / Rural)

**Table 8: Nature-based solutions for preventing erosion**

Nature-Based Preventative Infrastructural Interventions		Description	Area of Intervention
	Brush packing	Using branches of trees, especially thorn trees, to keep cattle out of overgrazed areas to allow these areas to re-establish vegetation and groundcover.	Zone of Integration (Agricultural / Rural)
	Contour ridging / bunds	Constructed bunds or ridges at intervals along a slope to slow runoff and to prevent erosion.	Riverbank Zone Zone of Integration (Green spaces; Agricultural / Rural)
	Erosion management along roadsides	Mitre drains along road-sides, especially gravel roads, to reduce channeling and erosion.	Zone of Integration (Green spaces; Agricultural / Rural)
	Gully rehabilitation	Grading of gullies (using interventions) to re-establish an appropriate slope, and to prevent further erosion.	Zone of Integration (Green spaces; Agricultural / Rural)
	Channel bank maintenance	Bank contouring (physical contouring or reshaping) to re-establish an appropriate slope, and to prevent further erosion.	Zone of Integration (Green spaces; Agricultural / Rural)
	Channel bank stabilisation	Protect scouring and erosion of channel banks using gabion rock baskets, and/or vegetated stepped terraces.	Zone of Integration (Green spaces; Agricultural / Rural)
	Water efficiency	Reducing erosion at source by absorbing water or reducing runoff, e.g. planting water-thirsty plants around boreholes or discharge points.	Zone of Integration (Residential; Business / Commercial; Industrial; Green spaces; Agricultural / Rural)
	Discharge point design	Where structures discharge to watercourses, structures should not be perpendicular to flow, but rather 45° facing downstream. Outlet should include erosion protection around the structure.	Riverbank Zone

Having presented some of the ways in which planning can mainstream rivers through the integration of river management and urban planning processes, in the section below the guideline examines ideas on how to enable the ongoing integration process.

**Table 9:** Nature-based solutions for preventing run-off in the riverbank zone

Nature-Based Preventative Infrastructural Interventions		Description	Area of Intervention
	<b>Conservation of natural areas / urban park / urban woodland</b>	<p>Retain the pre-development hydrological and water quality characteristics of undisturbed natural areas, stream and wetland buffers by restoring and/or permanently conserving these areas, including ecologically sensitive areas.</p> <p>Urban parks and/or urban woodlands bring the forest to the city and connects residents with nature. It also helps cities and towns to build their urban forest and to achieve their outdoor recreational goals.</p>	Riverbank Zone Zone of Integration (Green spaces; Agricultural / Rural)
	<b>Riparian buffer</b>	Riparian buffers can be used to treat and control stormwater runoff from some areas of a development project.	Riverbank Zone
	<b>Filter strips / groundcover</b>	Covering exposed soil with growing vegetation e.g. ground covers, or mulching, to reduce runoff from exposed soil.	Riverbank Zone Zone of Integration (Green spaces; Agricultural / Rural)
	<b>Vegetated swale</b>	The natural drainage paths, or properly designed vegetated channels, can be used instead of constructing underground storm sewers or concrete open channels to increase time of concentration, reduce the peak discharge, and provide infiltration.	Zone of Integration (Residential; Business / Commercial; Industrial; Green spaces)
	<b>Water absorption trench/pit</b>	Shallow excavations that create temporary subsurface storage of runoff - the trench catches exposed runoff and allows for infiltration.	Zone of Integration (Residential; Business / Commercial; Industrial; Green spaces)
	<b>Contour bunds</b>	Semi-permeable barrier along contours to retain runoff and sheet wash from fields and open land.	Riverbank Zone Zone of Integration (Green spaces; Agricultural / Rural)
	<b>Raised footpath</b>	Increase height of footpath in relation to adjacent land, so runoff does not flow down footpath but rather into adjacent lands.	Riverbank Zone Zone of Integration (Green spaces)
	<b>Pathway swale</b>	A small bund at regular intervals along paths to disperse runoff into adjacent fields or contour bunds.	Riverbank Zone Zone of Integration (Green spaces; Agricultural / Rural)

**Table 10: Nature-based solutions for preventing run-off in the zone of integration**

Nature-Based Preventative Infrastructural Interventions		Description	Area of Intervention
	Conservation of natural areas / urban park / urban woodland	Retain the pre-development hydrological and water quality characteristics of undisturbed natural areas, stream and wetland buffers by restoring and/or permanently conserving these areas, including ecologically sensitive areas.  Urban parks and/or urban woodlands bring the forest to the city and connects residents with nature. It also helps cities and towns to build their urban forest and to achieve their outdoor recreational goals.	Riverbank Zone Zone of Integration (Green spaces; Agricultural / Rural)
	Riparian buffer	Riparian buffers can be used to treat and control stormwater runoff from some areas of a development project.	Riverbank Zone
	Filter strips / groundcover	Covering exposed soil with growing vegetation e.g. ground covers, or mulching, to reduce runoff from exposed soil.	Riverbank Zone Zone of Integration (Green spaces; Agricultural / Rural)
	Vegetated swale	The natural drainage paths, or properly designed vegetated channels, can be used instead of constructing underground storm sewers or concrete open channels to increase time of concentration, reduce the peak discharge, and provide infiltration.	Zone of Integration (Residential; Business / Commercial; Industrial; Green spaces)
	Water absorption trench/pit	Shallow excavations that create temporary subsurface storage of runoff - the trench catches exposed runoff and allows for infiltration.	Zone of Integration (Residential; Business / Commercial; Industrial; Green spaces)
	Contour bunds	Semi-permeable barrier along contours to retain runoff and sheet wash from fields and open land.	Riverbank Zone Zone of Integration (Green spaces; Agricultural / Rural)
	Raised footpath	Increase height of footpath in relation to adjacent land, so runoff does not flow down footpath but rather into adjacent lands.	Riverbank Zone Zone of Integration (Green spaces)
	Pathway swale	A small bund at regular intervals along paths to disperse runoff into adjacent fields or contour bunds.	Riverbank Zone Zone of Integration (Green spaces; Agricultural / Rural)

## 5.5 Improving policy and spatial integration

Legislative and policy alignment must take place across scales to ensure that the strategic intent and vision for river planning is consistent, and can be applied on a project level. To achieve this, coordination between different spheres of government and horizontal coordination between government departments is imperative when drafting and reviewing legislation, policies and plans. Planning for rivers at a city level or project level should also aim to integrate with the existing spatial plans at a regional and national level, catchment as well as trans-boundary level. (See case study 2.3 in The Sustainable River-based Urban Planning for Sub-Saharan Africa: Case Studies Document)

Evaluating and reviewing relevant policies, legislation and spatial frameworks can be a starting point, after which a gap analysis can be undertaken. Policy reviews and comparisons of spatial frameworks can be used to understand alignment and misalignment. Integration in developing or updating spatial frameworks, legislation, policies, and plans can take place through providing the space for coordination between departments. Policy making needs to emanate from a process of joint reflective consideration between various stakeholders through an aggregated process of comprehensive input (Ran & Nedovic-Budic, 2016). Joint working groups, forums, establishing project steering committees and regular interdepartmental meetings with relevant local government departments are ways to achieve sector coordination and integration. Enabling this integration is also possible through an interdisciplinary approach to planning and effective knowledge sharing.

## 5.6 Make use of an interdisciplinary approach

Often, planning is seen as the sole responsibility of planners. **A shift in thinking to an interdisciplinary approach can contribute towards sustainable plans and interventions that ensure resource optimisation.** An interdisciplinary approach, one which ensures engagement of all local government stakeholders and specialists from a variety of disciplines ensures that interventions and plans complement one another, provide for the needs of many stakeholders as well as the environment and approach river-based urban planning holistically. For informed and strong decision making, it is recommended that specialist technical knowledge from a range of disciplines is included throughout the planning process. Drafting and reviewing legislation and policy in an interdisciplinary manner, and one which includes all spheres of government working together, can foster greater alignment between policies and plans to ensure the adequate representation of, and consideration for, rivers in urban planning and development processes.

This approach can include inputs from professionals, local government officials, community members, and non-government organisations. Including different disciplines facilitates a well-rounded and comprehensive understanding of these complexities. It enables the cross-pollination of ideas and knowledge, which can result in the generation of new and innovative solutions. An integrated and interdisciplinary approach allows for the development of plans and projects that are robust and flexible, and better able to respond to changes over time as they occur. The benefit of working between disciplines is that it allows for knowledge sharing and provides the platform for new innovative ways of approaching a problem to emerge.

## 5.7 Facilitating knowledge transfer

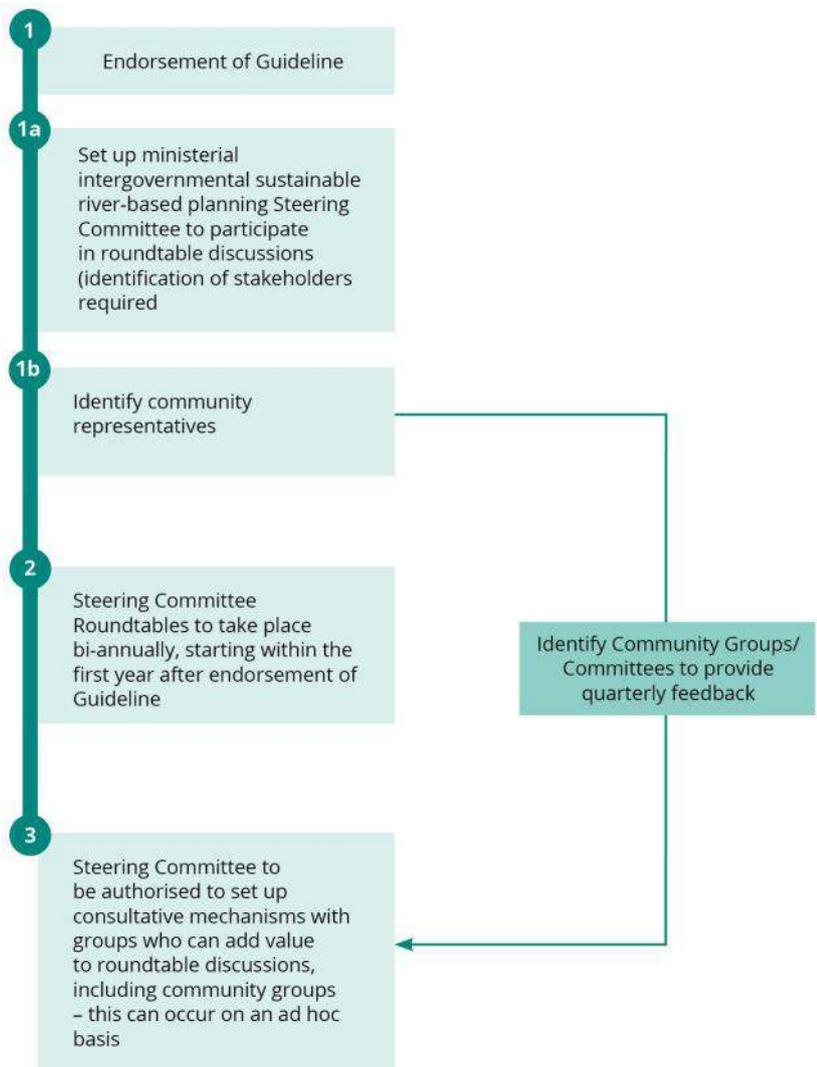


“Knowledge networks” are collections of individuals and teams who come together across organisational, spatial and disciplinary boundaries to invent and share a body of knowledge (Pugh and Prusak, 2013).

Having detailed knowledge about what happens within the local context enables the development of context-appropriate river plans and interventions that can, in turn, be successfully managed and integrated with other planning processes. Stakeholders do not only act as co-decision makers, but are also empowered with valuable ecological and management skills. Knowledge sharing is an effective way of enabling the integration of rivers into urban and land use planning. Drivers to improve and ensure effective knowledge sharing and details on establishing knowledge sharing platforms are shown in table 11 and figure 29 respectively:

**Table 11: Drivers for improved knowledge sharing**

Drivers	Details	Steps to improve
<b>Facilitating the space for sharing lessons</b>	Sharing lessons learnt addresses the challenge of urban rivers as a contested space. Each project will have its own challenges, opportunities and successes. Therefore, new projects can benefit from these lessons.	<p>Sharing lessons through concurrent projects, and also at the end of projects.</p> <p>Using previous projects and experiences as markers for successes and failures and translating knowledge to action, which can be supported through case studies.</p> <p>Establishing forums that meet to share project updates.</p> <p>Ensuring that the correct stakeholders are engaged and have the relevant knowledge and experience.</p>
<b>Adopting a river planning champion</b>	Adopting a river planning champion will overcome the challenge of silo working. The river champion will play the role of facilitating knowledge sharing between sector departments as each will have its own experience regarding what has and hasn't worked previously, and how to overcome these in future. Better communication between departments will be facilitated.	<p>Establishing working groups to learn from the experiences of other departments and to find joint solutions.</p> <p>Establish a steering committee for each project made up of a representative from various relevant departments to provide input throughout the planning process.</p> <p>Engaging with certain departments before conceptualising or starting a project to ensure that failures are mitigated from the beginning.</p>
<b>Bridging the divide between communities and city authorities</b>	Communities are the ones most affected by river projects and plans on a daily basis and will therefore be able to give input from another perspective regarding the successes, failures and impact of previous projects, including communities in their past experiences can asset the city in understanding why a project was and was not successful and the reasons for this.	<p>Establishing platforms for knowledge sharing.</p> <p>Ensuring that the planning process is consultative and participatory during all stages of the project. Include communities in the decision-making process.</p> <p>Undertaking research and engaging with communities before a project is conceptualised to ensure that their lessons are incorporated from the beginning of the project.</p>
<b>Improving methods for collaboration and networking</b>	Collaboration and networking can assist in the learning from the successes and failures of projects have occurred that planners may not be aware of it provides the opportunity to engage with the wide range of stakeholders who will have different and unique lessons form the perspective of different stakeholders.	<p>Undertaking study tours to other projects.</p> <p>Joining city networks, to network and learn from other projects and cities.</p> <p>Holding workshops, where representatives from other cities are present.</p> <p>Going to international events and conferences to network.</p> <p>Joining or establishing forums which provide the space to engage with new stakeholders and share lessons learnt.</p>



**Figure 29:** Establishing knowledge sharing platforms



Ways of ensuring that river management plans are integrated with land-use and urban-planning processes have been presented. An indication that this integration, which would enable effective river-based urban planning, is being achieved can be measured through the plans of various public departments. These public stakeholders, whose planning processes could be enhanced by integrating rivers, are shown in table 12. Their various roles, required expertise, and instruments for undertaking river-based planning are proposed.



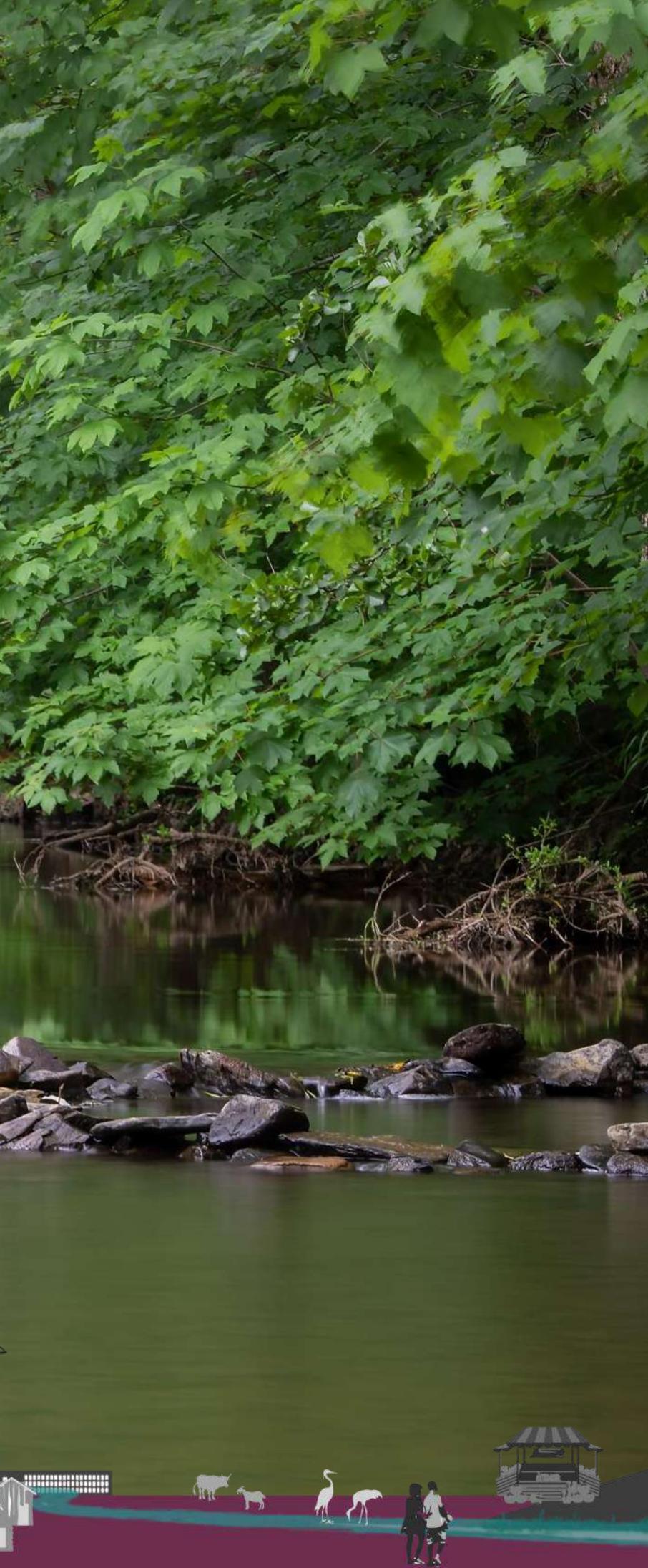
**Table 12: Public-sector stakeholders (part 1)**

	Stakeholders and expertise	Levels	Role (what can they do?)	What urban river functions are affected?	Expertise: (Who must do it?) Technical Skills (Institutional Capacity Requirements)	Instruments & offering (How? What tools do they have?)
Public	City Leadership	Local	Political decisions and strategies oriented in legislative terms; policy positioning.	Role of city leadership is to understand and enhance all river functions, and ensure that integrated planning takes place in support of the multifunctional river.	<ul style="list-style-type: none"> <li>Ministers</li> <li>Mayors</li> <li>City officials from the various departments listed in the following sections of the table</li> </ul>	Policy, legislation and by-laws, political influence, communication and obtaining inclusionary participatory processes.
	Water Management Authorities	ALL	Water sector planning, Water Supply, Water Quality Management.	Sediment Trapping, Subsistence, Water Supply & Quality, Flood Attenuation, Hydropower.	<ul style="list-style-type: none"> <li>Hydrologist</li> <li>Freshwater Specialists</li> <li>Chemical Engineering</li> <li>Water resources expert</li> </ul>	Laws, policies, plans, programmes and projects. Laws and policies typically defined at National Level, programmes and projects at Regional and Local Level.
	Planning Authorities	ALL	Integrated urban planning ensuring that all relevant stakeholders & factors have been taken into account prior to decision making; Land Use Planning, Meaningful community engagement; Ensure participatory planning.	ALL – Urban Planning viewed as the ‘integrator’ of various urban river functions. It must actively work toward spatial and policy integration as a supportive mechanism for decision-making.	<ul style="list-style-type: none"> <li>Professional Urban Planners, with support from:                             <ul style="list-style-type: none"> <li>Land Surveyors</li> <li>Community Surveyors</li> <li>Geographic Information System Specialists</li> </ul> </li> </ul>	Laws, policies, plans, programmes and projects; Programmes and projects are to be based on strategic directives and prioritisation of needs; Spatial Development Plans; Precinct Plans and Layout Plans - Land Use Planning as a key instrument through which planners give effect to development priorities.
Public	Land Authorities	ALL	In African Cities, land authorities typically fulfill a role of land administration.	All – planning and land authorities are closely linked. In many countries, the land authority function has been decentralised, and is fulfilled at a local level by planning authorities.	<ul style="list-style-type: none"> <li>Urban Planners</li> <li>GIS Specialists</li> <li>Conveyancers</li> <li>Politicians</li> </ul>	Legislation, laws, by-laws, policies, guidelines.
	Cultural and Heritage Authorities	National and Provincial/Regional	Protection of historical, natural and cultural monuments; sectoral planning.	Cultural & Recreational: <ul style="list-style-type: none"> <li>Riverine environments play an important role in ensuring restorative green environments in the urban context;</li> <li>Rivers have socio-cultural significance, and are often sites for many spiritual and cultural practices at a local level.</li> </ul>	<ul style="list-style-type: none"> <li>Heritage Specialists</li> <li>Cultural Heritage Specialists</li> <li>Community Engagement Specialists</li> </ul>	Laws, policies, plans, programmes and projects. Laws and policies typically defined at National Level, Programmes and Projects at Regional and Local Level.
	Housing Authorities	National and Provincial/Regional	Collaboration with planners and water managers to ensure the appropriate location of human settlements.  Strategic placement and direction for human settlement development to ensure health, safety and liveability of communities.	ALL – Human Settlement historically occurs in close proximity to rivers. The challenge is to ensure that the benefits to communities are balanced with the ecosystem level benefits, roles and function of the river.	<ul style="list-style-type: none"> <li>Housing officials</li> <li>Planners</li> <li>Social Facilitators</li> </ul>	Human Settlement Plans, Policies and Legislation; Guidelines for participatory planning processes.

**Table 12: Public-sector stakeholders (part 2)**

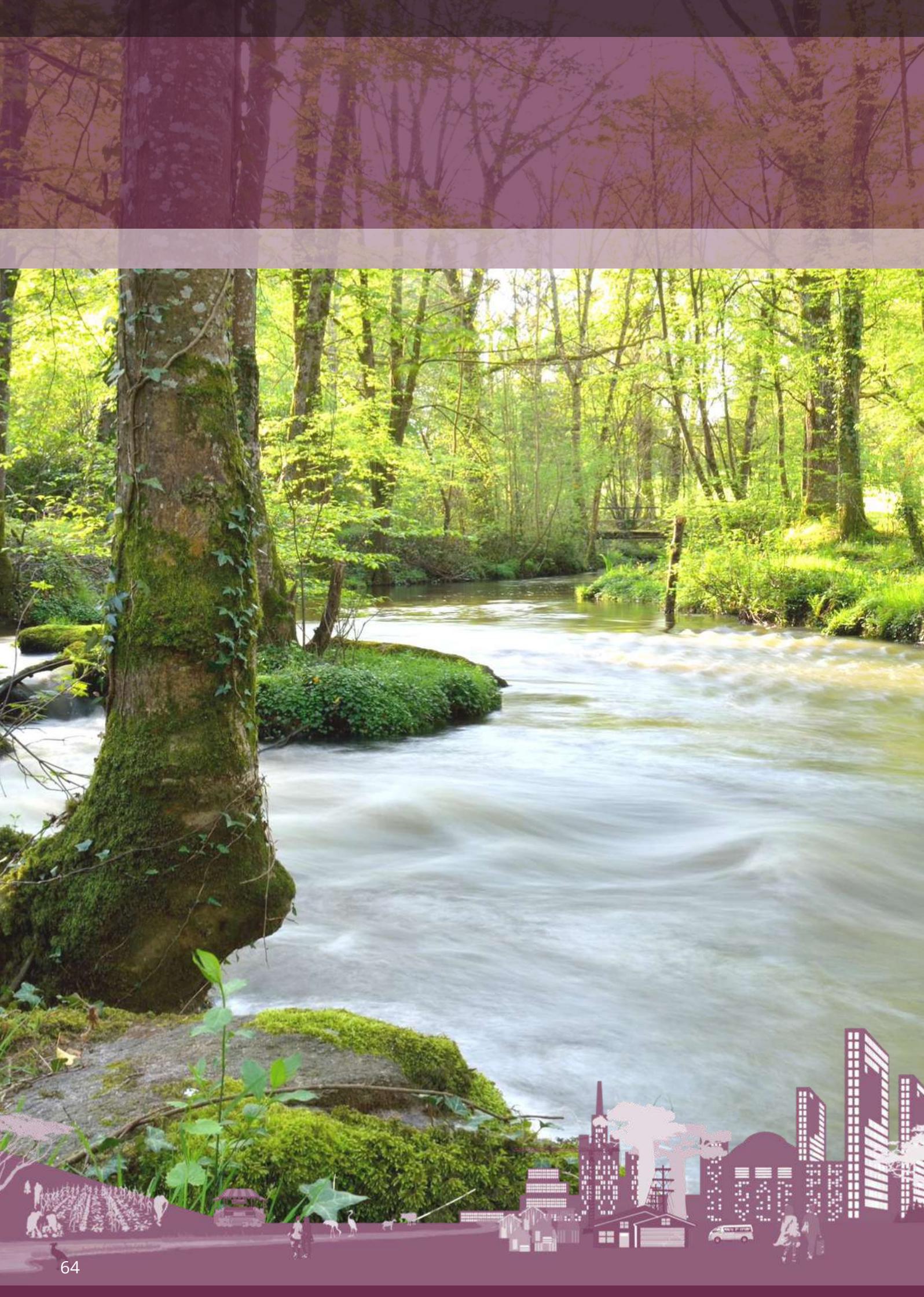
	Stakeholders and expertise	Levels	Role (what must they do?)	What urban river functions are affected?	Expertise: (Who must do it?) Technical Skills (Institutional Capacity Requirements)	Instruments & offering (How? What tools do they have?)
Public	<b>Tourism Authorities</b>	National and Provincial/Regional	Tourist economy and industries. Leisure industries.	Cultural Recreational Real Estate Subsistence	<ul style="list-style-type: none"> <li>• Tourism officials</li> <li>• Local Economic Development officials</li> <li>• Economists</li> </ul>	Tourism Plans; Local Economic Development Plans.
	<b>Environmental Authorities</b>	National and Provincial/Regional	Environmental Planning. Environmental Management.	ALL	<ul style="list-style-type: none"> <li>• Environmental practitioners</li> <li>• Biologists</li> <li>• Botanical Specialists</li> <li>• Water Quality specialists</li> <li>• Air Quality Specialists</li> </ul>	Environmental legislation, policies and plans; Local level projects and initiatives.
	<b>Disaster Risk and Resilience Authorities</b>	Local	Ensuring the health and safety of local communities via a people centered approach.	ALL	<ul style="list-style-type: none"> <li>• Disaster Risk and Resilience experts</li> <li>• Climate change experts</li> <li>• Sustainability experts</li> </ul>	Flood mapping; Risk and Vulnerability Assessments; Climate change strategies; Health and Safety Plans; Mitigation Strategies .
	<b>Energy and Mining Authorities</b>	ALL	Ensure that resources are extracted/used responsibly (e.g. Hydro Electricity).	ALL	<ul style="list-style-type: none"> <li>• Environmentalists</li> <li>• Geotechnical Specialists</li> <li>• Engineers</li> </ul>	Energy Master Plans; Spatial Master Plans; Environmental Legislation and Policies.
	<b>Health Authorities</b>	National and Provincial/Regional	Ensure river health and function; Ensure positive impact on river users (health of water supply) .	Water Quality Subsistence	<ul style="list-style-type: none"> <li>• Environmental Specialists</li> <li>• Public Health Expert</li> <li>• Disaster Risk Managers</li> </ul>	Health and Safety Plans.
	<b>Transport Planning</b>	National and Provincial/Regional	Ensure equitable access to riverine environments as well as ensuring that transport plans do not negatively impact on rivers.	ALL	<ul style="list-style-type: none"> <li>• Transport Planners</li> <li>• Engineers</li> <li>• Environmentalists</li> </ul>	Transport Master Plans; Spatial Master Plans; Environmental Legislation.





This section has provided an overview of how integrated river-based urban planning might be enabled, and the tools available. The aim is that the plan developed in the previous section is considered, represented, and preferably overlaid on all other urban and land-use plans to inform how integrated planning with rivers could be undertaken. The intention is that by integrating rivers into planning processes, public officials and stakeholders working in various departments, capacities, and disciplines may achieve planning which is sensitive to urban natural assets. In this way, this integrated approach contributes to the mainstreaming of rivers into urban and land-use planning. This mainstreaming, which underpins both of the previous sections, is now discussed, and some ideas are shared which are applicable to river management and river-based urban planning. Having shown the advantages of an integrated approach, the focus is turned to mainstreaming in the next section, with some flexible guidelines on how the integrated approach argued for in this section can be successfully implemented.







# 6. Mainstreaming the integrated approach



This section outlines some concepts on the mainstreaming of an integrated approach to rivers and planning that could contribute to the needed change of mindset and the building of capacity. It essentially aims to tie the previous two sections together by providing guidance on overarching principles which underpin the approach put forward in this guideline document. If mainstreaming of rivers into planning is going to occur in African cities, there are certain broad principles that need to be built into all integrated planning processes to enhance decision making. The guiding principles outlined below are applicable to both planning for and planning with rivers (both a management and river-based urban planning approach).

## 6.1 Mainstreaming policy integration

Policy integration refers to the “consideration of cross-cutting issues in policy making, where policies across spheres of government and between departments are in accord with one another in order to solve issues collectively” (Ran & Nedovic-Budic, 2016: 70). Spatial integration refers to reconciling differences/inconsistencies of spatial jurisdictions. It entails the “vertical integration among spatial scales and horizontal integration across adjacent areas or areas with a shared interest” (Ran & Nedovic-Budic, 2016: 70). Through spatial integration cognisance of the effects that plans and projects for rivers and riversides will have on the wider spatial region and the implications of these for biodiversity, the economy and society can be adequately understood.

Achieving integration of rivers and planning is different to mainstreaming integration. Mainstreaming the integration presented in the previous section needs to be facilitated through planning processes at a number of scales. This mainstreaming involves alignment with the vision and plan for an urban river with management and urban plans at all scales. In this way, mainstreaming can be achieved. This is a return to the systems-based approach that this guideline advocates for. Although achieving integrated river-based urban planning processes in African cities is a good start, this document seeks to mainstream this integrated approach throughout departments, jurisdictional boundaries, and scales of planning to build a well-aligned holistic planning system, which plans both for and with rivers. The aim is to spread awareness of, and build capacity to enable, this new approach. This approach should ideally filter through to policy and legislation to ensure mainstreamed protection and conservation of urban rivers. It is at this point where the guideline focuses on the implementation of integrated river-based planning. The guidelines that follow are some ideas around considerations in effective implementation of river management and river-based urban plans through an integrated, strategic, and proactive approach.

## 6.2 From planning to implementation

Successful implementation of plans which include an integrated approach to planning both for and with rivers requires a good understanding of the problems facing a river and a strategic plan to manage these upfront. Key factors in successful implementation of projects include:

### ◆ **Ensure political support:**

Political will assists greatly with accessing financing and timeous implementation, and providing political leaders with choice when it comes to implementation plans can contribute towards their sustained support. Suggestions on gaining political support are:

- Have a clear project plan with outcomes to be presented to the relevant politicians. In this plan identify how it would be beneficial for the politician to support the plan (e.g. positive publicity, gaining votes, gaining status etc.).
- Understand who the most strategic stakeholder is in terms of gaining their support and what they can offer towards making the project a success. Power structures in the political sphere need to be understood.
- Ensure that there is a common vision, goal and outcome for the project and plan.
- A stakeholder analysis may assist in identifying who the correct person/people are to lobby for support.
- Lobbying, advocacy and media and marketing strategies are ideal ways in which to gain political support.

### ◆ **Pre-Planning:**

Planning for implementation projects is probably the most important success factor. To undertake comprehensive pre-planning the following is necessary:

- Clear mandates, roles and responsibilities need to be assigned from the beginning.
- A multi-disciplinary technical team is needed in developing solutions to ensure they are integrated and viable on many levels
- Projects should be informed by evidence-based solutions.
- From the start coordination needs to occur between spheres of government and between different stakeholders to prevent duplication of efforts
- A clear implementation and monitoring and evaluation plan is needed.

### ◆ **Innovative solutions:**

Engaging in an inter-disciplinary team allows for innovative solutions to arise and promotes efficiency, effectiveness and sustainability. Some of ways of achieving this include:



- 
- City to city learning can be very useful when exploring new ways of managing issues with respect to rivers.
  - Education and awareness raising should be part of any river project.
  - Education and awareness raising should not only include the local community, but can start from a school age where the value of natural assets is taught.
  - Solutions also need to be wider in their scope from dealing only with the river, to approaching other causes of river degradation, such as implementing waste management strategies or creating the conditions for stronger enforcement from government
  - The provision of alternative livelihoods will be critical in the effectiveness of any river project and new and innovative means of providing livelihood strategies may want to be explored and implemented.

### ◆ **Stakeholder inclusion and partnerships:**

It is critical that throughout the process of identifying and implementing projects the local community is involved.

- It is important that the correct stakeholders are involved in various parts of the planning and implementation processes.
- Facilitating ownership of river projects by the local community not only ensures their sustainability but also reduces the load on government.
- Fostering a sense of shared responsibility among all stakeholders related to the river should be strived for.
- Governments can partner with NGOs, businesses and the private sector to assist with financing, implementing and managing projects.

### ◆ **Accessing to finances:**

To effectively develop and implement river plans and projects, sufficient finances are needed. Only with finances can the plan be implemented and projects maintained. Other innovative ways of sourcing funding are discussed later in this guideline.

### ◆ **Capacity:**

For plans to be effectively implemented, organisational and human resource capacity is needed to oversee and manage the implementation process. Ideally there should be a dedicated project team.

### ◆ **A monitoring and evaluation (M&E) plan:**

For implementation to have long-term success, and be able to respond to changes or challenges as they arise, a clear monitoring and evaluation plan should be developed prior to implementation.

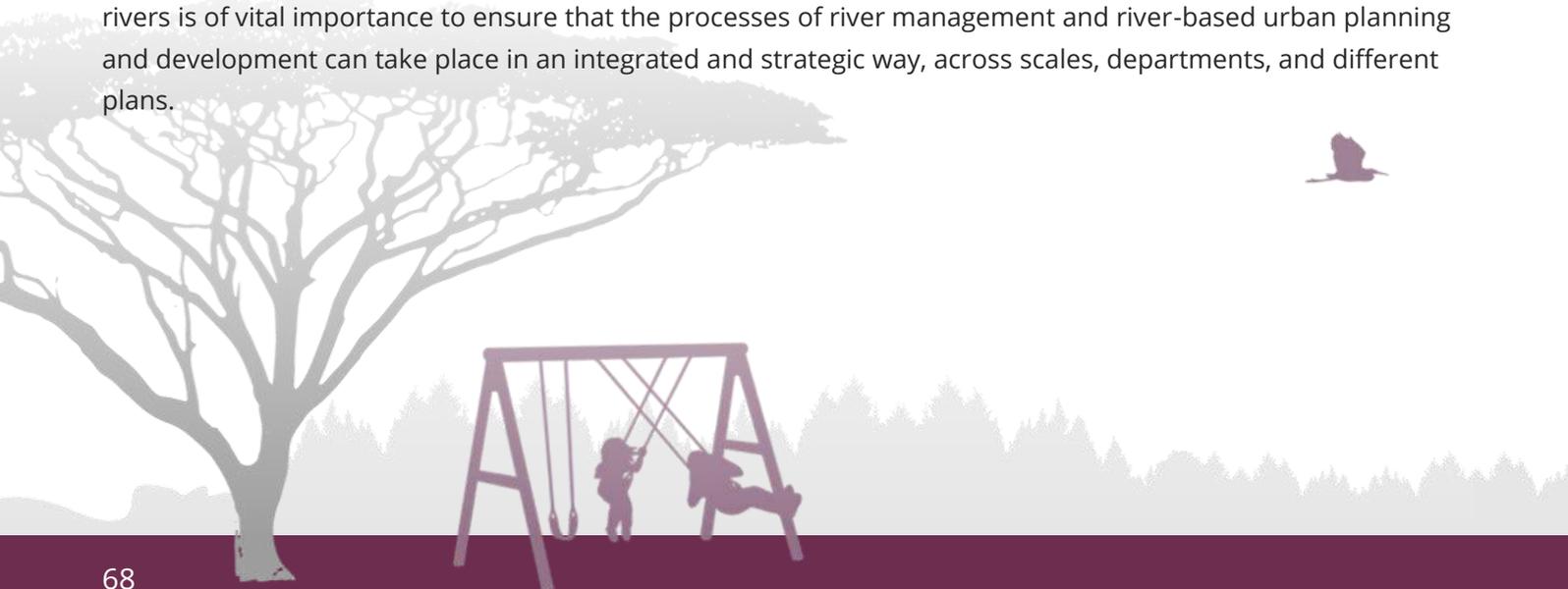
- Capturing learnings throughout the process can assist with change management and the learnings can inform future projects.
- M&E guidelines are outlined in section 7.

## 6.3 Capacity building

A lack of capacity within a local authority and across stakeholder groups is a challenge for managing and planning for and with rivers in the African context. This can lead to an inability to plan effectively and a lack of implementation. The potential impacts of this lack of capacity are:

- ◆ It prevents planners' ability to focus on long-term strategic planning as they are constrained to the point of only being able to prioritise urgent daily tasks. It results in reactive planning rather than proactive planning.
- ◆ It prevents planners from engaging in inter-disciplinary approaches to problem solving.
- ◆ It impacts on the ability of local government to effectively enforce and monitor land-use schemes both formal and informal, on riverbanks and within flood zones.
- ◆ It creates limitations on the ability of officials to further their skills through training in modern technologies and new ways of doing things.
- ◆ It results in limited ability to collect the up-to-date data (aerial photographs, GIS data, natural asset data collection) needed in order to ensure plans for rivers are relevant to the current realities on the ground.
- ◆ It limits the ability to capacitate local communities through knowledge sharing and educational campaigns.
- ◆ It can hinder the development of flexible and dynamic plans based on new knowledge and innovative thinking.
- ◆ It inhibits the ability of government officials to better implement plans.
- ◆ It can limit the funding for implementation and on-going maintenance of projects.
- ◆ The lack of coordination of projects can result in duplication of efforts, limited resource optimisation and lowered alignment of objectives.

The above can be overcome through harnessing political support for the appropriate allocation of finances into planning across departments, as well as through engaging in innovative financing mechanisms. **A constant learning and professional development environment should be encouraged in order to prioritise education and capacity building through skills training and development. A mind-set shift to a focus on long-term, rather than short-term outcomes can also have a positive impact.** (See case study 3.4 in The Sustainable River-based Urban Planning for Sub-Saharan Africa: Case Studies Document). Education, skills development, and continuous training of officials, politicians, engineers, and other stakeholders working on rivers is of vital importance to ensure that the processes of river management and river-based urban planning and development can take place in an integrated and strategic way, across scales, departments, and different plans.



# 6.4 Participatory planning: integrating land use stakeholder needs

The only way in which the integration of land-use plans and decisions and rivers can be mainstreamed is through a participatory planning process. A participatory planning approach is needed in both river management and river-based urban planning. There are a number of participatory planning methodologies, some examples of which are outlined in the text boxes below. To comprehensively take into account the demands of different users of rivers in urban areas, it is important that traditional knowledge, as well as vulnerable groups such as women and youth are included. One way to include women and children is through identifying and engaging community groups such as school groups, women's networks, policing forums, street forums or groups of women working in the same sector such as crèches. In some instances planning occurs in a top-down manner where community input into plans is limited. Through extensive community participation and the inclusion of all stakeholders in the planning process the disjuncture between the needs and desires of planners and the communities can be addressed. Buy-in, support for, and ownership of integrated plans can then be a reality for all parties. Participatory planning is an important tool in implementing the mainstreaming of the integrated planning approach that this guideline seeks to promote.

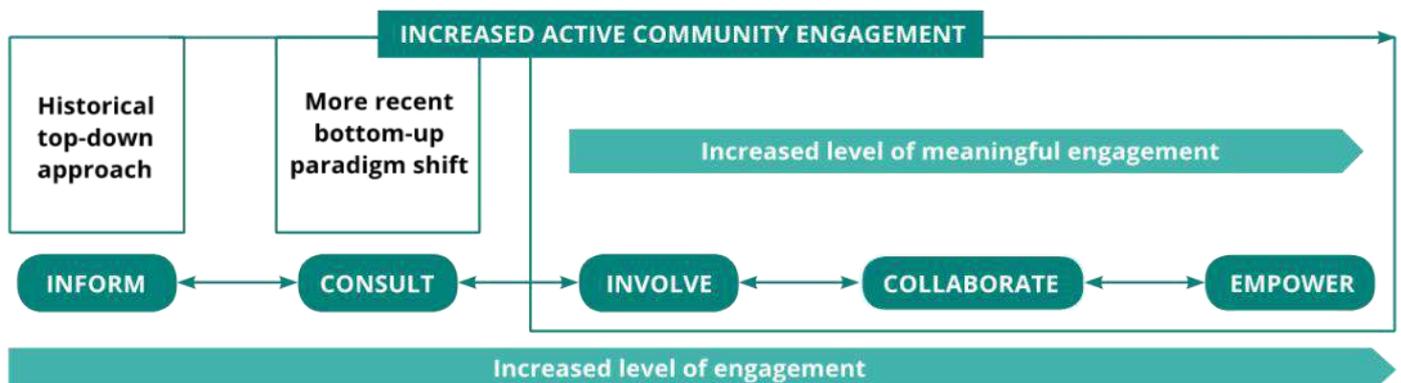
All stakeholders including vulnerable groups can be integrated into the planning process through establishing community committees. Community committees play an important role in giving local communities a collective voice, and create a platform for residents to engage with one another, as well as with other stakeholder groups, such as local government. This allows for the leveraging of local knowledge through participatory planning processes. A crucial step is to create a Community Committee with clearly defined roles and responsibilities (Figure 30).



**Figure 30:** Steps in establishing a community committee (Source: Adapted from Speed et al., 2016)

It is essential that one understands what is meant by participation since participation can occur in three principal ways, which include: information supply, consultation and active involvement. The steps to improve community engagement are shown in figure 31. The three principle ways in which participation can occur are detailed below:

- ◆ Information supply entails activities that essentially provide information to stakeholders. This type of information sharing includes making results of specific studies/findings, progress updates/reports and proposed plans available (Tippet et al., 2005).
- ◆ With consultation, the participants/stakeholders are asked to comment and provide input, either verbally or through writing (Tippet et al., 2005).
- ◆ Active involvement entails activities in which the participants/ stakeholders are actively contributing to river management processes and do not include the involvement of the public only as stakeholders, but also includes other organisations and government agencies. The focus is on stakeholders who will be involved in implementation and/or stand to directly benefit from the project. This type of approach includes multi-stakeholder workshops (Tippet et al., 2005).



**Figure 31:** Steps to improve community engagement  
(Source: National Department of Human Settlements, 2013)

Best practice for preparing for community participation and community participation methods are showcased by case study 1.2, 1.3 & 1.4 in The Sustainable River-based Urban Planning for Sub-Saharan Africa: Case Studies Document) Three examples of the successful mainstreaming of an integrated approach through participatory planning are cited below.

## ◆ Participatory design process

### ◆ Lilongwe, Malawi

As part of the UNA Rivers project, a participatory process for the design of a river restoration plan for the Lilongwe River was undertaken. This plan aimed to connect people in urban communities with biodiversity and ecosystems in a holistic way, enhancing overall human well-being. A team of consultants was hired to undertake the participatory design process as well as develop the landscape master plan, with ICLEI Africa facilitating the process. The process included engagements with a number of stakeholders, including community members and city officials, in order to understand their needs and vision for the site. Based on these engagements, through an iterative process, the restoration plan was developed. The iterative process ensured community buy-in and ownership of the final design. Due to the success of the process and buy-in to the design, components of the plan are currently being implemented in partnership with community members.



## ◆ Minecraft methodology

### ◆ Addis Ababa, Ethiopia

ICLEI Africa partnered with UN-Habitat and the Addis Ababa City Administration in a participatory process using the game Minecraft to design a public open space. Minecraft, one of the best video games of all time, is being used by UN-Habitat in their Global Programme on Public Space, to facilitate participatory design of open spaces. This method is extremely effective at building an inclusive process, specifically targeting vulnerable groups such as women and children. In July 2017, a four-day workshop was attended by over 50 city officials and community members. A site visit to the design site encouraged visionary exercises to take place. Participants, in groups of two to four, then used the Minecraft software to design the site. The final output of the process was a consolidated design consisting of the main design elements that came out of the Minecraft design process. This was presented back to participants to ensure stakeholder buy-in. Implementation, based on the final design, has begun at the site. This process was highly effective in bringing community members and city officials together in the design process and in obtaining community buy-in. The process was also useful as a visioning exercise, understanding how design is applied practically in a space, and for bringing the process of urban design into the hands of the stakeholders.

## ◆ Participatory design process / design charrette

### ◆ Kerkplein, Bellville

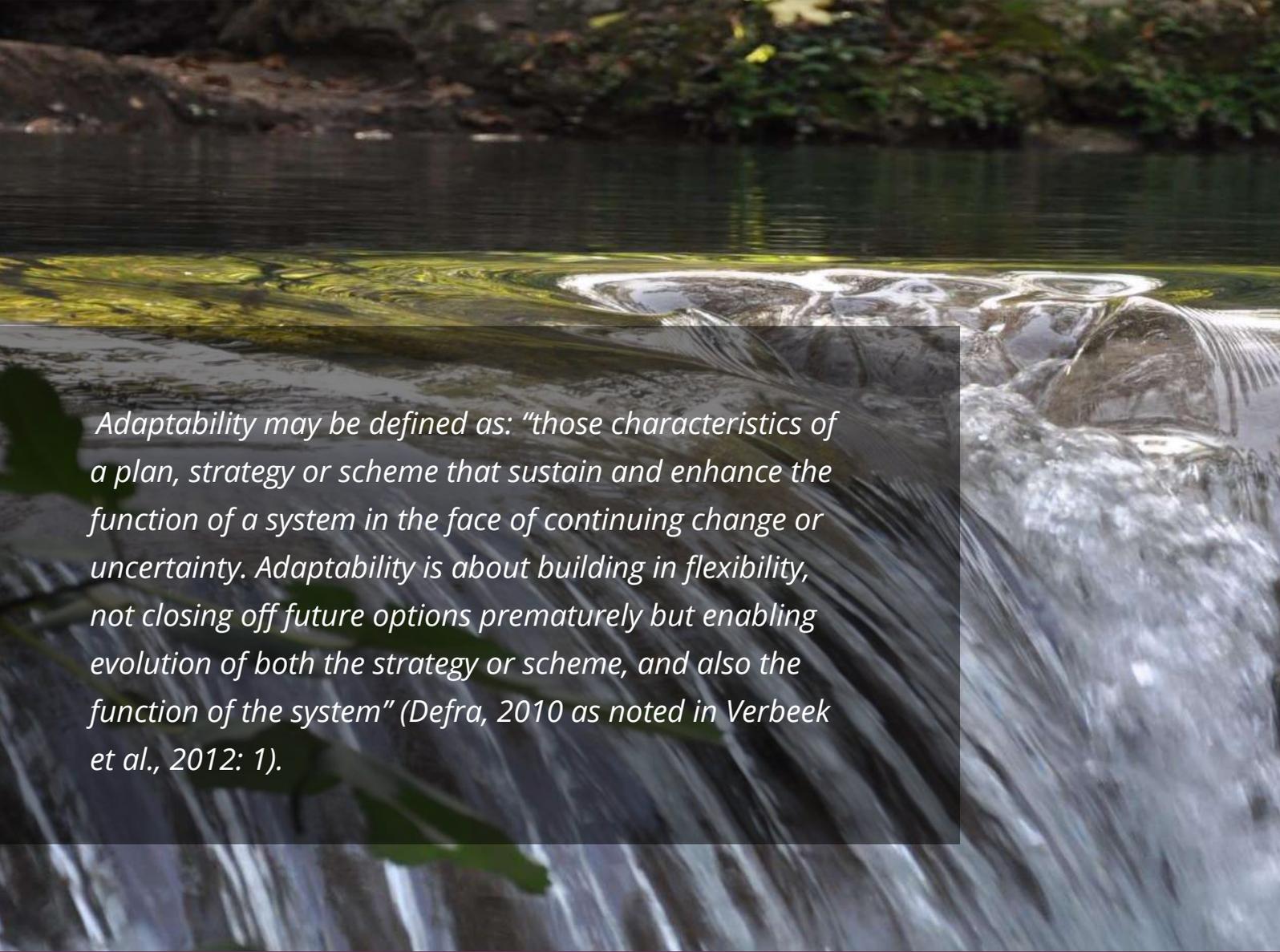
Kerkplein, meaning Church Square, is a public open space in Bellville, Cape Town (South Africa). While currently a degraded parking lot, the space holds significant potential for redevelopment due to its strategic location in what is known as Cape Town's second Central Business District. This is especially true given the lack of open space available for development in Bellville.

Working with CityThinkSpace, now Gapp Architects, a design charrette process took place to understand stakeholders' needs and vision for the site as part of a pre-feasibility study for the redevelopment of the site. Property owners and business owners around the site as well as city officials were involved. A vision for the site was agreed upon. Four design options were developed by the consultants and these were then workshopped with stakeholders, identifying the pros and cons of each. The aim of this was to develop a common consensus of the land uses to be on the site. The outcome of this process was, however, that a strategic idea should be developed, rather than prescriptive land uses. The strategy developed would define rules for development that could facilitate short-to-long-term projects.

## 6.5 A flexible approach to planning within a complex system: scenario planning as a tool for decision making

When using the systems approach to planning for and with rivers, one of the key considerations is that urban systems are dynamic, and often these changes are unpredictable. Examples of these unpredicted changes could be population growth, governance structures, political instability and climate change. It is recommended that policies, plans and projects be flexible and adaptive to be able to respond to this.

Each policy, plan or project must therefore find the appropriate balance between the following elements uncertainty (i.e. provide a solid framework but allow for adjustments so that the plan is flexible enough to adapt to the changing context), contentiousness (mandate versus collaborate dialogue), multiplicity (multiple planning approaches) and complexity.



*Adaptability may be defined as: “those characteristics of a plan, strategy or scheme that sustain and enhance the function of a system in the face of continuing change or uncertainty. Adaptability is about building in flexibility, not closing off future options prematurely but enabling evolution of both the strategy or scheme, and also the function of the system” (Defra, 2010 as noted in Verbeek et al., 2012: 1).*

Flexible and adaptive management and river-based urban plans are those that understand the drivers and stressors of river health, and have the ability to respond to these creatively should they change (See case study 4.1 in The Sustainable River-based Urban Planning for Sub-Saharan Africa: Case Studies Document).

At times the traditional development planning approach does not provide for this flexibility and adaptability. In many African cities, development plans are often in the form of master plans. Given the rapid changes occurring in cities, at times these plans are not able to effectively adapt to new contexts as they arise. Inclusivity and multiplicity are important principles to be taken into account when planning in Africa, often requiring a paradigm shift from the current top-down master planning approach (Jaffe, 2011).

Scenario planning is one flexible and adaptive method that can be applied. Scenario planning is not prescriptive about future development, but rather a number of development scenarios or plans are created in workshops with relevant stakeholders. Local and scientific knowledge is used to inform the scenarios. The impact of each of the scenarios is discussed and the outcome of the discussions is a development plan along with actions that have been agreed upon by all relevant stakeholders (Addison & Ibrahim, 2013). Addison & Ibrahim (2013:5) note that “the actions agreed are non-prescriptive as it is developed by its users, takes a ‘bottom up’ approach and includes a range of hard or soft measures. This process aims to overcome ‘predictive’ mind-sets and engage stakeholders in analysing wide-ranging possible futures. Communities are empowered, through an increased understanding of their situation, to implement the action plan which can alleviate possible impacts of risks, both current and in the medium to long term”.

### **Characteristics of scenario plans are:**

- ◆ They are made based on conditions which could occur, and take into account a number of variables affecting how the urban system can change.
- ◆ It is highly participatory, involving a number of stakeholders and decisions makers whose needs and values are taken into account during the planning process.
- ◆ The planning process identifies incremental steps that explore possibilities and opportunities that could occur in future.
- ◆ The vision developed is a long-term one and stakeholders then identify what steps need to be taken to meet this vision over time, with appropriate benchmarks for review.
- ◆ The end result is a number of possible scenarios for development, bearing in mind the changes that could occur.

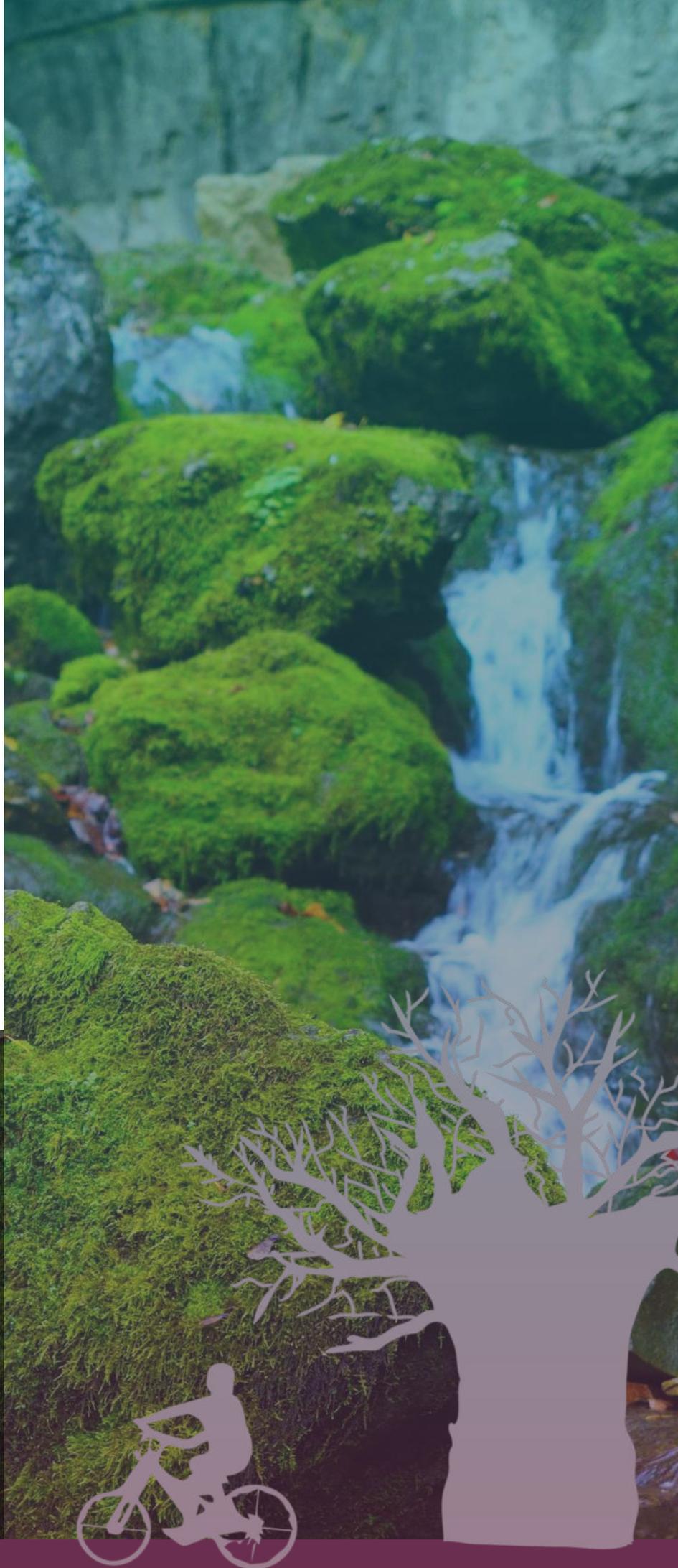
### **Methods for planning for unpredicted change include:**

- ◆ Evidence-based solutions and scientific knowledge becomes critical in informing the planning process, and finding solutions that are grounded in reality of the potential changes.
- ◆ Risk assessment can be a useful tool in scenario planning to predict a number of potential future outcomes (Wikstom, 2013).
- ◆ Mapping can also provide a useful tool in developing plans. Through mapping, trends over time can be assessed, aiding to predict future trends.
- ◆ Integration is a founding principle of scenario planning as not only does adaptability need to be built into the plan, but mainstreamed into policy and legislation as well (Wikstom, 2013).

Scenario planning is relevant for both river management approaches and river-based urban planning approaches to the mainstreaming of rivers into planning. Scenario planning enables more informed decision making which is able to facilitate improved planning for and with rivers. The diagram alongside (Figure 32) provides public- and private-sector development practitioners with a scenario-based decision matrix for assessing site-level urban riverine environments and for determining appropriate interventions. These scenarios, and the associated interventions, are based on international best practice principles in terms of river setback zones, nature-based infrastructure solutions, planning-based interventions, traditional infrastructure solutions, as well as socially, participatory planning practices. Accordingly, the overarching purpose of the diagram is to provide a practical decision-flow that will assist on-the-ground decision making and implementation around the integration of land use and urban planning and river management.

*This method (scenario planning) “does not only make the system less vulnerable to future change, but it also gives planners and governments a more clear idea of necessary priority decisions within the present and future work towards resilience”.*

– Wikstrom (2013)



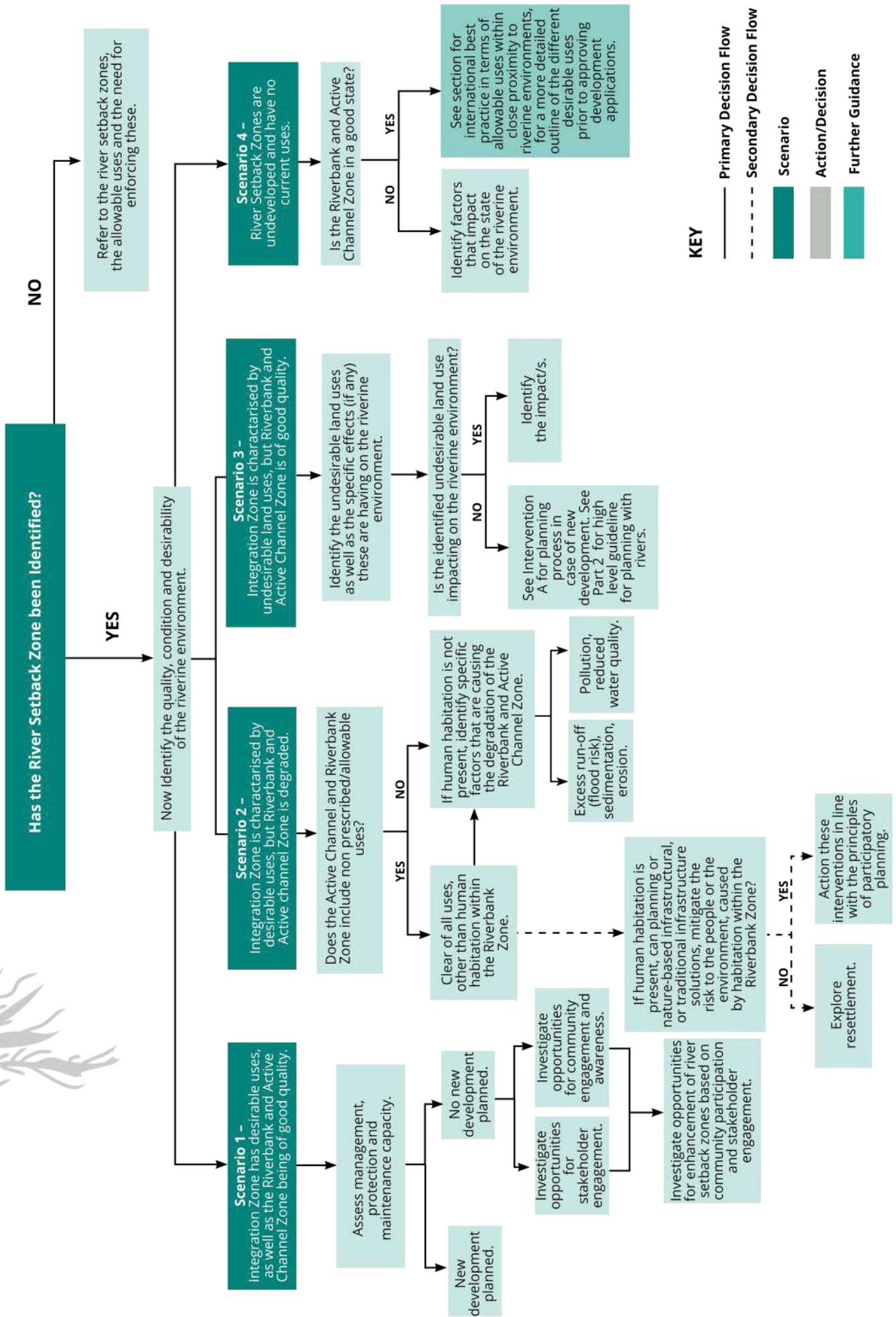


Figure 32: Scenario-based decision-making matrix

## 6.6 Balancing competing interests / needs (trade-offs)

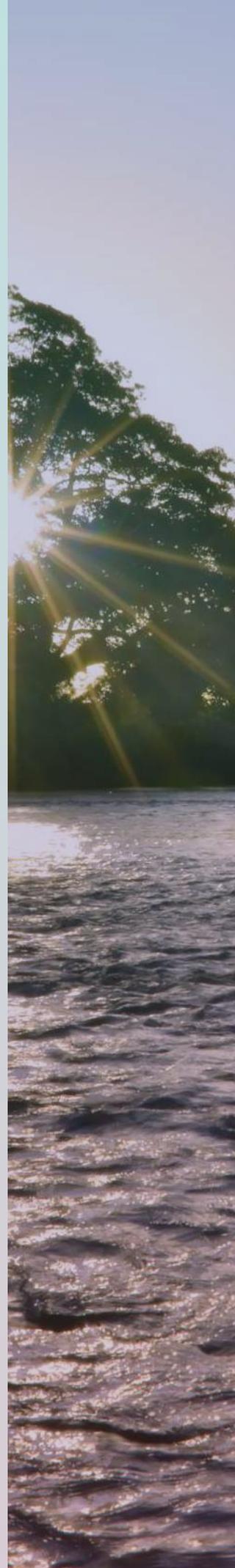
Even though the image above provides a guideline on decision-making for integrated river-based planning, the end goal in any decision-making process is to balance the range of elements in a way that makes up a healthy system. Integrating human needs, the economic value and the ecological processes rivers provide, is crucial in successful river and riverside planning. Planning for this balance includes assessing the need for housing, identifying where development should and should not occur, identifying appropriate land uses to be located alongside rivers, and identifying which areas are to be protected or restored and what form this should take (Speed et al., 2016). In instances where development is needed at the cost to nature, measures can be put in place to compensate for and/or mitigate this loss.

As this implies, a need for trade-offs in the river planning process is required. Trade-offs identify priority interventions and take cognisance of how they may impact people's lives and livelihoods. Identifying what trade-offs should take place will depend on the vision, goals and objectives for the river and on the stakeholder needs that come to light through participatory planning processes. However, a systems thinking approach should be kept in mind during the process of identifying and agreeing upon trade-offs, taking cognisance of how certain trade-offs will affect the wider urban system.

## 6.7 Facilitating meaningful stakeholder engagement

To ensure that ecological, economic, financial, and social values are met during the planning process, multidisciplinary teams should be consulted to ensure that there is a balance of the social, ecological, environmental and economic needs. It is important that local governments recognise and plan for the fact that conservation of riverine environments is more cost effective than restoration. At the same time however, planning should ideally also take a people-centred approach which involves understanding the trade-offs required in balancing ecological, financial, economic and social needs. In order to achieve this balance, a systems thinking approach is required and one where solutions are co-produced that can meet the needs of all stakeholders as best as possible. A critical stage in river planning that enables the co-production of solutions is using the visioning process as a tool to understand trade-offs and build consensus between stakeholders.

Rivers are an information-intensive ecosystem: knowledge about the river entails a wide socio-ecological understanding of its functions and the role it plays in people's lives and livelihoods, knowledge which is spread between various groups, individuals and organisations in different degrees. It is thus essential that these "knowledge-holders" are brought together in a participatory approach in order for the applicable information to be





mobilised and integrated into a management strategy for the urban rivers (Carr, 2015: 394). Users of the river have different demands regarding water quality and quantity. These differences will all have to be considered and addressed so that decisions and consensus can be reached regarding the way forward for a specific river. Stakeholders also interact with the land uses surrounding rivers and the functions that rivers provide differently (Figure 33 on page 79). As different stakeholders have differing needs in the river restoration and planning processes, these needs can at times be competing and conflicting. For example, clearing of riversides for agriculture can impact the river's ability to provide flood attenuation functions. Livelihoods depend on rivers, as do cultural practices, movement needs, recreation needs, spiritual needs and basic needs such as water supply and housing. Planning should account for all of these to ensure that community's lives are not adversely affected through land-use decisions.

For example, clearing of riversides for agriculture can impact the river's ability to provide flood attenuation functions. Livelihoods depend on rivers, as do cultural practices, movement needs, recreation needs, spiritual needs and basic needs such as water supply and housing. Planning should account for all of these to ensure that community's lives are not adversely affected through land-use decisions.

**The stakeholders required for planning with urban rivers include (but are not limited to):**

- ◆ Local communities and community groups
- ◆ Developers
- ◆ Housing authorities
- ◆ Land authorities
- ◆ Building plan and land use authorisers
- ◆ Stormwater management authorities
- ◆ Planning authorities
- ◆ Cultural and heritage authorities
- ◆ Tourism authorities
- ◆ Environmental authorities
- ◆ Fishermen and farmers and related unions or organisations
- ◆ Businesses and industry
- ◆ Property owners
- ◆ Disaster risk and resilience authorities
- ◆ Energy authorities and companies
- ◆ River water consumers
- ◆ Health authorities
- ◆ Water supply authorities

In both river management and river-based urban planning processes, meaningful stakeholder engagement is needed to empower stakeholders, meet the varying needs of stakeholders, and obtain buy-in and ownership of plans and interventions. Through meaningful stakeholder engagement, more vulnerable groups are given a voice in decision making.

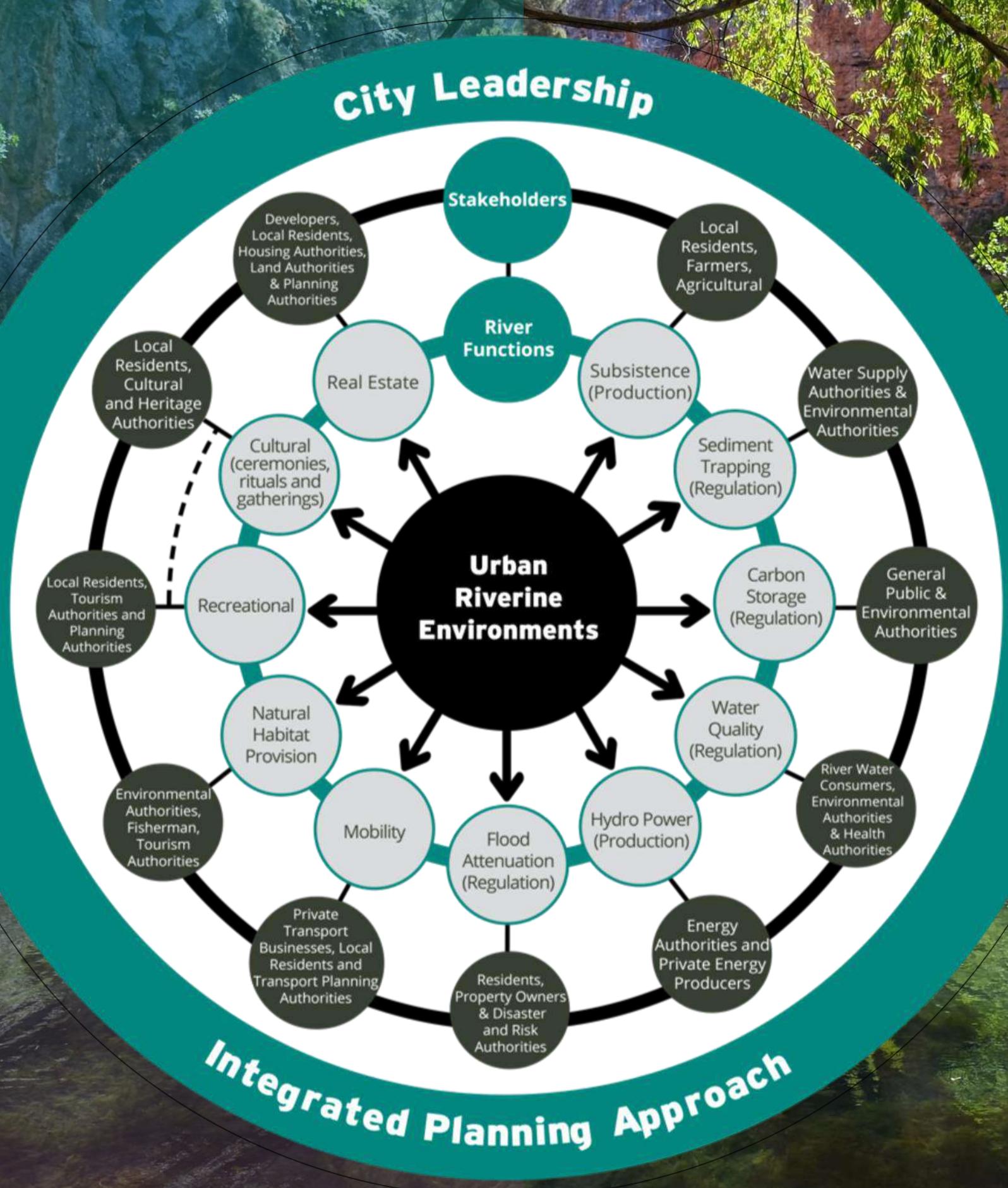
## **In order for meaningful engagement to take place:**

- ◆ Governments should determine stakeholders' targeted level of engagement – with a focus on meaningful engagement practices. The engagement and communication strategy should be tailored to the needs of the community, and to the audience being engaged with, and should communicate in a way that is easy for stakeholders to understand and to relate to their own needs and interests.
- ◆ This requires clear guidance on stakeholder engagement requirements and contributions.
- ◆ It also requires a clear strategy for community awareness, education and participation.

## **The stakeholder engagement should take account of the following:**

- ◆ Consultation should become an integral part of all issue-specific and sectoral-level decision-making processes.
- ◆ All major stakeholders should be identified, and their involvement encouraged.
- ◆ Stakeholders should be provided with opportunities to develop an understanding of the issues to enable effective involvement in the consultative process.
- ◆ Adequate opportunities should exist for timely input to the consultative process.
- ◆ Agencies should meet the community's expectation that views will be heard and considered.
- ◆ The effort required to improve the level of information provided to the community on the implications of the goal, objectives and principles for all industry sectors.
- ◆ Ensure that mechanisms for community awareness, education and participation are available.
- ◆ Governments should work through the appropriate community structures.
- ◆ Maintain targeted public information and education programmes, aimed at key community groups, such as farmers, industry sectors and consumers.
- ◆ Develop a high level of community awareness and understanding of the goals, objectives and principles of a sustainable river planning guideline and strategy.
- ◆ Seek to develop other appropriate means of emphasising the positive contribution that can be made by individuals and groups, and the need for every individual to participate in actions aimed at embracing sustainable planning with rivers (Ecologically Sustainable Development Steering Committee, 1992).
- ◆ It is recommended that an experienced facilitator is used for public participation processes to professionally handle situations that may require mediation between stakeholders and to ensure that all stakeholders remain positively engaged in the process.
- ◆ Government authorities and the facilitator should be cautioned against raising expectations. It needs to be clearly communicated from the beginning of engagement what the community can and cannot expect from the plan or project at hand.





**Figure 33:** The relationship between stakeholders and the functions that rivers provide

## 6.8 Creating an enabling environment

The need for a strong and supportive enabling environment for both management and river-based urban planning can be achieved through a shared governance and participatory approach, working with a multidisciplinary team and through fostering political support and city leadership. A participatory approach where meaningful stakeholder engagement is facilitated is essential. All the various stakeholders with vested interests in a river should be consulted and local communities should be included in the planning process from project inception.

**Creating an enabling environment for planning with rivers can have a significant impact on the success of plans and projects.** An enabling environment means that certain factors that are present contribute positively to the planning process. It can ensure that goals and objectives are met effectively, that the process runs timeously, it minimises red tape and contributes towards the sustainability of plans and projects. The following eight focus areas are recommended to facilitate an enabling environment for river planning.

Recommended focus areas for creating an enabling environment are shown in figure 34.

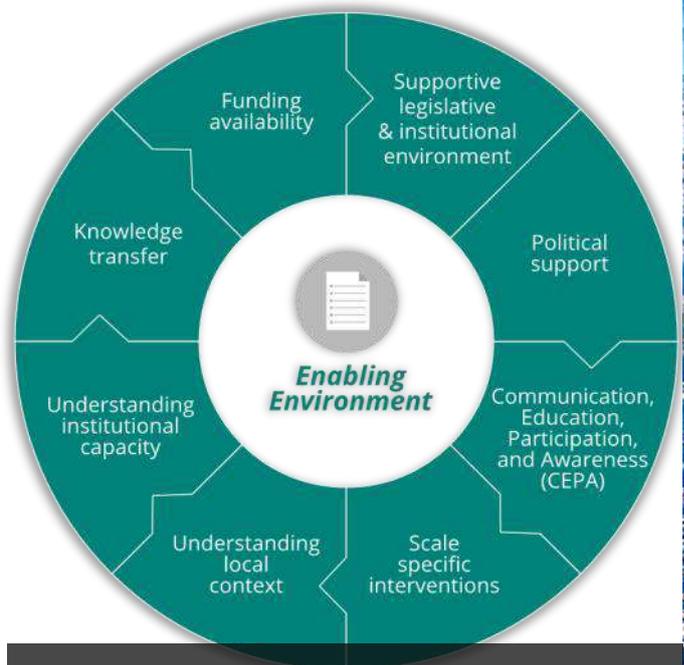


Figure 34: Creating an enabling environment

## 6.9 Understanding and improving institutional capacity

Effective river management or river-based urban planning is difficult if there is not a mandated lead institution to drive the process. This does not imply that the designated institution must have all the power with regards to decision-making and implementation (as it relates to river management), but rather that a recognised authority has authority to convene and facilitate planning procedures at the appropriate scale. An ideal step in ensuring this is the establishment of a dedicated river and riverside office.

Developing adequate institutional capacity at the applicable scale is multifaceted and includes focused activities in seven main areas, shown in table 13 (WWF, 2003).

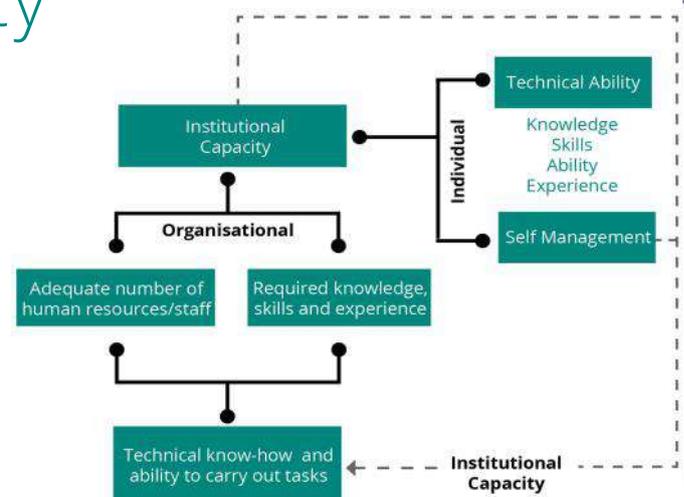


Figure 35: Overview of institutional capacities and how they are interrelated (Source, WWF, 2003)

**Table 13:** Types of institutional capacity (Source: WWF, 2003).

1	<p><b>Policy and legal capacity</b></p>
	<p>Policy and legal capacity includes the support for planning with urban rivers through inclusion of rivers and river systems in the planning process. Practically this would entail the consideration of appropriate mandates and management instruments.</p>
2	<p><b>Planning and managerial capacity</b></p>
	<p>Ability of those in leadership roles to facilitate the planning process strategically. This is a challenging task since this usually occurs in complex institutional environments in which the outcomes have to be implementable on a local scale.</p>
3	<p><b>Human and infrastructure capacity</b></p>
	<p>Successful river management requires technically skilled people with the ability to process information, communicate the information across different scales and synthesise information from diverse sources (environmental, social, economic and institutional) in order to make recommendations that are implementable for basin management.</p>
4	<p><b>Organisational and procedural capacity</b></p>
	<p>This type of capacity refer to structures and systems that are required to support the implementation of river guideline plan. This can either be achieved through direct regulatory control, economic incentives, participatory cooperation and institutional collaboration.</p>
5	<p><b>Financial Capacity</b></p>
	<p>Financial resources that are required to support the implementation of urban river guideline. The financial capacity resources would enable the different actions that have been identified to be implemented and also include the capacity to successfully manage these funds.</p>
6	<p><b>Network Capacity</b></p>
	<p>Sharing experience and knowledge with different groups and associations to strengthen the dimensions of institutional capacity for river planning.</p>
7	<p><b>Stakeholder support</b></p>
	<p>It is important that the institutions that are leading the way for the river guideline will be credible and take responsibility for the implementation of the proposed guideline.</p>

# 6.10 Financial considerations: accessing financing

At the end of the day, the availability of funding will predict what interventions can be undertaken (the extent to which management and planning processes can be undertaken), the prioritisation process of these interventions and the timeframes for implementation. Funding availability will dictate the feasibility of goals and objectives for the river and therefore impact how a river plan, strategy and project implementation will be rolled-out. Access to funding for maintenance costs over the long term is needed to ensure the sustainability of plans and interventions implemented and to prevent the river from moving back to a degraded state.

## **Finances can be accessed through:**

- ◆ Submitting proposals to funders, both local and international
- ◆ Joining city networks such as ICLEI-Local Governments for Sustainability
- ◆ Engaging in public-private partnerships
- ◆ Developing special projects that work across departments to align budgets
- ◆ Engaging in projects such as the Transformative Actions Programme

Before funding and financing can be sourced, a financial assessment for the plan or project is needed. This will aid in building a financial proposal to present to potential funders if required, and to understand the short- and long-term financial costs, benefits and implications. Undertaking this assessment can also aid in identifying which financing option is best suited to implementing a plan or project.

## **Guidance in undertaking a financial assessment (World Wildlife Fund, 2009, as cited in The Nature Conservancy, 2011):**

- ◆ A financial assessment considers the project's scope, spatial scale, strategic activities and time frame, as well as total costs, current sources of revenue, and gaps.
- ◆ A sustainable financing strategy evaluates the total funding currently or potentially available from all sources – government budgets; funding from private donors, corporate or non-governmental organisation (NGO) partners; revenue generated by access and user fees, fines and other payment schemes.
- ◆ The assessment estimates the funding needed and determines the financing gap that must be filled to meet the program's conservation goals.
- ◆ A comprehensive financial assessment then evaluates the legal, social, political and environmental context to determine which finance mechanisms can most realistically close the financing gap.

# 6.11 Monitoring and evaluation: a culture of reflection and learning

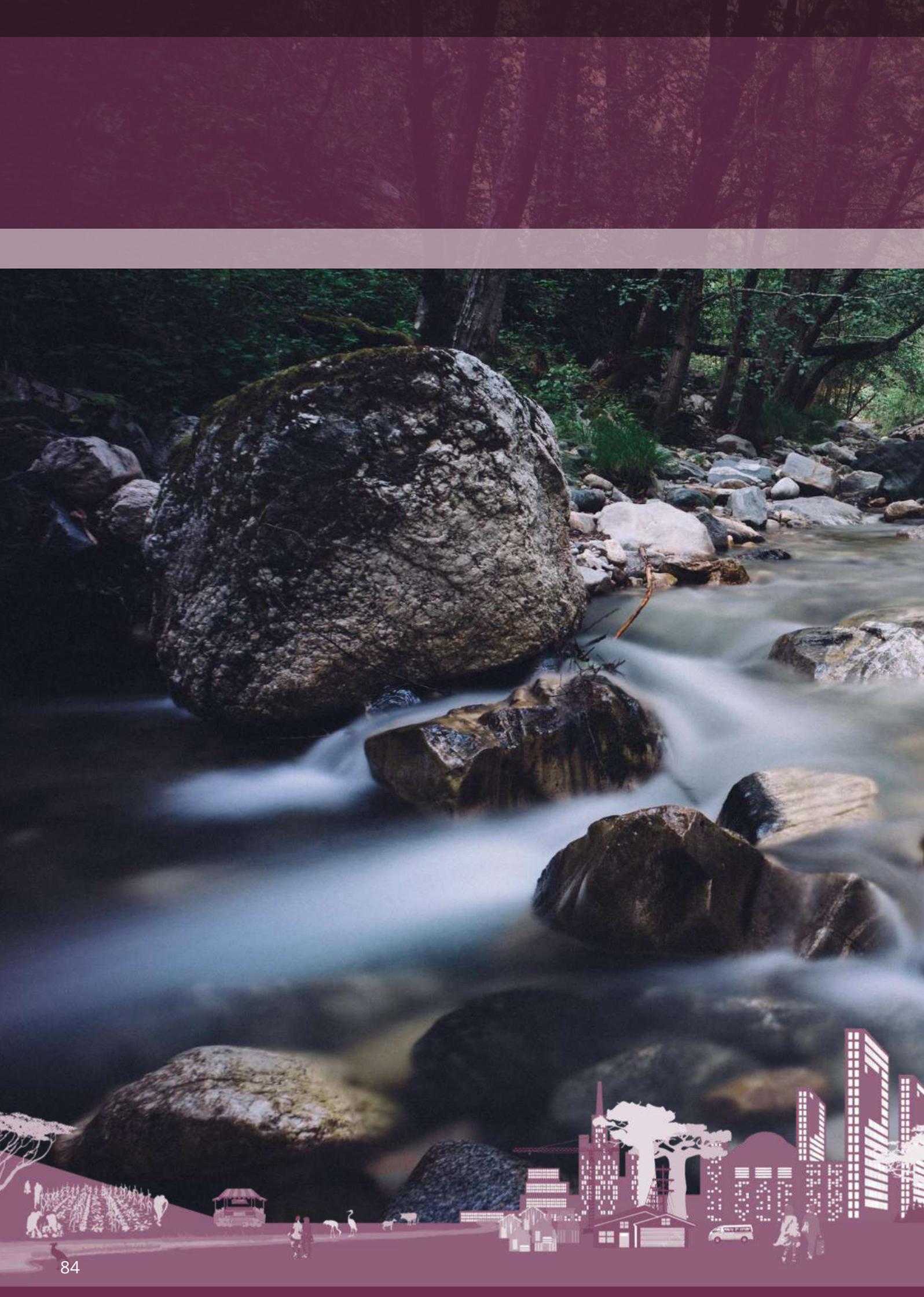
River plans and projects require a large amount of financial and human capacity to be developed. Monitoring and evaluation (M&E) of these is therefore critical to ensure that they are sustainable and have the desired impact and outcomes both short and long term. In order for the vision to be successfully achieved, regular monitoring and evaluation is needed. Assessing the state of the river before any plan is developed or intervention has taken place is necessary as a baseline from which to measure change. This assessment should not only be an ecological assessment, but should include a social and economic assessment. Relevant stakeholders should be engaged with to undertake this assessment in relation to the ability of the river and riverside to provide the functions they rely on to meet their needs. This is also true throughout the M&E process, as at times it can be thought that interventions and plans have been successful when in fact they have been detrimental to certain stakeholders or to the ecological well-being of the river. Ecological assessments should be founded in scientific knowledge and can often be collected through qualitative data collection methods. Data collection methodologies can include water sampling, mapping to assess the increase in vegetation cover, rate of buffer zone encroachment, number of flood events and growth of invasive species. Social and cultural data can be collected through qualitative and quantitative data. Objectives to be measured can include the change in the number of people using the river, changed perceptions of the river, behaviour changes as well as the ability of the river to provide the functions that stakeholders depend on the river for.

**When undertaking M & E a clear plan needs to be developed, with specific and measurable objectives. Under each objective the plan should include:**

- ◆ What will be measured
- ◆ What indicator will be used to measure the objective
- ◆ What methodology will be used to capture the data
- ◆ Who is responsible for data capture
- ◆ How frequently will data be captured
- ◆ How will the data be stored
- ◆ What will the data be used for

Differing objectives will have different timeframes for M&E as some changes may be achievable in the short term, such as use of a river, and some long term, such as rate of decrease or increase of invasive species (Speed et al., 2016). It is recommended that obstacles to effective monitoring and evaluation be considered at the beginning of the planning process and where possible, mitigation measures put in place. Challenges in an African context could include lack of financing and capacity to undertake monitoring and evaluation, resources such as data or equipment available and lack of regularly updated information such as GIS data and aerial photographs. The outcomes of the M&E process should then be used to revisit the plan or project and make adjustments as needed. M&E also allows plans to be flexible and adapt to unforeseen changes that occur that impact the ecological, social or economic value and functions of a river. This is called adaptive management (Speed et al., 2016). Valuable information regarding mistakes made during the planning process and successes to be built on can be used to inform future river plans.

There are a number of frameworks that can be used to inform the M&E plan. One such framework is the Promoting and assessing value creation in communities and networks: a conceptual framework, developed by Wenger, Trayner and de Laat (2011).





## 7. Conclusion

This document has laid out a suggested approach to planning for and with rivers in the context of African cities. It has provided flexible and adaptive guidelines for river management, integrated river-based urban planning, and the mainstreaming of an integrated approach to the implementation thereof. It is hoped that this guideline will be used by stakeholders to enable capacity building and promote a new way of thinking and planning in African cities. This new approach will be firmly integrated with the urban natural assets on which a city depends. This document can be used to guide decision making processes and provides a benchmark and baseline against which development applications and urban planning can be assessed. Overall, the intention is to enhance the capacity of African cities to see rivers as an integral part of the urban system and to enable a paradigm shift towards a more proactive, strategic, and integrated approach to planning. It has been shown how river management objectives can be overlaid in various planning processes to improve awareness around the need to plan for and with rivers in African cities. Through aligning plans, policies, and legislation at a number of scales, with the vision, objectives, and actions of river management and river-based urban plans, the health of rivers in Africa can be improved.



# Glossary

## ◆ **Aggregated process**

Process which involves combining a variety of separate elements to form a whole.

## ◆ **Biodiversity**

Variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems.

## ◆ **Community based activation**

Action or process of making something active or operative by leveraging the assets and capabilities of the local community.

## ◆ **Conscientiousness**

A personality trait of being careful or vigilant, the desire to do a task well and take obligations seriously

## ◆ **Conservation**

The preservation of wild fauna and flora and natural habitats and ecosystems, especially from the effects of human exploitation, industrialisation and rapid urbanisation.

## ◆ **Complexity**

A state of having many parts and being difficult to understand.

## ◆ **Ecological process**

The flow and cycling of energy, materials, and organisms in an ecosystem. Examples of ecological processes include the carbon and hydrologic cycles, terrestrial and aquatic food webs, and plant succession, among others.

## ◆ **Ecologically sensitive design**

Approach to design which is cognisant and mindful of environmental aspects (particularly sensitivities and risk factors) to avoid or minimise negative environmental impacts.

## ◆ **Ecosystem**

A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

## ◆ **Ecosystem services**

Ecosystem services make human life possible by, for example, providing nutritious food and clean water, regulating disease and climate, supporting the pollination of crops and soil formation, and providing recreational, cultural and spiritual benefits.

## ◆ **Evidence-based solutions**

Formulation of solutions to complex challenges based on accurate, true and demonstrable evidence, facts, data and intelligence derived from an official and reliable source.

## ◆ **Flexibility**

The ability to be easily changed or adapted.

## ◆ **Integrated planning approach**

Joint planning exercise that ensures participation across a broad range of stakeholder groups, affected departments or sectors of society, such as infrastructure, human settlements, social services, etc.

## ◆ **Interdisciplinary research/ approach**

Research efforts conducted by investigators from different disciplines working jointly to create new conceptual, theoretical, methodological, and translational innovations that integrate and move beyond discipline-specific approaches to address a common problem.

◆ **Livelihood**

People's capabilities, assets, income and activities required to secure the necessities of life.

◆ **Livelihood strategy**

The way in which the options to secure the necessities of life are arranged. A livelihood strategy is sustainable when it enables people to cope with and recover from shocks and stresses (such as natural disasters and economic or social upheavals) and enhance their well-being and that of future generations without undermining the natural environment or resource base.

◆ **Mainstream**

Ideas, attitudes, or activities that are shared by most people and regarded as normal or conventional.

◆ **Multi-disciplinary approach**

An approach which draws appropriately from multiple disciplines to redefine problems outside normal boundaries and reach solutions based on a new understanding of complex situations.

◆ **Multifunctional**

Being able to, or having to, fulfill multiple functions.

◆ **Multiplicity**

A large number or variety of an element.

◆ **Multi-sectoral**

Partnership that results when government, non-profit, private, and public organisations, community groups, and individual community members come together to solve problems that affect a whole system.

◆ **Nature-based solutions**

Solutions that are inspired and supported by nature, which are cost effective, simultaneously provide environmental, social and economic benefits, and help build resilience.

◆ **Participatory planning approach (also referred to as people-centred approach)**

Process of collective action aimed at achieving a common objective, particularly by including communities to leverage local knowledge and assets, maximise impact and ensure long-term sustainability.

◆ **Policy integration**

Management of cross-cutting issues in policy making by balancing economic, social and environmental interests and policies in a way that trade-offs (negative effects) between them are minimised and synergies (mutually beneficial opportunities) are maximised.

◆ **Polycentrism**

It is the organisation of an area around several political, social or financial centres.

◆ **Pre-planning**

Attempt to consolidate a set of preparatory activities into a special stage that goes prior to the project planning phase.

◆ **Rehabilitation**

Action of restoring something that has been damaged or subjected to harmful impacts to its former condition.

◆ **Resilience**

Ability to respond to an external disturbance by recovering quickly from external shocks and stresses.

◆ **Restoration**

Action of returning something to a former owner, place, or condition.

# Glossary

## ◆ **Riparian buffer**

Vegetated area near a water body which helps shade and partially protect it from the impact of adjacent land uses. It plays a key role in increasing water quality in associated streams, rivers, and lakes, thus providing crucial environmental benefits.

## ◆ **River-based urban planning**

Approach to planning an urban environment which is premised on and centred around a river system, both to preserve ecologically sensitive areas and to leverage areas of opportunity offered by the system itself.

## ◆ **Robustness**

The ability to withstand or overcome adverse conditions or rigorous testing.

## ◆ **Spatial integration**

Integration between different domains in a specific territory, as well as the integration between territories in different domains.

## ◆ **Status quo assessment**

Analysis of existing contextual realities, particularly strengths, weaknesses, opportunities and threats.

## ◆ **Strategic action**

Activities and actions oriented at, and relating to the identification of long-term or overall aims and interests and the means of achieving them.

## ◆ **Strategic intent**

Clearly defined and readily grasped rationale in favour of a specific long-term activity or action.

## ◆ **Systemic**

Relating to a whole network or system, as opposed to a singular emphasis on a specific part.

## ◆ **Systems thinking approach**

Holistic approach to analysis that focuses on the way that a system's constituent parts interrelate and how systems work both over time and within the context of larger systems.

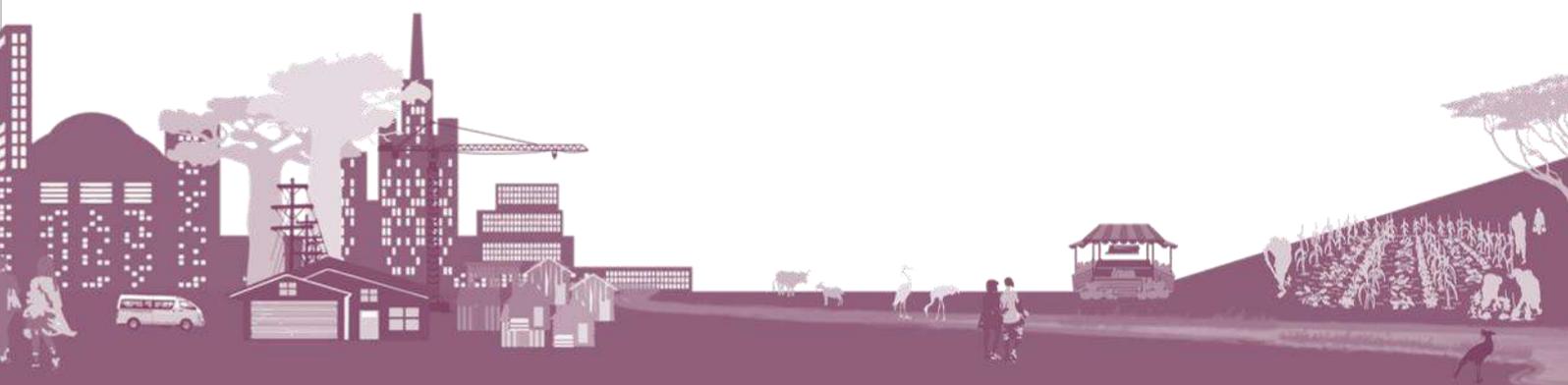
## ◆ **Water resource**

Sources of water that are potentially useful for an array of different uses which include, but are not limited to agricultural, industrial, household, recreational and environmental activities.



# References

- Abshirin, E. & Koch, D. 2016. Rivers as integration devices in cities. *City Territory and Architecture* 3(1).
- Addison, A. & Ibrahim, M. 2013. *Planning tool: Participatory planning for community resilience*. World Vision. UK.
- Aylward, B., Bandyopadhyay, J., Belausteguigotia, J., 2005. Chapter 7: Freshwater Ecosystem Services, in *Ecosystems and Human Well-being: Policy Responses*. [Online]. Available: <https://www.millenniumassessment.org/documents/document.312.aspx.pdf>
- Bolay, J.C. 2015. Urban Planning in Africa: Which Alternative for Poor Cities? The Case of Koudougou in Burkina Faso. *Current Urban Studies*, 3: 413-431
- Campbell, L. 2016. *Stepping back: understanding cities and their systems*. ALNAP Working Paper. London: ALNAP/ODI.
- Carr, G. 2015. Stakeholders and public participation in river basin management – an introduction. *WIREs Water*, 2:393-405.
- CEPSA. 2008. *Situation Analysis of Ecosystem Services and Poverty Alleviation in arid and semi-arid Africa*. Khanya-African Institute for Community-driven Development
- Earth2Water Pty Ltd. 2018. *The Water Cycle*. [ONLINE] Available: <http://www.earth2water.com.au/portfolio-view/the-water-cycle/>. [23 March 2018].
- Ecologically Sustainable Development Steering Committee. 1992. *National Strategy for Ecologically Sustainable Development*. Available: [www.environment.gov.au/node/13014](http://www.environment.gov.au/node/13014).
- Engelbrecht, F., Adegoke, J., Bopape, M., Naidoo, M., Garland, R., Thatcher, M., McGregor, J., Katzfey, J., Werner, M., Ichoku, C., & Gatebe, C. 2015. Projections of rapidly rising surface temperatures over Africa under low mitigation. *Environmental Research Letters*, 10(08).
- Food and Agriculture Organization (FAO) & Global Mechanism of the United Nations Convention to Combat Desertification (UNCCD). 2015. *Sustainable financing for forest and landscape restoration: Opportunities, challenges and the way forward*. Discussion paper. Rome.
- Goulden, M., Conway, D. & Persechino, A. 2008 *Adaptation to climate change in international river basins in Africa: a review*. Tyndall Working Paper 127.



# References

- Jaffe, E. 2011. Improving Urban Planning in Africa. [Online]. Available: <https://www.citylab.com/design/2011/11/improving-urban-planning-africa/549/>
- OCED. 2003. Annual Report 2003. [Online]. Available: <https://www.oecd.org/about/2506789.pdf>
- Mattijssen, T.J.M., Olafsson, A.S., Møller, M.S., Gulrud, N.M. & Caspersen, O.H., 2017. Urban Green Infrastructure: Connecting People and Nature for Sustainable Cities: A Summary for Policy Makers. GREEN SURGE, D8.5. [Online]. Available: [http://research.ku.dk/search/?pure=en%2Fpublications%2Furban-green-infrastructure-connecting-people-and-nature-for-sustainable-cities\(8801fb2a-c7ef-4fe0-b058-0d894dd7aa6c\)%2Fexport.html](http://research.ku.dk/search/?pure=en%2Fpublications%2Furban-green-infrastructure-connecting-people-and-nature-for-sustainable-cities(8801fb2a-c7ef-4fe0-b058-0d894dd7aa6c)%2Fexport.html)
- Met Office. 2018. Water cycle for kids - Met Office. [Online] Available: <https://www.metoffice.gov.uk/learning/weather-for-kids/water-cycle>. [16 March 2018].
- National Department of Human Settlement. 2013. [Online]. Available: <http://www.dhs.gov.za/content/publications>
- Pegram, G., Li, Y., Le Quesne, T., Speed, R., Li, J., and Shen, F. 2013. River Basin Planning: Principles, procedures and approaches for strategic basin planning, Paris, UNESCO.
- Phong, L.H. 2015. The relationship between rivers and cities: influences of urbanization on the riverine zones – a case study of Red River zones in Hanoi, Vietnam. Sustainable Development and Planning. VII, 27-43.
- Pugh, K. & Pursak, L. 2013. Designing effective knowledge networks. MIT sloan Management review. [Online]. Available: <https://sloanreview.mit.edu/article/designing-effective-knowledge-networks/>
- Ran, J. & Nedovic-Budic, Z. 2016. Integrating spatial planning and flood risk management: A new conceptual framework for the spatially integrated policy infrastructure. Computers, Environment and Urban Systems. 57: 68-79.
- Secretariat of the Convention on Biological Diversity. 2012. Cities and Biodiversity Outlook. Montreal.
- Speed, R., Li, Y., Tickner, D., Huang H., Naiman, R., Cao, J., Lei G., Yu, L., Sayers, P., Zhao, Z. & Yu, W. 2016. River Restoration: A Strategic Approach to Planning and Management. Paris, UNESCO.
- Tippett, J., Searle, B., Pahl-Wostl, C. & Rees, Y. 2005. Social learning in public participation in river basin management—early findings from HarmoniCOP European case studies. Environmental Science & Policy. 8 (3): 287-299.
- The Nature Conservation. 2015. [Online]. Available: <https://www.nature.org/ourinitiatives/regions/africa/index.htm>
- UN General Assembly. 2015 Transforming our World: the 2030 Agenda for Sustainable Development, 21 October 2015, A/RES/70/1. [Online]. Available: <http://www.refworld.org/docid/57b6e3e44.html>
- United Nations (UN). 1992. United Nations Conference on Environment & Development Rio de Janeiro, Brazil, 3 to 14 June 1992. AGENDA 21.

- United Nations (UN). 2001. Glossary of Environmental Statistics, Studies in Methods. Series F. No 67. 1997. New York.
- United Nations (UN). 2015. Report of the Capacity Building Workshop and Expert Group Meeting on Integrated Approaches to Sustainable Development Planning and Implementation. 27-29 May 2015, New York.
- United Nations (UN). 2015. A/RES/70/1: Transforming our world: the 2030 Agenda for Sustainable Development [Online]. Available: [http://www.un.org/ga/search/view\\_doc.asp?symbol=A/RES/70/1&Lang=E](http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E)
- United Nations (UN). 2018. Sustainable Development Goals: 17 Goals to transform our world. [Online]. Available: <https://www.un.org/sustainabledevelopment/inequality/>
- United Nations International Strategy for Disaster Reduction (UNISDR). 2012. Making cities resilient report 2012. [Online]. Available: <https://www.unisdr.org/we/inform/publications/28240>
- University of Wollongong. 2001. National Strategy on ESD. [Online]. Available: <https://www.uow.edu.au/~sharonb/STS300/sustain/index.html>.
- United States Agency for International Development (USAID). 2012. [Online]. Available: <https://www.usaid.gov/reports-and-data>
- van Buuren, A., Driessen, P., van Rijswijk, M., Rietveld, P., Salet, W., Spit, T. & Teisman, G. 2013. Towards Adaptive Spatial Planning for Climate Change: Balancing Between Robustness and Flexibility. JEEPL 10.1: 29-53
- Veerbeek W, Ashley R, Zevenbergen C, Rijke J, Gersonius B. 2012. Building adaptive capacity for flood proofing in urban areas through synergistic interventions, Proceedings of the 7th International Conference on Water Sensitive Urban Design, 21-23 February 2012, Melbourne, Australia [Online]. Available: <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.819.7739&rep=rep1&type=pdf>
- Wenger, E., Trayner, B. & de Laat, M. 2011. Promoting and assessing value creation in communities and networks: a conceptual framework. Rapport 18, Ruud de Moor Centrum, Open University of the Netherlands. [Online]. Available: <https://wenger-trayner.com/resources/publications/evaluation-framework/>
- Wenzheng, S. 2013. Landscape Management for Urban Green Space Multifunctionality: A comparative study in Sheffield (UK) and Yuci (China). PhD thesis, University of Sheffield. [Online]. Available: <http://etheses.whiterose.ac.uk/5190/>
- Wikström, A. 2013. The Challenge of Change: Planning for social urban resilience. An analysis of contemporary planning aims and practices
- World Wildlife Fund (WWF). 2003. [Online]. Available at: [http://www.wwf.org.za/our\\_research/publications/](http://www.wwf.org.za/our_research/publications/)

