I U W M

Integrated Urban Water Management

RAPID ASSESSMENT

GODAWARI • NEPAL

ENPHO
Creating Eco Societies

BORDA

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Cooperation Partners:
Godawari Municipality, Lalitpur District, Nepal

Established in 1990, the **Environment and Public Health Organization (ENPHO)** envisages to create eco-societies by providing quality services on Water, Sanitation and Hygiene (WASH), environment and public health. Research, innovations and promotion of the WASH technologies and approaches have been the core priorities of ENPHO, a service-oriented national Non-Governmental Organization (NGO).
www.enpho.org

BORDA (Bremen Overseas Research & Development Association) is an expert NGO specialising in full-cycle decentralised sanitation. For over 40 years, their award-winning solutions have empowered people and set new standards in 20+ countries around the world.
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Front Cover : Rooftop view of Godawari Municipality. Photo by Hari Paudyel on Wikimedia.org

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Introduction
to Partners & the Study

THE **PARTNERS**

ENPHO and BORDA have been working in partnership since 2004 to improve living conditions and to protect natural resources and climatic conditions in inadequately served urban and peri-urban settlements in South Asia. Concentrated in the field of urban sanitation, key achievements include technical support and scaling up of Decentralized Wastewater Treatment Systems (DEWATS), introducing Faecal Sludge Management (FSM) services in Nepal, local Water, Sanitation and Hygiene (WASH) capacity building, and innovations and demonstrations of new urban sanitation solutions.

More recently, they have been working closely on the German Federal Ministry for Economic Cooperation and Development (BMZ) funded 'Integrated urban water management at the centre of municipal public services' project (2018-2020). Designed in line with Sustainable Development Goals (SDG) 6 (water) and 11 (sustainable cities), this project aims to support municipalities and environmental service providers to improve the living conditions of all inhabitants, protect natural resources, and develop liveable and inclusive cities.

ENPHO
Creating Eco Societies

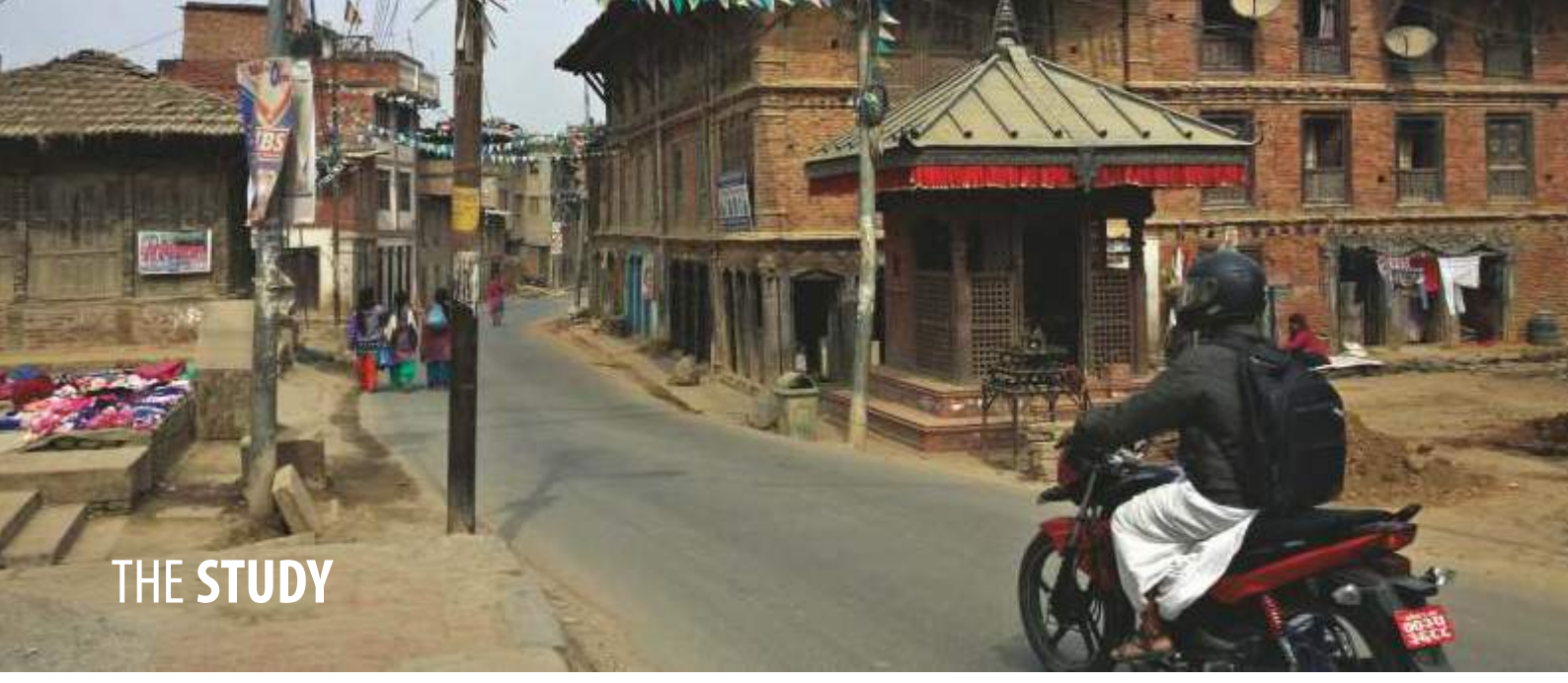
BORDA

BMZ Federal Ministry for Economic Cooperation and Development

SUSTAINABLE DEVELOPMENT GOALS

6 CLEAN WATER AND SANITATION

11 SUSTAINABLE CITIES AND COMMUNITIES



THE **STUDY**

Godawari is a young municipality experiencing water-infrastructure challenges, changing climate, and, due to its close proximity to Kathmandu, rapidly increasing urbanization. This combination of pressures, and the importance of traditionally water intensive industries in Godawari, has caused the municipal region to become more conscious of sustainable integrated water and sanitation development strategies.

As a result, Godawari Municipality actively welcomed a rapid assessment of Integrated Urban Water Management (IUWM) and supported a stakeholder workshop in February 2020. This workshop provided an opportunity for Godawari water sector stakeholders to share information on the current state of Godawari's water and sanitation situation, and to review and confirm specific IUWM assessment data.

The purpose of this publication is to:

- Inform stakeholders so that they start thinking about IUWM issues and possible solutions in a wider and more informed context
- Provide practical guidance on how Godawari Municipality can actively move forward in developing a productive and sustainable city-wide IUWM approach

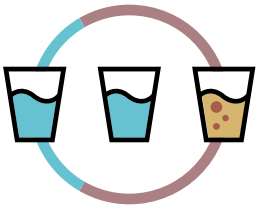
This publication provides the results of the City Blueprint Approach, which consists of a 'Trends and Pressure Framework' (TPF) assessment and a 'City Blueprint Framework' (CBF) assessment. The results of these assessments are discussed and provide insight into the current IUWM situation in Godawari. Key highlights include :

- Godawari's water-related strengths and weaknesses are identified
- TPF: The trends and pressures Godawari faces are of 'medium concern'
- CBF: Godawari is classified as a 'wasteful city'
- Recommendations are provided for key management steps and technical focus areas within an IUWM framework

It is hoped that Godawari Municipality will consider employing an IUWM approach, to help build a more sustainable climate resilient future, with the ultimate goal being to conserve the environment and improve liveability for all citizens in Godawari.

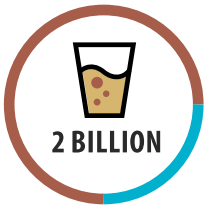
Background: **Global Context**

GLOBAL **WATER ISSUES**

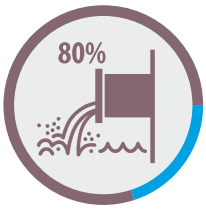


1 in 3 people worldwide, or **2.2 billion** people, currently lack access to **safe drinking water**.[1]

Over half of the global population, **4.2 billion** people, lack access to **safe sanitation**.[1]



Globally, at least **2 billion** people use a drinking **water source contaminated** with faeces.[2]

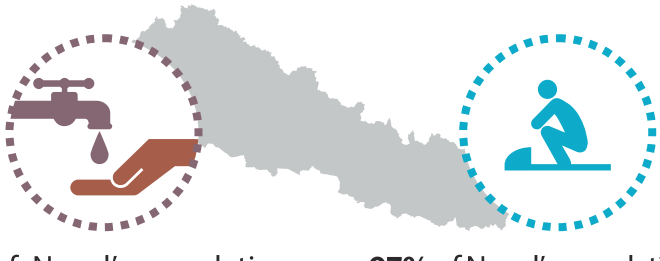


Over **80%** of global wastewater is released to the environment **without adequate treatment.**[3]

1 million people die each year from **water, sanitation and hygiene-related diseases**.[4]

By **2025**, half of the world's population will be **living in water-stressed areas**.[2]

Floods and other **water-related disasters** account for **70% of all deaths** related to natural disasters.[4]



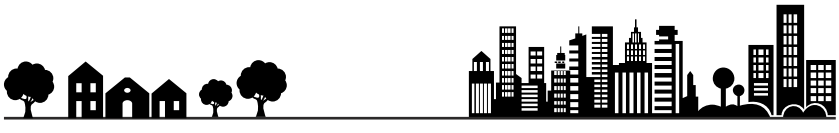
87% of Nepal's population has access to **basic water supply** facilities, with **91%** access in Bagmati Pradesh.[5]

97% of Nepal's population has access to **basic sanitation** facilities, with **98.8%** access in Bagmati Pradesh.[5]

[1] United Nations Children's Fund (UNICEF) &World Health Organization 2019,'Progress on household drinking water, sanitation and hygiene I 2000-2017 Special focus on inequalities', New York
[2] World Health Organization 2019,'Drinking Water', Online
[3] WWAP (United Nations World Water Assessment Programme) 2017,'The United Nations World Water Development Report 2017. Wastewater: The Untapped Resource', Paris, UNESCO
[4] United Nations Children's Fund (UNICEF) and World Health Organization 2017,'Progress on household drinking water, sanitation and hygiene: 2017 Update and SDG Baselines', Geneva
[5] Budhathoki, CB 2019,'Water Supply, Sanitation and Hygiene Situation in Nepal: A Review', Health Promotion, 7, 65-76

GLOBAL **URBANIZATION**

The current world population is 7.8 billion and it is expected to increase to 9.7 billion by 2050.[6]



55% of the world's population currently lives in urban areas, but this is expected to increase to 70% by 2050. This means an additional 2.5 billion people are expected to migrate to urban areas around the world, an amount which is equivalent to doubling the populations of both India and China.

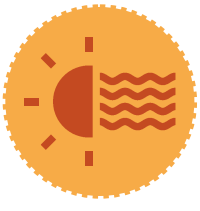
Almost all current population growth is taking place, and will take place, on 2% to 4% of Earth's land area – in Cities.

84% (2.1 billion) of the increases in urban population is expected to be in Asia and Africa, and concentrated in small and medium sized cities in low- and middle-income countries.[7]

For the period 2014-2050, Nepal will remain amongst the top ten fastest urbanising countries in the world. Urbanisation in Nepal is dominated by a few large and medium cities with an excessive population concentration in the Kathmandu Valley.[8]

[6] United Nations, Department of Economic and Social Affairs, Population Division 2014, 'World Urbanization Prospects: The 2014 Revision', New York
[7] United Nations, Department of Economic and Social Affairs, Population Division 2019, 'World Urbanization Prospects: The 2018 Revision', New York
[8] Bakrania, S 2015, 'Urbanisation and urban growth in Nepal (GSDRC Helpdesk Research Report 1294)', Birmingham, UK

CLIMATE CHANGE & CITIES



HEAT WAVES

DROUGHT

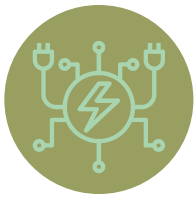
EXTREME PRECIPITATION

FLOODING

The Earth is warming; Climate change is here. The scientific evidence for the warming of the climate system is clear, and human activity, primarily from greenhouse gas emissions, is responsible.[9] However, those emissions continue to rise, and mean temperatures continue to rise. 17 of the 18 hottest years globally on record have occurred since the year 2000.[10] [11]

In all or most regions of the world, climate change means higher risks of heat waves, higher risks of drought, and higher risks of extreme precipitation events and associated flooding events. The impact will be felt through increases in the frequency, magnitude or both, of these climate related events, with many events already starting to take place with increasing frequency.[12]

How will this impact cities and towns? Climate change is expected to have significant impacts on four key sectors in most cities and towns: local energy systems, transportation, public health, and water supply, water demand, and wastewater treatment.[13]



ENERGY SYSTEMS

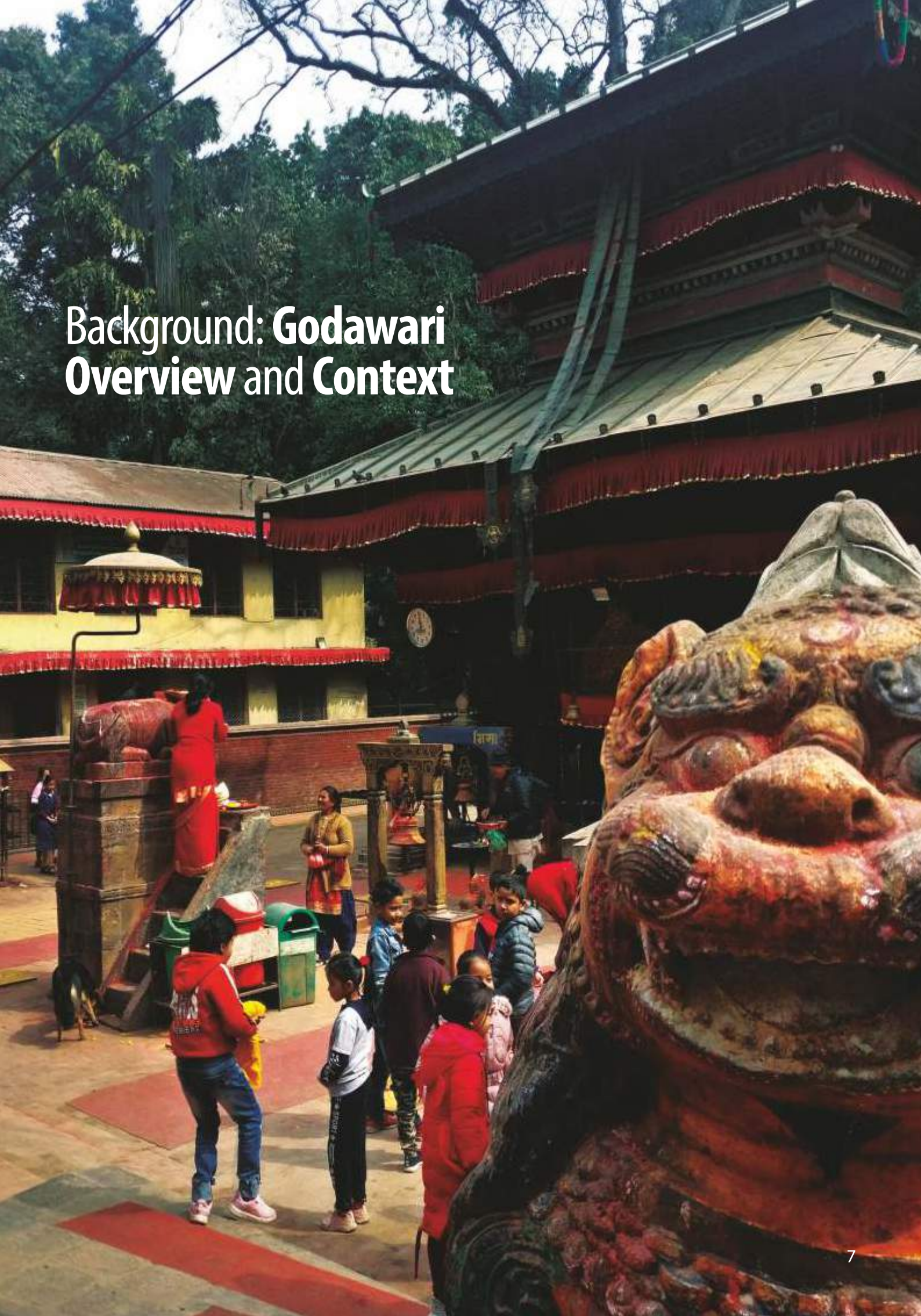
PUBLIC HEALTH

TRANSPORTATION

WATER

KEY **URBAN SECTORS** IMPACTED BY **CLIMATE CHANGE**

[9] Intergovernmental Panel Climate Change 2013, 'Summary for Policymakers', Cambridge
[10] NOAA National Centers for Environmental Information 2014, 'State of the Climate: Global Climate Report for Annual 2013,
[11] World Meteorological Organisation 2018, 'WMO Statement on the State of the Global Climate in 2019', Geneva
[12] Intergovernmental Panel Climate Change 2013, 'Climate Change 2013: The Physical Science Basis', Cambridge
[13] Urban Climate Change Research Network 2010, 'Cities lead the way in climate-change action', Nature, 467, 909



Background: **Godawari Overview** and **Context**

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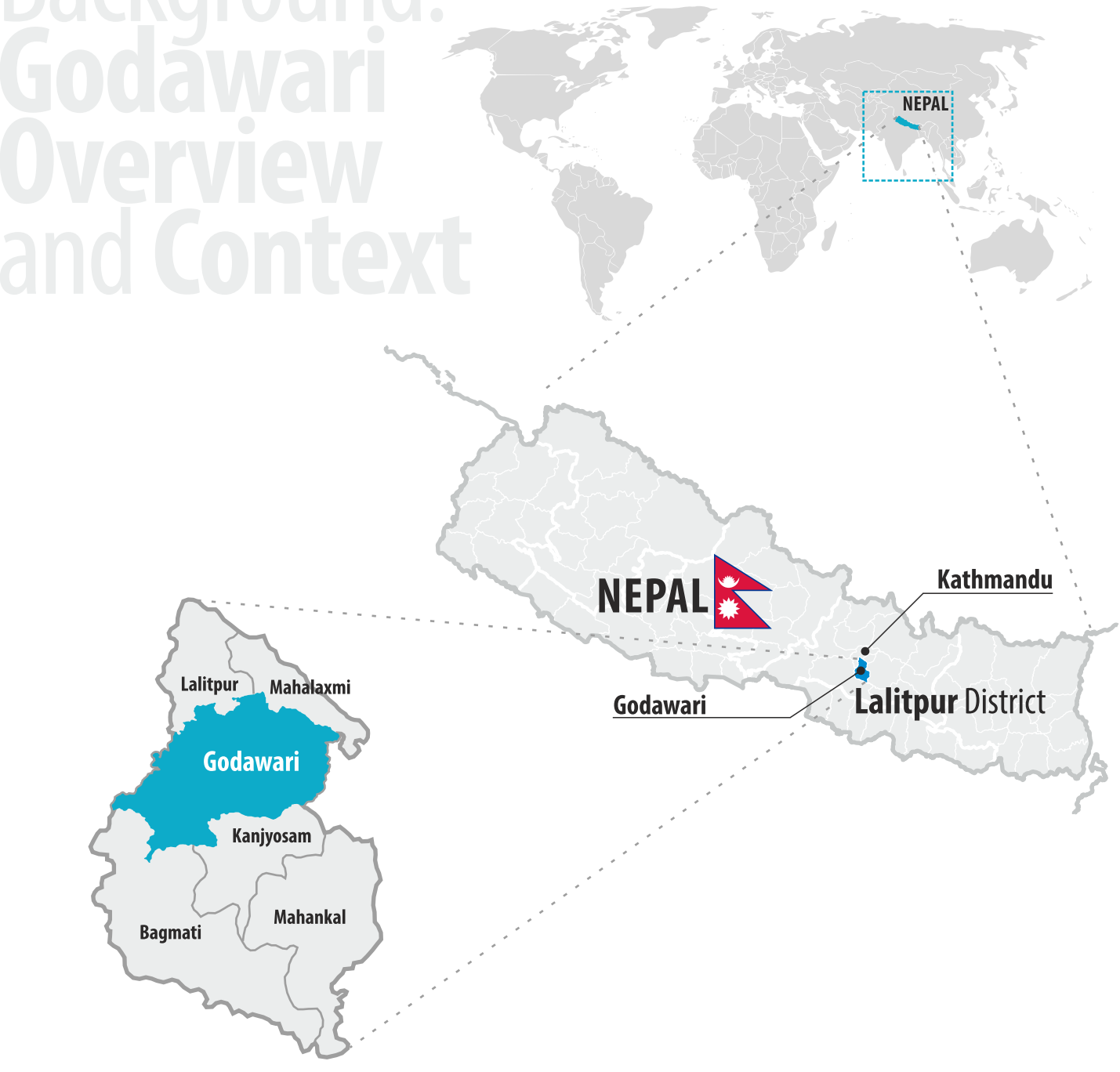
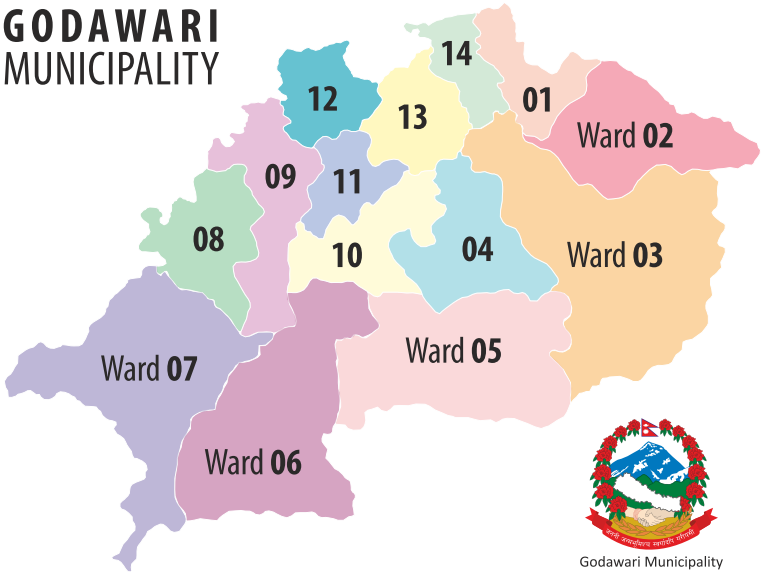


Godawari Municipality



Godawari Municipality, established in 2014, is located in Lalitpur District in Bagmati Pradesh province, Nepal. Sub-divided into 14 administrative wards, this municipality is home to approximately 116,000 residents.[14]

Approximately half of Godawari's 91 km^2 land area is occupied by agricultural land and forest, with the remaining areas seeing a mixture of grassland, bushland, and urban areas. It has a truly diverse mountainous topography with elevation ranging between 1300m to 3000m.

Godawari is famous for its botanical garden and close proximity to "Phulchowki" which is the highest peak in Kathmandu valley. It is also rich in water resources and home to Godawari Khola, a tributary of the Bagmati river and the namesake of Godawari.

As a result, it is an important source for tanker water supply to Kathmandu and some downstream municipalities are dependent on the Godawari Khola.

Agribusiness, trade, mining and ecotourism are the largest contributors to the local economy. Godawari's abundance of natural resources, local economy, and close geographical proximity to Nepal's capital, Kathmandu, are some of the factors driving population growth and putting pressure on the water resources in the municipal region.

Learn More:
http://godawarimun.gov.np/

[14] Ministry of Population and Environment Nepal 2017, 'National Population Report 2017', Kathmandu

Introduction to **IUWM: What & Why?**

"IUWM is a comprehensive approach to urban water services, viewing water supply, drainage, and sanitation as components of an integrated physical system, and recognizes that the physical system sits within an organizational framework and a broader natural landscape." [15]

- Mitchell, 2006

IUWM varies in definitions and interpretations, but essentially encompasses planning and management strategies that recognize the relationships between water supply, stormwater and wastewater management within urban systems. Sanitation and solid waste management are often also considered within this definition due to their strong links to urban water cycles.

When first attempting to understand what IUWM is, it is useful to consider the scope and limitations of existing conventional urban water systems.

Inefficiencies in conventional **Urban Water Systems**

Conventional urban water systems are characterised by a multitude of inefficiencies which promotes wastefulness and inflexibility. This leads to poor sustainability and low resilience in the face of social or environmental changes.[16] The three primary inefficiencies relate to infrastructure design, system planning and system management:

INFRASTRUCTURE DESIGN INEFFICIENCIES

- Large, rigid centralized infrastructure for urban water management that is not optimized for local conditions and is difficult to expand gradually over time.
- Extended water collection and distribution networks and treatment components are designed to perform limited and specialized functions.
- Systems are expensive to build and maintain.
- Systems are wasteful in terms of energy, water and nutrients.
- Waste leads to environmental consequences, such as water source depletion and biological pollution. [17]

SYSTEM PLANNING INEFFICIENCIES

- Disconnect between wider urban planning processes, master plans and consideration of the overall catchment area.
- Top-down planning approach neglects consultation with important stakeholder groups, such as end-users particularly those living in informal settlements.[17]
- Investment planning, setting tariffs and financial sustainability are generally not planned with a long-term view.

SYSTEM MANAGEMENT INEFFICIENCIES

- Services such as solid waste management, water supply, faecal sludge management, sewerage and storm water are planned and delivered in silos/isolation, so synergies that can save costs and promote the circular economy are not exploited.
- Institutional fragmentation across different authorities.[18]

An IUWM approach to urban water management and planning aims to reduce the above-mentioned inefficiencies, while increasing sustainability and resilience against social and environmental changes.

[15] Mitchell, VG 2006, 'Applying Integrated Urban Water Management Concepts: A Review of Australian Experience', Environ Manage., 37(5), 589-605
[16] Leigh, N, Lee, H, 2019, 'Sustainable and Resilient Urban Water Systems: The Role of Decentralization and Planning', Sustainability, 11(3), 918
[17] Wong, THF, Brown, RR 2009, 'The water sensitive city: principles for practice', WST, 60(3), 673-682
[18] Adopt IUWM 2016, 'AdoptIUWM: Adopting Integrated Urban Water Management in Indian Cities', ICLEI South Asia

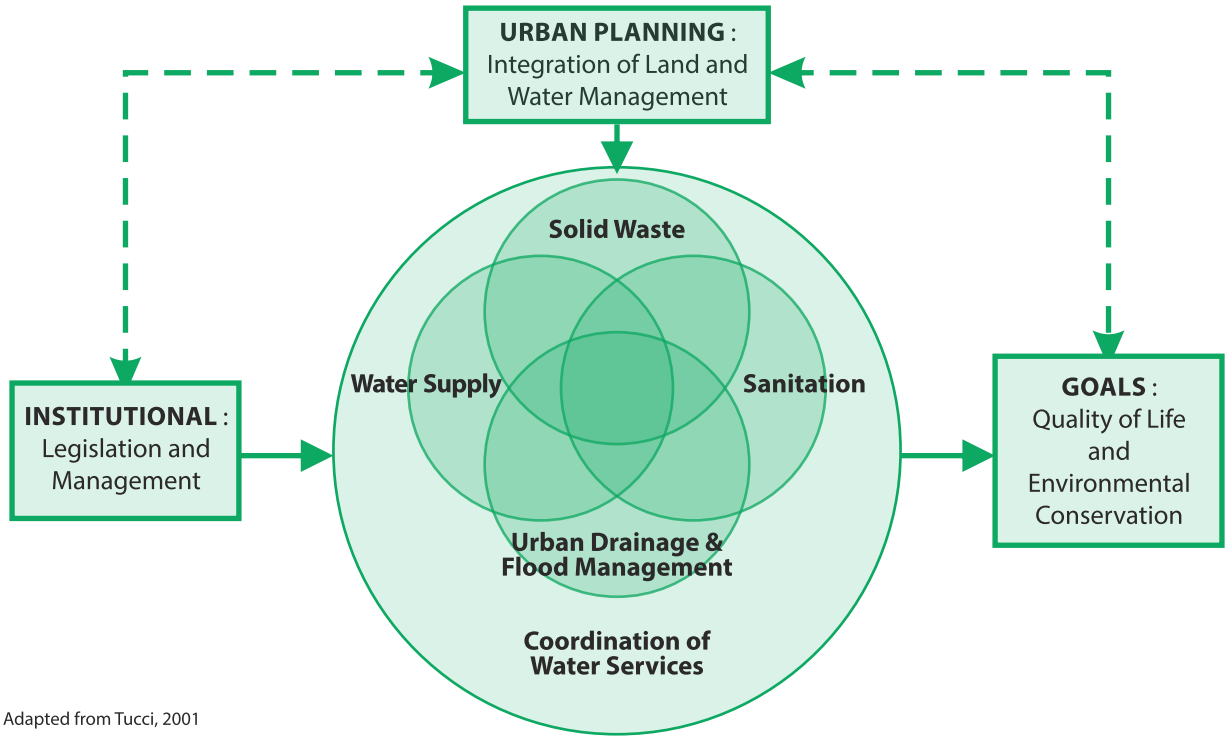
IUWM **Principles**

In order to describe the broad IUWM philosophy in a more defined and approachable manner, it is useful to consider IUWM in terms of key principles. These principles help with integrating the local context and defining IUWM from the local level.

KEY IUWM **PRINCIPLES**[15]	**EXPLANATION**[18]
All parts of the water cycle to be considered as an integrated system	All elements of water supply, sanitation and stormwater management are interlinked and should be planned and managed together
All dimensions of sustainability to be balanced	Balance supply and demand with environmental, social and economic needs in the short, medium and long term; • Conserve water sources; • Cultivate multiple water sources; • Prioritize efficiency (energy, water) and equity of access; • Recycle, reuse & recharge; • Address impacts of climate change in planning
All stakeholders including all water users to be involved	All related organisations and stakeholders should be involved in planning and decision-making processes, link to broader urban planning processes and services.
All water uses to be taken into account	Understand all users and use cases, human and ecological, urban and rural, including domestic use, recreation, commerce, tourism, industry, agriculture etc; Water use is matched with water quality.
All specifics of the local context to be addressed	Recognise the importance of local environmental, social and cultural perspectives; Local stakeholders to decide what works best in the local context; Priority to strengthening existing systems.

[15] Mitchell, VG 2006, 'Applying Integrated Urban Water Management Concepts: A Review of Australian Experience', Environ Manage., 37(5), 589-605
[18] Adopt IUWM 2016, 'AdoptIUWM: Adopting Integrated Urban Water Management in Indian Cities', ICLEI South Asia

Example **Coordinating Structure** for IUWM

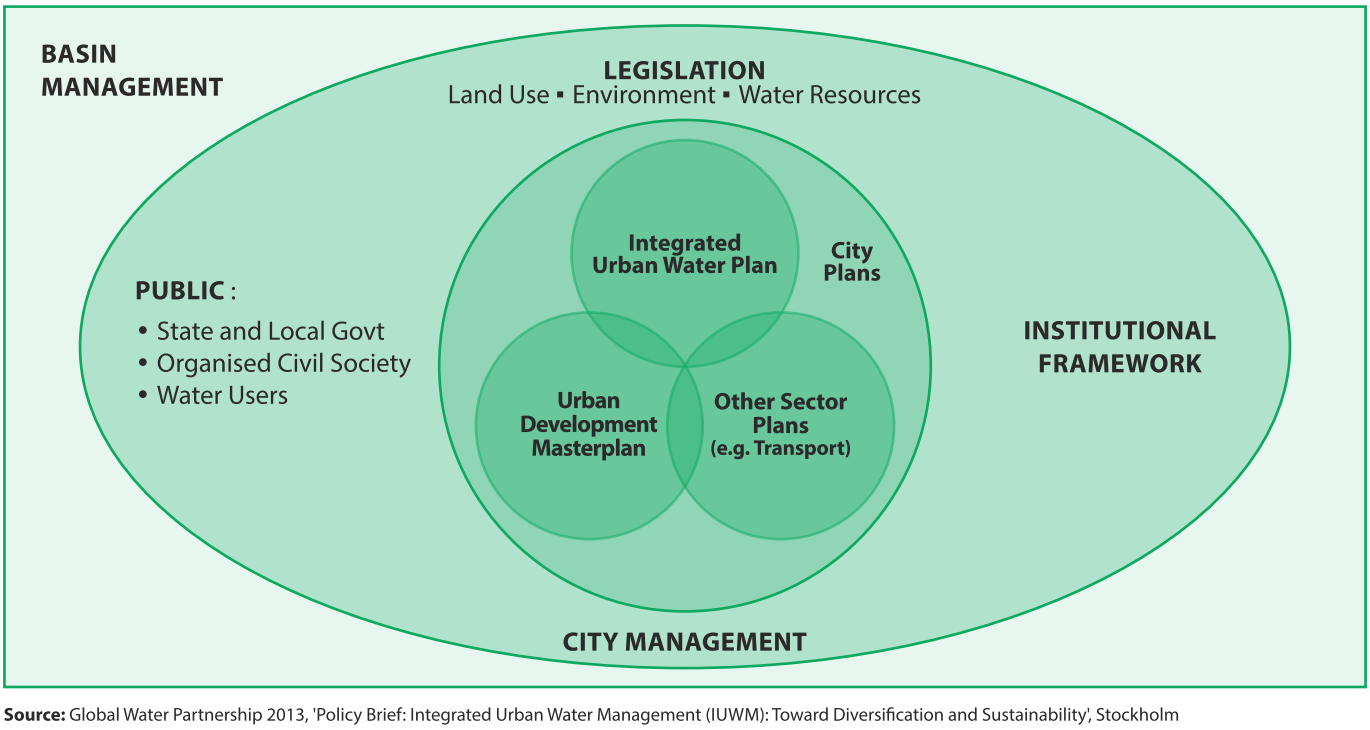


Source : Adapted from Tucci, 2001

Water supply, wastewater, stormwater and solid waste management should be considered from the perspective of being an integrated cycle. Neglecting one element of the cycle means that other elements will never perform optimally. Therefore, linking IUWM to urban planning processes and master planning is essential to improving sustainability and resilience of the wider urban water system.

Additionally, the local context is significant for defining an appropriate IUWM strategy on the local level, as different contexts can mean a different IUWM interpretation or focus areas. Truly understanding the local context is only possible with a genuine multi-stakeholder approach. All stakeholders need to be involved in IUWM planning & implementation, if the urban water management strategy of a city or municipality is to be successful.

Example **Integrated Planning Framework** for IUWM **(land and water management)**



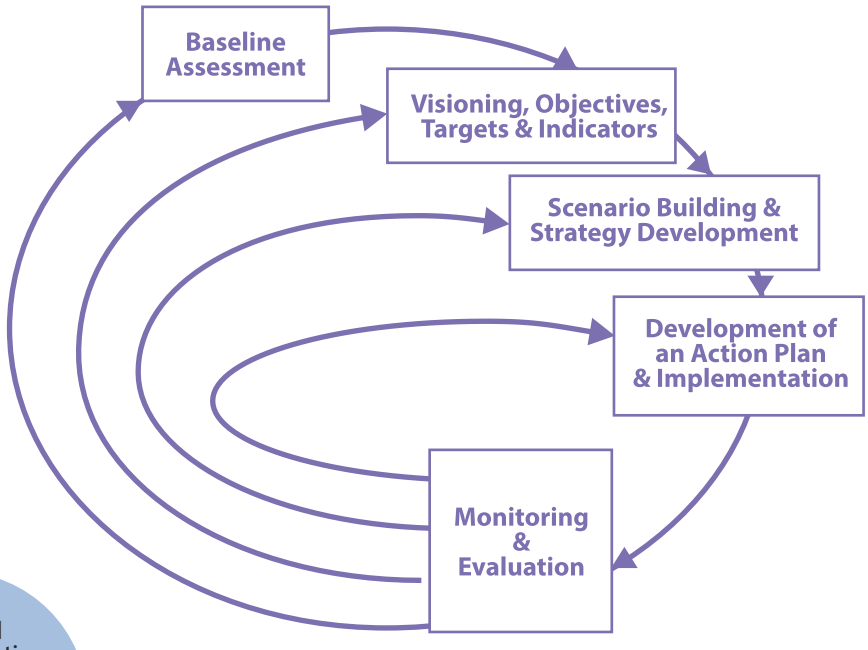
Source: Global Water Partnership 2013, 'Policy Brief: Integrated Urban Water Management (IUWM): Toward Diversification and Sustainability', Stockholm

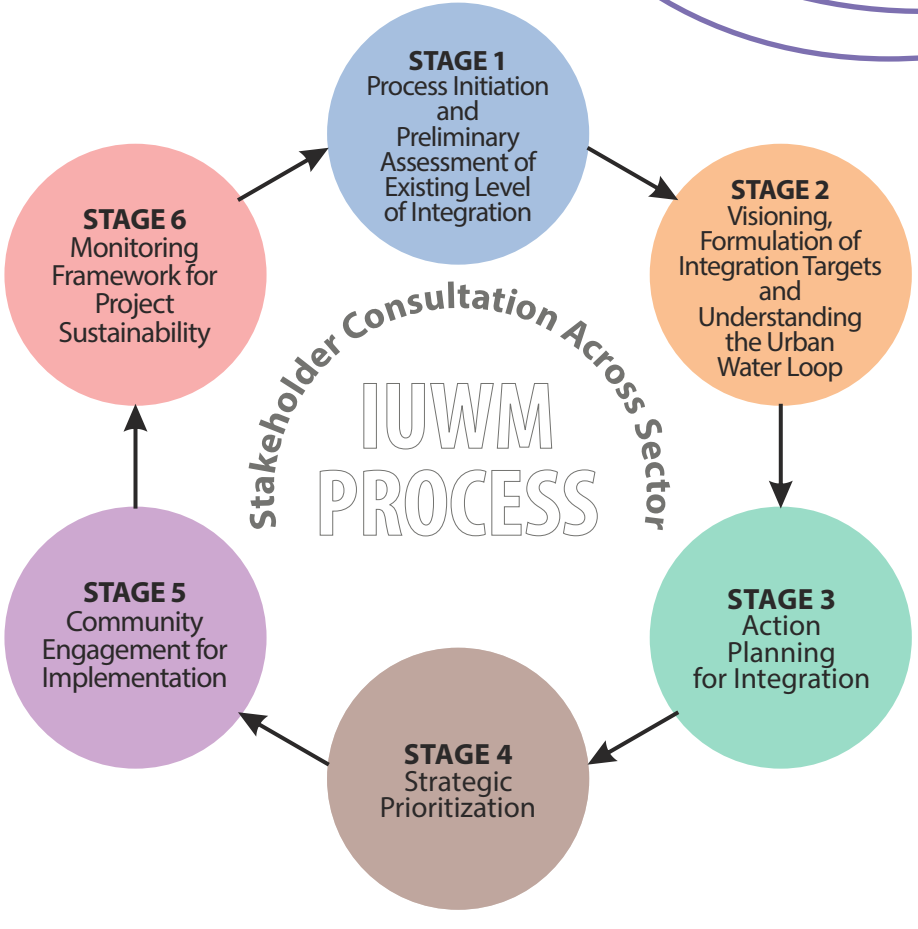
IUWM: **IMPLEMENTATION TOOLS**

There are many different tools, toolkits and manuals available to help guide cities and towns on the IUWM pathway.

Most of them follow a similar project cycle structure, especially providing guidance to **Understand, Plan, Implement** and **Evaluate.**

IUWM Project Cycle (source SWITCH)





For example, the AdoptIUWM (ICLEI South Asia) process includes six stages and is designed as a cyclical process.

Remember, IUWM is a journey not a destination. The evolution and development of any urban water system is always going to be gradual and challenging, but this should not deter cities and towns from making a start with small and incremental investments in building knowledge, relationships and capacity related to IUWM.

Learn More:
https://www.gwp.org/globalassets/global/toolbox/publications/policy-briefs/13-integrated-urban-water-management-iuwm.-toward-diversification-and-sustainability.pdf
https://iuwm.urbanwatermanagementindia.org/home/
https://www.siwi.org/what-we-do/city-water-resilience-approach/
https://www.gwp.org/en/learn/iwrm-toolbox/About_IWRM_ToolBox/

Methodology: The **City Blueprint** Approach

Methodology: The **City Blueprint** Approach

Introduction

But how to get started on the IUWM journey? With limited time and resources any city or town can implement the City Blueprint Approach (CBA). The CBA serves as a method for a baseline assessment of the sustainability of IUWM in cities and towns, and it can act as a first step in a strategic planning process.

It should also be noted that the CBA offers an overview 'snapshot' of the current local situation, and is therefore limited to the information available when the study is conducted. Planned developments in infrastructure, institutional capacity, and policy that would positively impact a CBA score are not considered during the assessment, as they are not yet implemented.

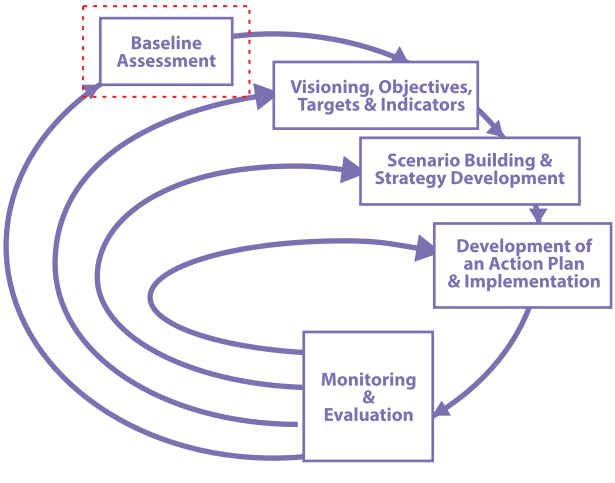
Since 2012, the CBA has been developed by KWR Water Research Institute in the Netherlands, as part of the European Innovation Partnership on Water and Watershare. The approach has been regularly reviewed and updated based on implementation experiences in 75 municipalities across 40 countries on every continent.

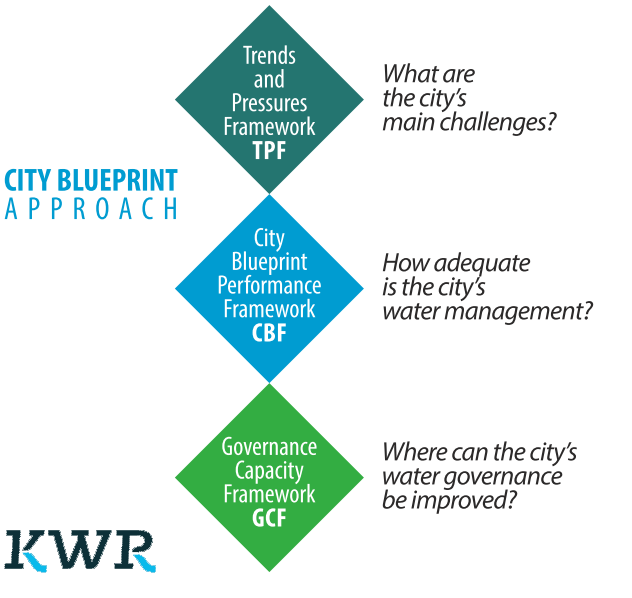
The CBA is a baseline assessment and a first step in the strategic planning process in cities, depicted in the red box below.

The CBA consists of three complementary frameworks:

- The **Trends and Pressures Framework (TPF)** to assess the main challenges of cities,
- The **City Blueprint Framework (CBF)** to provide an overview of IUWM, and
- The **Governance Capacity Framework (GCF)** to assess water governance capacity.

IUWM Project Cycle (source SWITCH)





The GCF was outside of the scope of the study in Godawari, and thus the Godawari assessment is limited to the TPF and CBF frameworks.

The data required to calculate the TPF and CBF indicators are collected from publicly available sources such as international databases, national and local reports, governmental websites and scientific articles. The data is co-collected together with local stakeholders (municipal leaders, department representatives, NGOs & water and sanitation user groups), who provide feedback and additional inputs regarding the preliminary results. KWR provides City Blueprint surveys and verifies data and scoring calculations within the CBA framework, before and after a stakeholder workshop.

Trends and Pressures Framework (TPF)

Each city has its own context-specific challenges, and the TPF has been developed to be sensitive towards local contexts. The TPF framework consists of 24 indicators divided into 4 broad categories. They are external social, environmental, financial and governance challenges and pressures that are unlikely to be able to be influenced by local authorities, but nevertheless drive a city's requirements for change and adaption.

Category	Indicators		Indicator Number
I **SOCIAL**	Urbanization Rate		1
	Burden of Disease		2
	Education Rate		3
II **ENVIRONMENTAL**	Flood risk	Urban drainage flood	4
		Sea level rise	5
		River peak discharges	6
		Land subsidence	7
	Water scarcity	Freshwater scarcity	8
		Groundwater scarcity	9
		Sea water intrusion	10
	Water quality	Surface water quality	11
		Biodiversity	12
	Heat risk	Heat island	13
	Air Quality		14
III **FINANCIAL**	Economic pressure		15
	Unemployment rate		16
	Poverty rate		17
	Inflation		18
IV **GOVERNANCE**	Voice and accountability		19
	Political Stability		20
	Government effectiveness		21
	Regulatory quality		22
	Rule of law		23
	Control of corruption		24

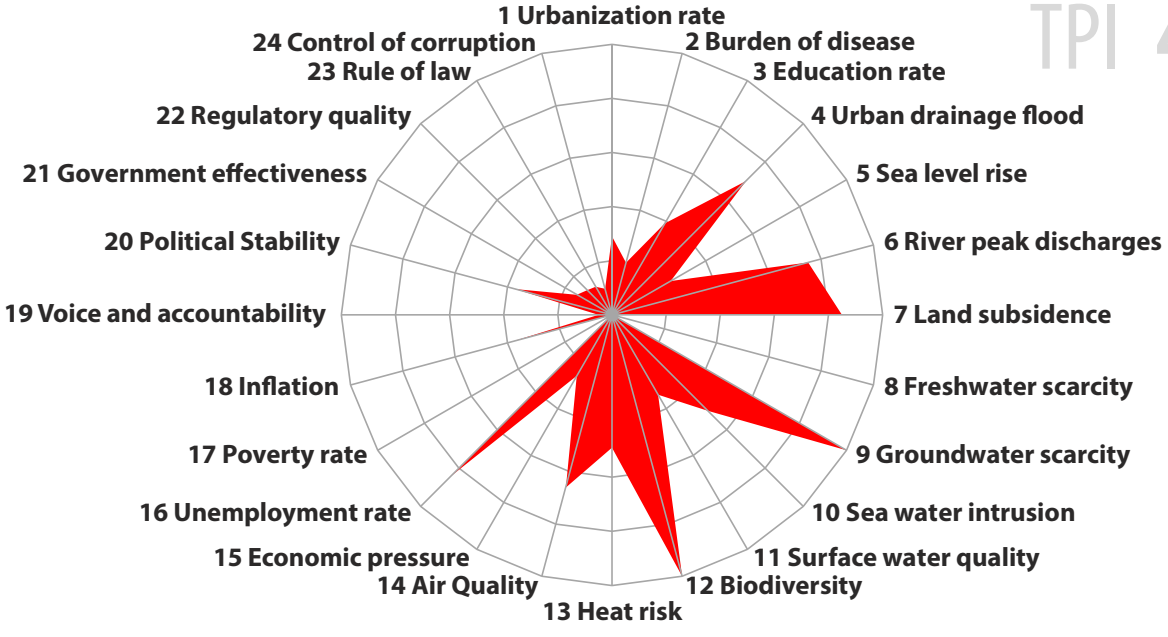
The 24 indicators are standardized to a scale of 0-10 and divided in ordinal classes expressed as a 'degree of concern' as shown below. A higher score means higher urban pressure or concern.

TPF indicator score	Degree of concern
0 – 2	no concern
2 – 4	little concern
4 – 6	medium concern
6 – 8	concern
8 – 10	great concern

There are two key outputs of the TPF, the Trends and Pressures Index (TPI), which is the geometric mean of the 24 indicators, and a radar chart to better present the indicator scores in a more accessible visual format.

Antwerp, Belgium **TPF**

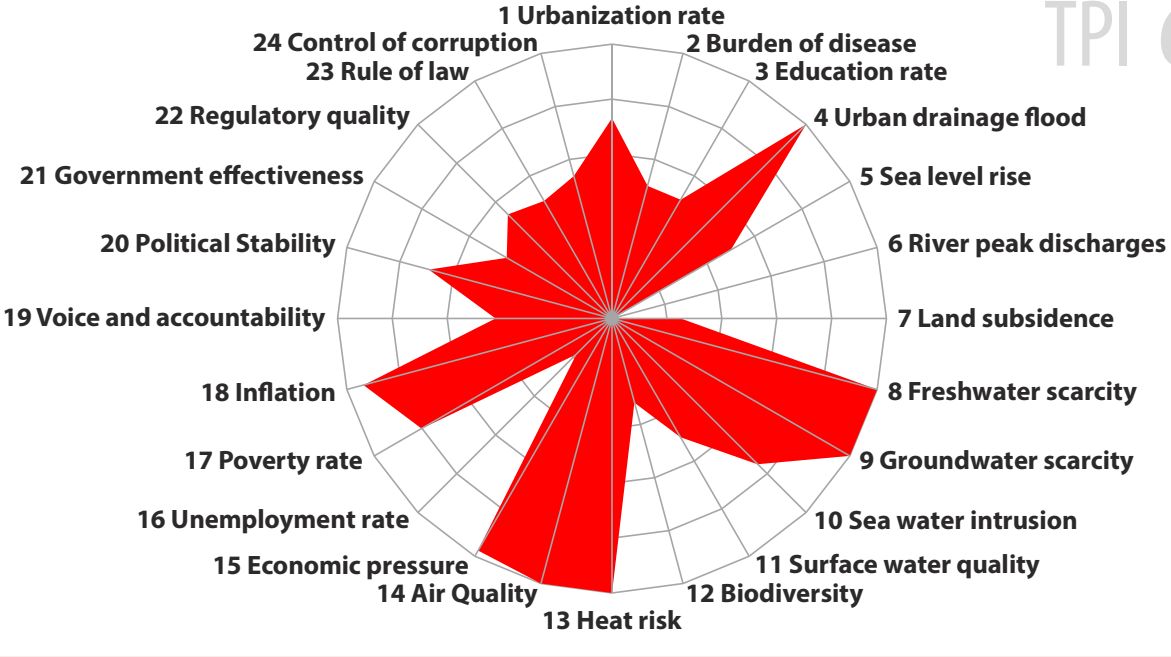
ANTWERP
TPI 4.09



Example : **Antwerp**, Belgium
TPI Score : **4.09**
This graph shows that Antwerp is a developed city with a stable political and environmental environment but is notably susceptible to the forecast impacts of climate change, and therefore requires increased climate resilience.

Ahmedabad, India **TPF**

AHMEDABAD
TPI 6.27



Example : **Ahmedabad**, India
TPI Score : **6.27**
This graph shows a comparatively higher level of pressures and challenges that Ahmedabad faces overall when compared to Antwerp. Ahmedabad is experiencing rapid urban expansion, with severe economic-related pressures, risks to water security, air quality and heat, as well as moderate governance challenges.

City Blueprint Framework (CBF)

The CBF consists of 24 performance-oriented indicators divided over seven broad categories that together strive to provide a comprehensive overview of a city's current state of IUWM competency.

Category	Indicators
I Basic Water Services	01 Access to drinking water
	02 Access to sanitation
	03 Drinking water quality
II Water Quality	04 Secondary WWT
	05 Tertiary WWT
	06 Groundwater Quality
III Wastewater Treatment	07 Nutrient Recovery
	08 Energy Recovery
	09 Sewage Sludge Recycling
	10 WWT Energy Efficiency
IV Water Infrastructure	11 Stormwater separation
	12 Average age sewer
	13 Water system leakages
	14 Operation cost recovery
V Solid Waste	15 Solid waste collected
	16 Solid waste recycled
	17 Solid waste energy recovered
VI Climate adaptation	18 Green space
	19 Climate adaptation
	20 Climate-robust buildings
VII Plans and actions	21 Management and action plans
	22 Water efficiency measures
	23 Drinking water consumption
	24 Attractiveness

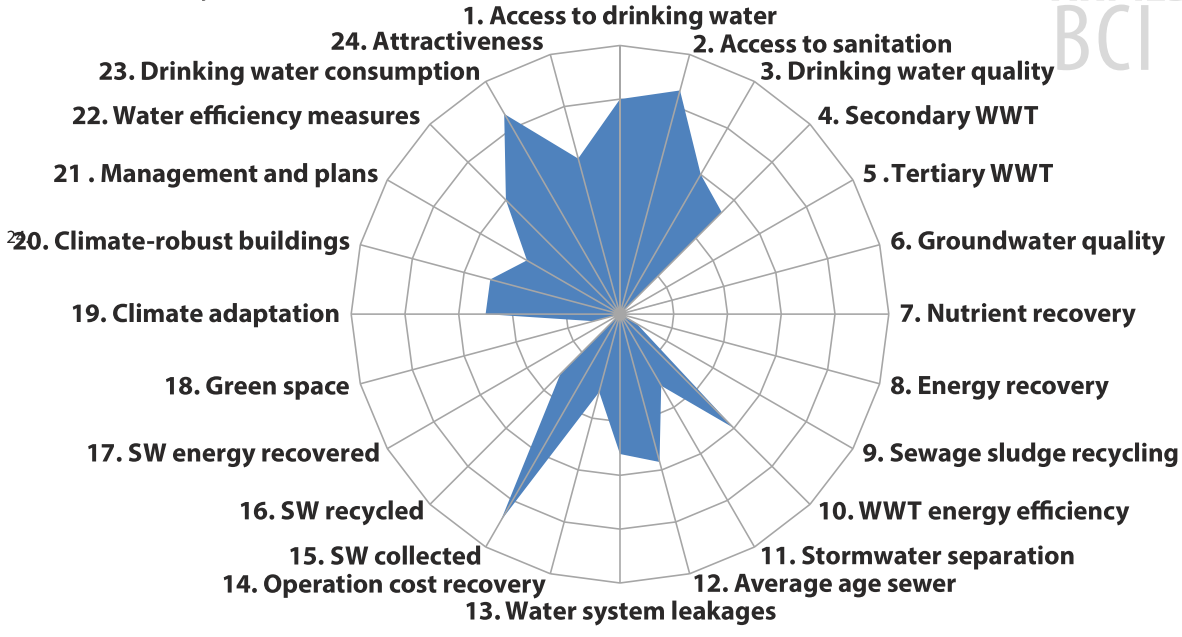
The CBF indicators are scored on a range of 0 to 10 points according to a standardised and reproducible method. A lower score indicates low performance, and a higher score indicates higher performance.

CBF indicator score	Meaning
0	Low Performance
10	High Performance

There are two key outputs of the CBF, the Blue City Index (BCI), which is the geometric mean of the 24 indicators, and a radar chart to better present the indicator scores in a more accessible visual format.

Ahmedabad, India **CBF**

AHMEDABAD
BCI 3.2

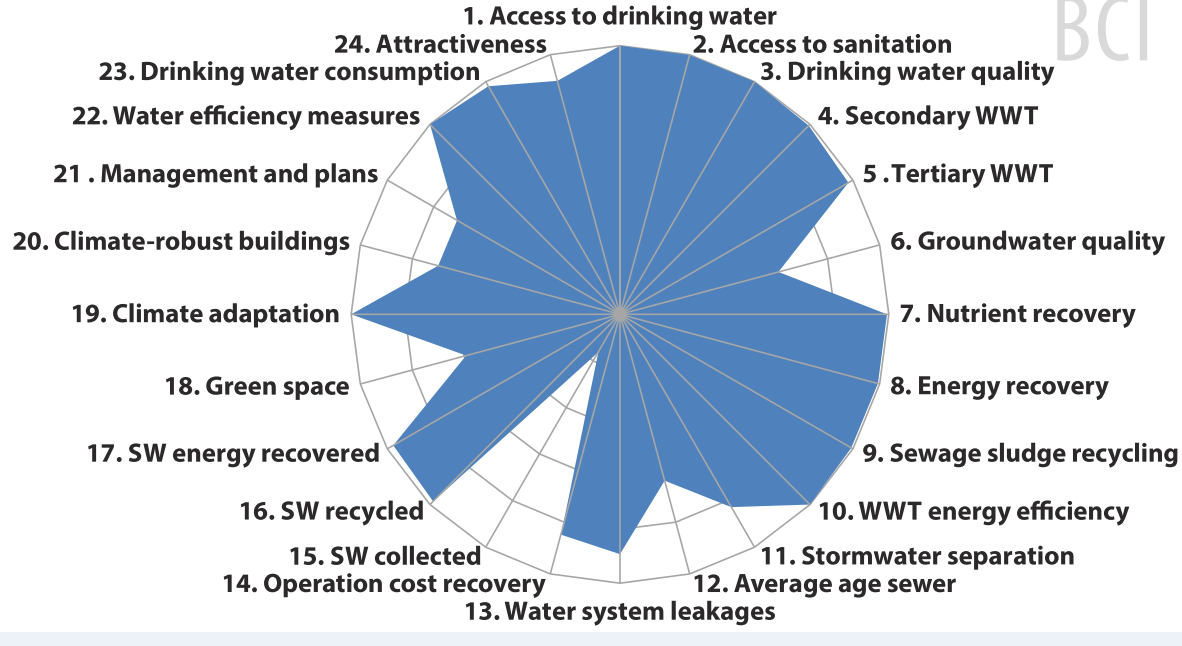


Ahmedabad, India:
BCI Score: **3.2**

Ahmedabad's low BCI score indicates that IUWM concepts are either not established within the city's operations, or limited resources are available for water-related initiatives. While the city scores highly for access to drinking water and sanitation, there are performance gaps in infrastructure and climate resilience categories.

Amsterdam, Netherlands **CBF**

AMSTERDAM
BCI 8.3



Amsterdam
BCI Score: **8.3**

Amsterdam's high BCI score indicates that IUWM concepts are well established, although there are still performance gaps in areas such as solid waste management, groundwater quality and aging infrastucture.

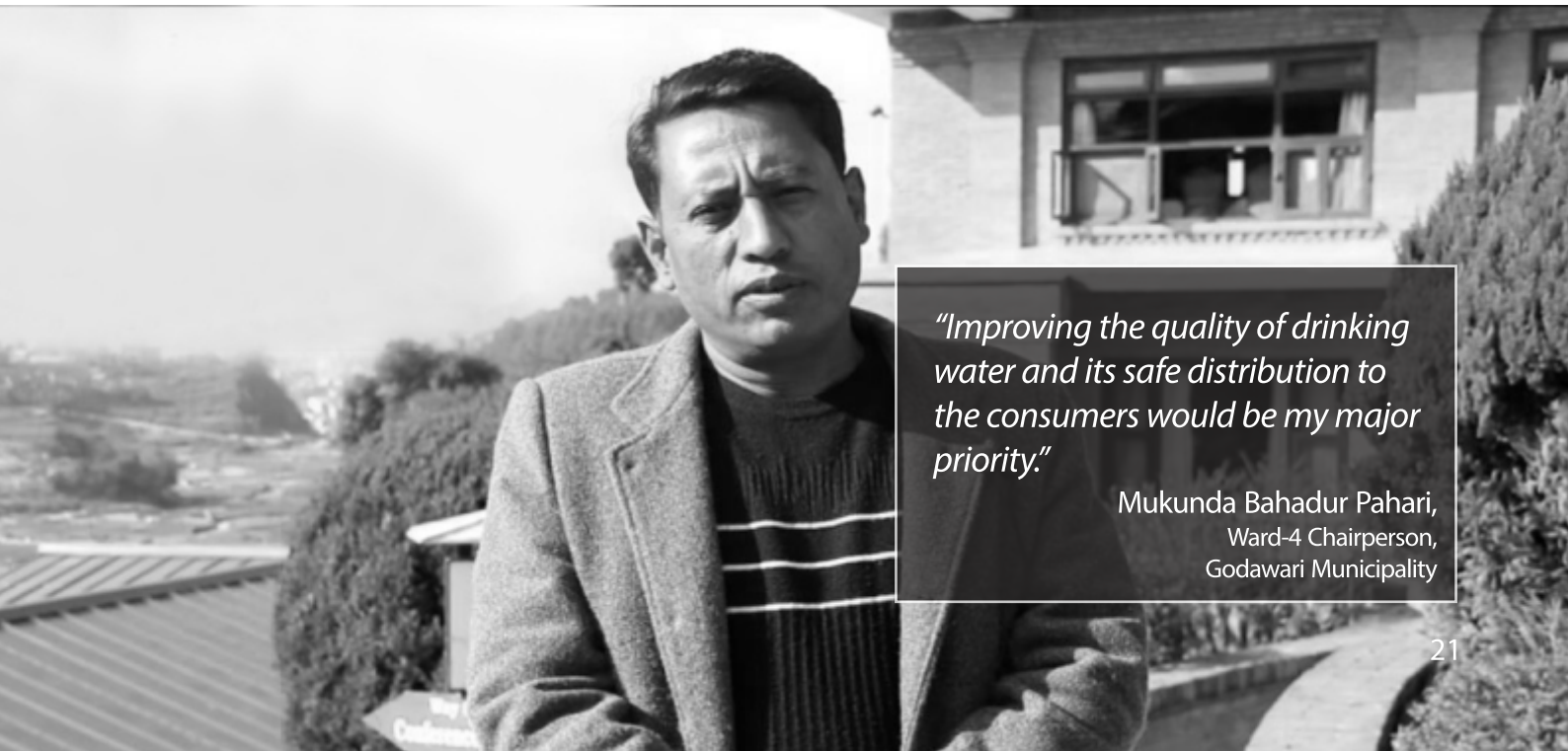
Learn More:
https://www.youtube.com/watch?v=AdQf6CT_w9U&t=332s
https://www.eip-water.eu/City_Blueprints

Results & Discussion:
IUWM Analysis

Results & Discussion: **IUWM Analysis**

The purpose of the TPF and CBF is to quickly highlight key areas of concern regarding the current challenges and issues in urban water and sanitation within the assessed area. The information generated by these frameworks allows local authorities and communities to better prioritize, plan, and manage their work in the sector in a more integrated, effective and efficient manner.

It should also be noted that the City Blueprint Approach offers an overview 'snapshot' of the current situation in Godawari, and does not account for improvements and plans that are under development or currently being implemented. Thus, although Godawari municipality has many plans in development and projects underway to improve water and sanitation, they are not yet reflected in the results of the CBA assessment. Plans which will likely impact a CBA assessment once they're implemented, include Integrated Urban Development Project (IUDP-ADB) works in wards 10,11,12, (specifically stormwater/sewer pipe system planning), three more deep tube wells for wards 1, 11 and 12 with storage and treatment plans, and dam construction with Chinese government support.



"Improving the quality of drinking water and its safe distribution to the consumers would be my major priority."

Mukunda Bahadur Pahari,
Ward-4 Chairperson,
Godawari Municipality

Trends and Pressures Framework (TPF)

Through the City Blueprint process an overall Trends and Pressures Index (TPI) score of 4.13 was calculated. On the TPI indicator scale, this score indicates that the external social, environmental and financial challenges and pressures Godawari faces should be considered a 'medium concern'.

The results below describe the detailed results of the City Blueprint process; the current categories of trends and pressures Godawari faces, and their extent.

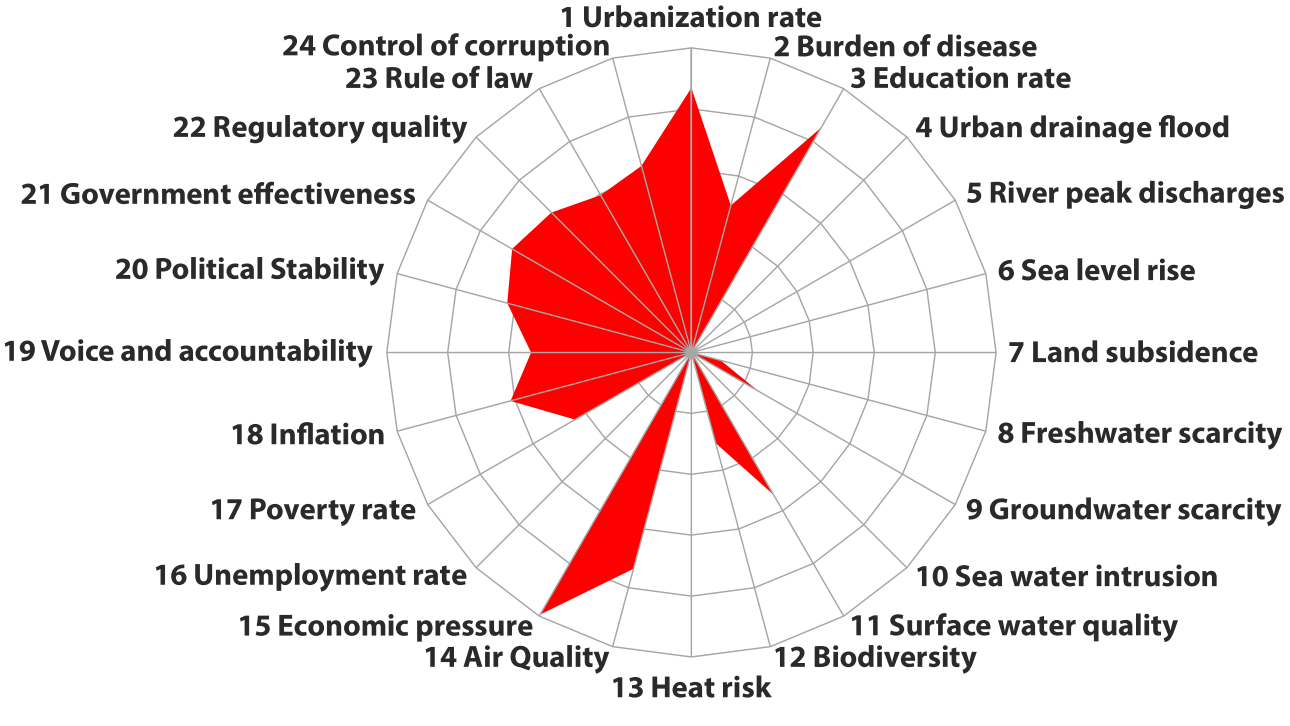
GODAWARI, NEPAL **TPF**

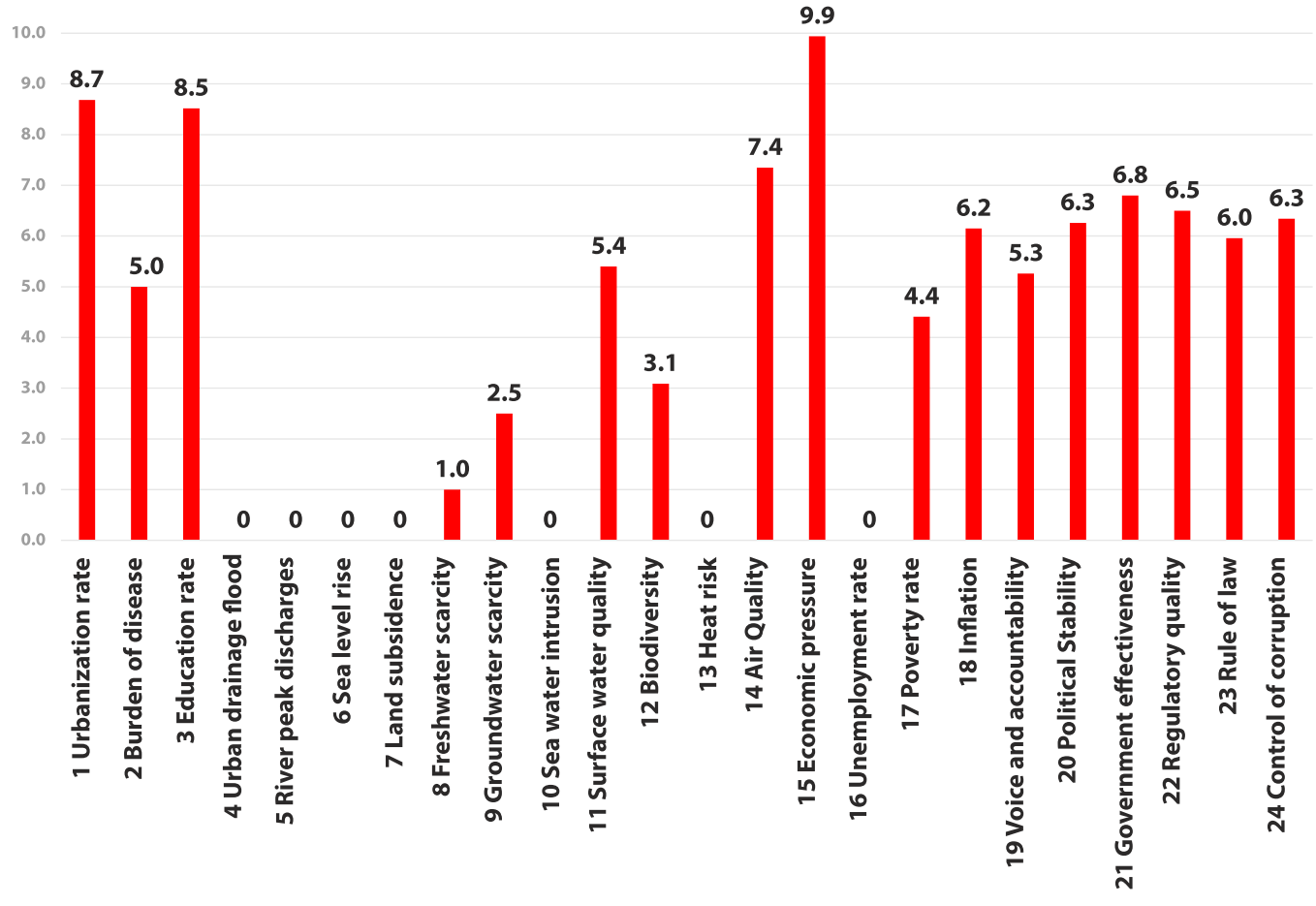
TPI: 4.13
Medium
Concern

TPF indicator score	Degree of concern
0 – 2	no concern
2 – 4	little concern
4 – 6	medium concern
6 – 8	concern
8 – 10	great concern

A higher score = higher urban pressure/concern

GODAWARI TPF





TPF **ANALYSIS**

The specific trends and pressures which are of the **highest concern** to Godawari's development along an IUWM path, are related to **urbanization, economic pressure and education rate**. With a high urbanization rate of 3.15%, and its close proximity to the capital Kathmandu, **the challenges Godawari faces regarding its water systems and resources will likely increase over time**. Nepal's overall low GDP per capita translates into high economic pressure, which limits investments that Godawari can make in all sectors, including urban water and sanitation. The education rate, expressed as a percentage of primary school completions, of 77.5%, affects all sectors of society, but can have an especially strong negative impact on health and hygiene issues.

No less important, but identified as medium concerns by the TPF, governance issues and surface water quality emerge as actionable priorities. Government effectiveness and regulatory quality are important elements of sustainable urban water systems that need to be cultivated over long time periods. Further, there is an understanding that while surface water quality issues may not seem to be an urgent problem now, **rapid urbanization, without effective integrated planning, can change the water quality situation very quickly**.

City Blueprint Framework (CBF)

Through the City Blueprint process an overall **Blue City Index (BCI) score of 2.6** was calculated. This indicates that Godawari's water management performance is somewhat low and it is classified as a 'wasteful city' on the BCI indicator scale.

While the label of wasteful may seem rather negative, it is an accurate description when considering the waste of water, nutrients and energy in relation to urban water and sanitation management.

The results below describe the current state of IUWM within Godawari, according to the CBF analysis.

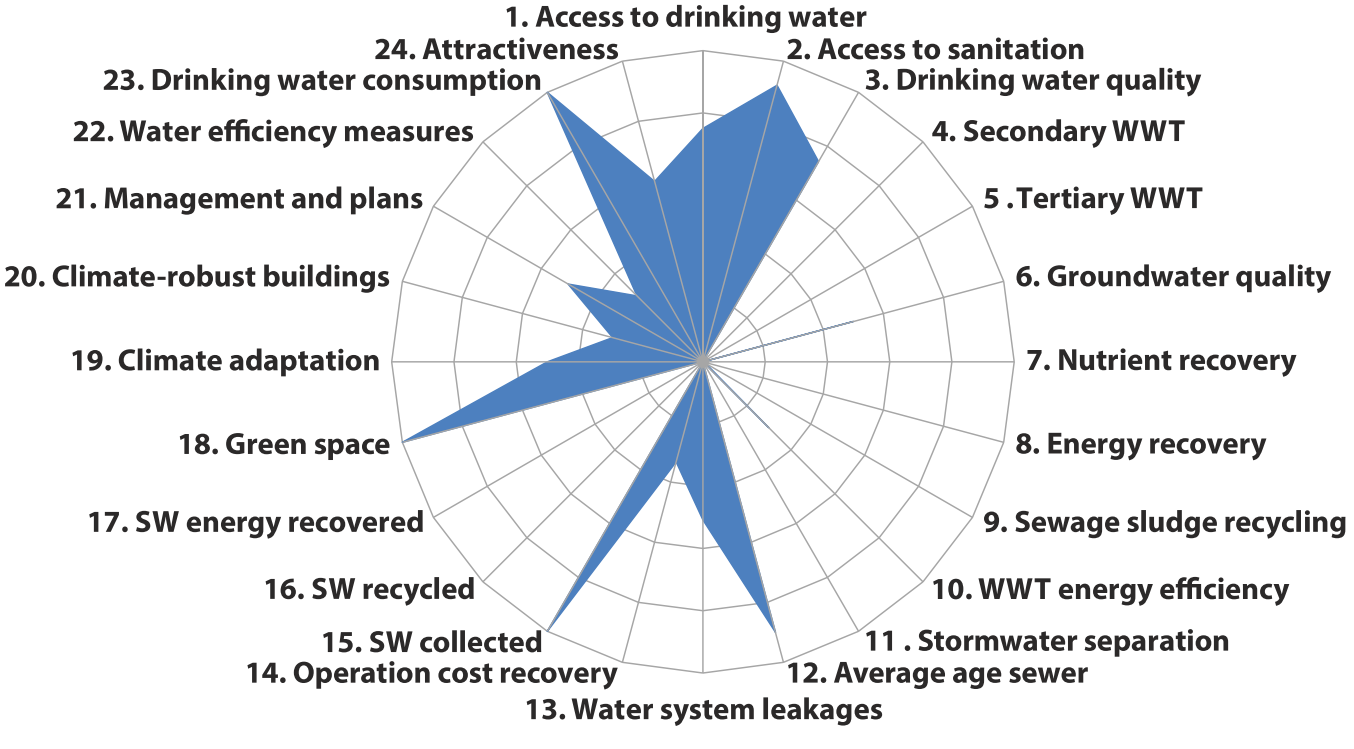
GODAWARI, NEPAL CBF

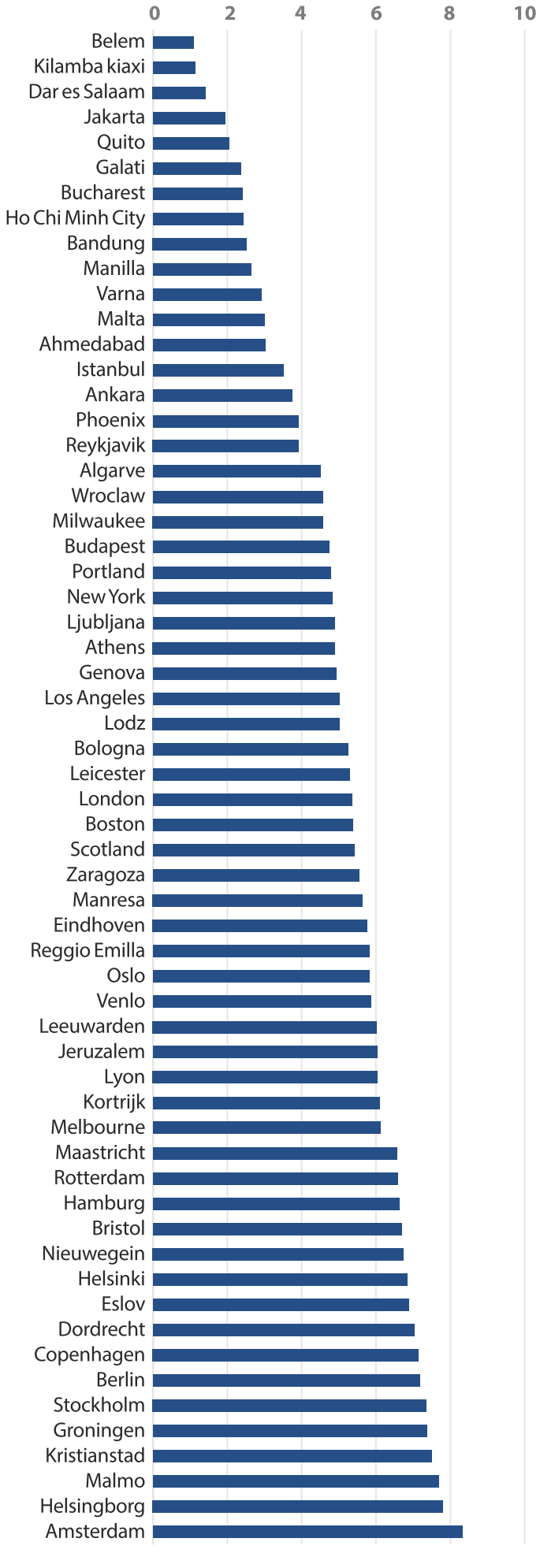
BCI: 2.6
Wasteful City

BCI	Categorization of Cities
0 – 2	Cities lacking basic water services
2 – 4	Wasteful cities
4 – 6	Water efficient cities
6 – 8	Resource efficient and adaptive cities
8 – 10	Water wise cities

0 = Low Performance (Concern)
10 = High Performance (No Concern)

GODAWARI CBF





BLUE CITY INDEX
BCI
60 Cities
compared

BCI scores for 60 cities and regions.

How does your city compare?

CBF **ANALYSIS**

The high scores for solid waste collected (score 10) and drinking water consumption (score 10) are a result of the relatively low per-capita water consumption and solid waste generation. In these cases, the high scores should not necessarily be interpreted as perfect-performance, but rather considered within the context of the overall low performance BCI score.

Indeed, the scores for solid waste recycling (score 0) and solid waste energy recovery (score 0) indicate there is a lot of potential to improve solid waste management in Godawari. **Revenue, compost and energy can all be generated from different solid waste recycling and management techniques**.

The low generation of solid waste is a result of the limited collection service area, currently focused in just 3 or 4 wards of a total of 14. The data from the local solid waste companies suggests that Godawari's residents generate approximately 52 kg of solid waste per person per year. However, according to an ADB study in 2013[19], the average per capita waste generation per year in Nepalese municipalities is 115 kg. **A more detailed study in Godawari is required to clarify the discrepancies in the figures on solid waste generation, collection and recycling**.

[19] Asian Development Bank 2013, 'Solid waste management in Nepal: Current status and policy recommendations', Mandaluyong City

Access to sanitation scored very high (score 9.2), which is an excellent result based on a detailed sanitation study by ENPHO in 2018[20]. However, it was also found that secondary and tertiary wastewater treatment (score 0) and associated nutrient recovery (score 0) is extremely limited in Godawari. There is one partially functioning DEWATS[21] which serves 200 households. Otherwise, soak pits and holding tanks, which discharge wastewater into the groundwater, are the most common form of primary wastewater management. According to the ENPHO study[20], these make up about 95% of local containment solutions, while proper sealed septic tanks are rare, representing just 2%. This is generally due to a lack of awareness of what proper sealed septic tanks are, what they do, and their relatively high cost when compared to more common containment solutions.

The lack of wastewater management has **significant implications for drinking water quality** (score 7.4) and groundwater quality (score 5) in Godawari. Indeed, one of the key findings of the City Blueprint process was that there was **very little reliable water quality data available** for Godawari. However, feedback from participants, including a number of ward level water and sanitation user committee leaders, confirmed that **water quality was a growing concern** for them.

There is no central water supply provider in Godawari. There are many water providers across the 14 wards. The main Kathmandu water utility (Kathmandu Upatyaka Khanepani Limited - KUKL) supplies three wards and several local water and sanitation user groups manage water supply in the other wards. **The level of access to drinking water (score 7.5) is generally good**, but access can still be improved, and the municipality is working on this. However, the good level of access does not indicate **how many hours of water supply households have each day or each week, nor consider the water quality**. Furthermore, if access to water supply is increased, it is not clear how the resulting increase in wastewater will be managed.

With regards to the water suppliers themselves the city blueprint indicates that **water system leakages (5.1) and operation cost recovery (3.3) are areas of concern**. However, getting clear data on these two topics is difficult. Available data on the municipal level from each ward, is fragmented and unclear. Data from KUKL, which was used in the city blueprint, shows that almost 25% of water is lost due to pipeline leaks and overflows, and that KUKL is not able to cover its operational costs from its annual income[22]. This indicates that KUKL is somewhat unsustainable in terms of its operations, but **more data is needed to confirm the situation** in the other wards of Godawari.

[20] Environment & Public Health Organization 2018, 'SFD Report Itahari Nepal', Kathmandu
[21] Decentralized Wastewater Treatment System
[22] Ministry of Water Supply and Sanitation 2016, 'Water Service Providers Capacity Assessment and Benchmarking', Kathmandu

Faecal sludge management, measured partially in the City Blueprint by looking at the proportion of sewage sludge recycled or re-used (**score 0.1**), is also an area of underperformance in Godawari. It was reported that about 1% of households have ecosan toilets and all the generated compost, approximately 1,026 kg/year, is used in local agriculture[22]. This potentially means that **almost 99% of Godawari's faecal sludge is released into the environment untreated**, unmanaged and with no nutrient recovery. This should be of a high concern as it is a further risk to water quality.

Stormwater separation (score 0) is a measure of the proportion of the wastewater system for which sanitary sewage and stormwater flows are separated and managed independently. Aside from a 3 km sewer pipeline serving the DEWATS plant, there are currently no other formal sewers, stormwater sewers or sanitary sewers in Godawari. What exists for the transportation of storm and wastewater (mostly greywater) is essentially the **traditional water management system** of mostly open canals and drains linked to old irrigation systems, which flow to ponds that are used to store water for agricultural or communal use. The traditional system is therefore acting as a combined sewer system without regular maintenance. **Stormwater and wastewater separation are important for reducing the risk of flooding events and associated pollution of the environment and water bodies**.

Climate adaptation (score 5) is a measure of the level of action taken to adapt to climate change threats. **Management and action plans (score 5)** are a measure of the application of the concept of integrated water management in the city and more broadly in the country. The municipal annual budget includes climate change related budget lines and the city has a 'Disaster and Climate Resilience Plan'. City Blueprint participants were aware that precipitation is increasing, and that it is irregular in its timing. Furthermore, gradual increases in temperature are being noticed too. Integrated water resource management projects, with basin approaches, have been ongoing for many years in Nepal, but more focused in rural areas. Godawari has been identified as a watershed area and the IUDP-ADB is a project that promotes an integrated approach to water management. These are all excellent initiatives, but increased efforts are required, such as the **direct linking of climate actions with urban water management**.

The Way Forward: Recommendations

Godawari Municipality

The City Blueprint process has highlighted high performance areas and low performance areas, identified gaps, raised many questions, and started conversations between key stakeholders on urban water and sanitation issues and climate change in Godawari.

The recommendations below provide practical actionable steps, ideas and guidance for Godawari municipality over the short to medium term.

It is highly recommended that a formal process be initiated by the municipality to develop a comprehensive city-wide integrated plan using an IUWM approach linked to climate change and SDG actions. Active political leadership to support the process, institutional changes and opportunities to mobilize funding sources will be essential for long term success.

The process of building and implementing an IUWM approach for Godawari, and establishing key partnerships along the way, should be viewed as a capacity building program for the municipality, one that will be unique in Nepal. This can help establish Godawari municipality as a leader in the integration of urban water and sanitation services and climate adaptation through water management.

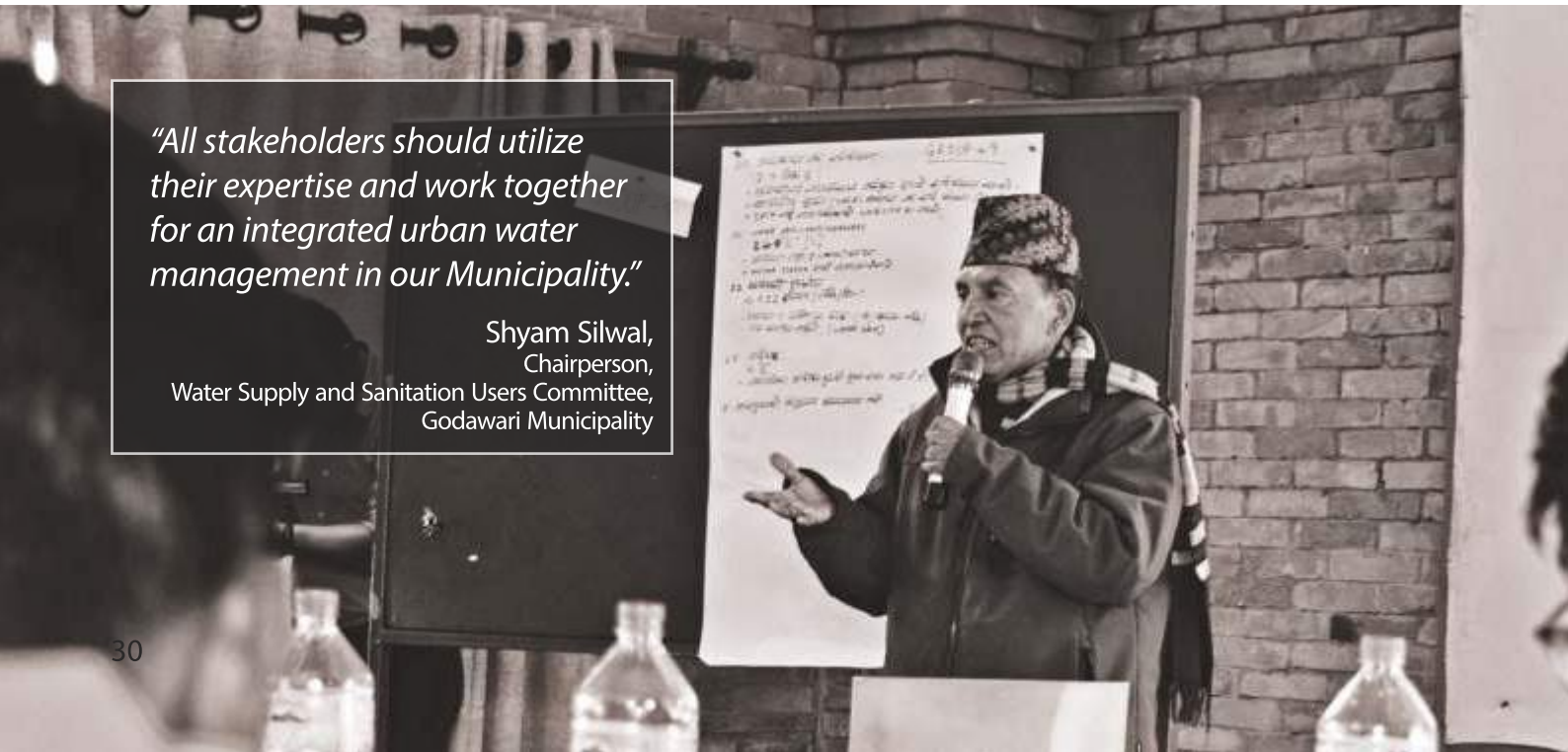
A sustainable and holistic approach to water management will have long term ecological, economic, social, and water security benefits. The process is slow by nature, and takes many small steps within a multi-stakeholder approach, to achieve the ultimate goal of conserving the environment and improving liveability for all citizens in Godawari.

The first small steps have been taken, but it is now up to the municipality to continue to show leadership and to move the process forward.

Recommendations	Rationale / Explanation	Key Targets
Management & Leadership		
Step 1 Actively seek out technical partners to assist in the development of integrated urban water management plans and services	No municipality can do everything alone. Partnering with other municipalities, government agencies, IO/NGO/INGOs, private companies and/or universities can bring in technical, financial and capacity building support.	• MoUs and cooperation agreements • Increased municipal technical capacity • Increased technical implementations
Step 2 Select an IUWM approach and commit to a formal IUWM process in partnership with ward-level stakeholders	Starting any formal or official integration process, even if it is small and has limited resources, is the key to longer term success and sustainability. Engagement with community-level stakeholders early in the process is also essential for sustainable outcomes. Select from existing approaches or toolkits. Do not try to develop a new framework, but rather build on what is already available. This approach will save time and resources.	• A clear, visible, senior level political commitment to IUWM • Focal point staff member & supporting budget allocated • IUWM approach/toolkit selected • Institutional arrangements related to IUWM reviewed • Key staff & stakeholders build IUWM knowledge and experience • Initiate IUWM policy development
Step 3 Prioritize allocation of municipal budget for IUWM related project implementations	Create specific budget lines for IUWM studies or assessments, and water and sanitation related infrastructure projects, or reallocate existing budget lines already earmarked for water and sanitation. Link to climate change related budget lines where possible. If full funding for assessments or infrastructure is not possible, allocate what is available, and use it as leverage with donors to secure more funding.	• Annual budgets include budget lines for IUWM activities
Step 4 Develop IUWM related policy and proposals to attract more funding sources	Nepalese municipalities have the power to issue their own policies and by-laws. Even a very basic policy on IUWM can unlock more partnership options and funding sources. Clear policy direction gives donors more confidence. Policy examples from around the world are readily available to be adapted to the local context. Any policy should include the establishment of an IUWM unit to be responsible for oversight of IUWM activities. Policy related to revenue raising should also be included, e.g. tourism tax or tanker/groundwater extraction fees. IUWM policy development also has benefits beyond financing, such as legitimising acceptance; supporting approvals for projects and increasing capacities of those involved in the process. Developing proposals for IUWM related projects or programmes to raise funds from 3rd party donors can reduce pressure on the municipality budget. Proposals should be distributed widely to government agencies, IO/NGO/INGOs, private companies and universities. For example, KVWSMB[23] is interested in supporting water and sanitation projects in municipalities.	• Basic IUWM policy issued • IUWM unit established within the Environment Improvement Division • One proposal for KVWSMB • Proposals for other potential donors

[23] Kathmandu Valley Water Supply Management Board

Recommendations	Rationale / Explanation	Key Targets
Technical Aspects: Sanitation		
Conduct technical and performance assessment of the existing DEWATS (Thaiba)	Significant investment has already been made in this DEWATS, but it is already 15 years old. It is not operating at full capacity and treatment performance is not clear. Based on a technical assessment, renovation and retrofitting should be considered. Further, new operation and maintenance management structures should be investigated, including outsourcing to the private sector.	• Existing DEWATS assessment report • Proposal DEWATS renovation • **Implementation:** Existing DEWATS treatment performance improved and household connections increased
Study feasibility for new decentralised wastewater management solutions in different locations	Given the topography of Godawari and high cost of more conventional centralized sanitation infrastructure, non-sewered decentralized sanitation solutions (e.g. DEWATS, FSM & septic tanks etc) should be prioritized. All options for local recycling and reuse of treatment by-products should be considered.	• Feasibility reports for single location or multiple location cluster on ward level • Proposal decentralized sanitation solution(s) • **Implementation:** Pilot decentralized sanitation solution implementation or decentralized sanitation solutions cluster
Review and study current status of solid waste management	Fully understanding the current status of solid waste generation, collection and recycling is essential to be able to plan, upgrade and expand services. New management models and innovative technologies (e.g waste to energy) should be considered.	• Status report on SWM including recommendations on management solutions and technology options
Implement FSM project	This project has already been in planning for some time and is supported by the Fecal Sludge Management Institutional and Regulatory Framework (2017). Plans and designs are in place and land is available. New management models (e.g. PPP) and innovative technologies (e.g mechanical de-watering system) should be considered.	• **Implementation:** Pilot implementation FSM



"All stakeholders should utilize their expertise and work together for an integrated urban water management in our Municipality."

Shyam Silwal,
Chairperson,
Water Supply and Sanitation Users Committee,
Godawari Municipality

Recommendations	Rationale / Explanation	Key Targets
Technical Aspects: Water		
Water supply services technical and performance assessment	A ward by ward review of water suppliers. Key focus points: service coverage, water quality (water quality tests for all main sources, surface and groundwater), service performance (e.g. wastage & cost recovery). Also, understand glacier and snow resources and the impact of climate change on water supplier resources. Use WQ data to identify appropriate water supply treatment approaches.	• Technical and performance assessment report • **Implementation:** Pilot water supply treatment project
Conduct water quality testing on household water storage systems	Promote household level water treatment approaches. Use water quality data to identify appropriate household water treatment approaches	• Household water quality report • **Implementation:** Pilot household water treatment approaches
Conduct assessment of current status of traditional water systems, ponds and spouts	Link to stormwater management planning. Can traditional systems be revived? Can traditional ponds be rejuvenated? Can the traditional and modern systems be merged? Are traditional management systems still viable?	• Current status of traditional water systems report

Recommendations	Rationale / Explanation	Key Targets
Social Aspects: Community Engagement		
Engage community groups in participatory and inclusive IUWM planning, including women, youth, end users & the disabled	Planning and implementation from the ward level. Women, youth and water and sanitation users' groups should be included.	• Active community engagement leads to increased citizen ownership and sustainability of IUWM outcomes • **Implementation:** Regular ward level planning and coordination meetings
Engage community groups in inclusive and collaborative WQ studies and awareness raising on integrated water management and sanitation issues, including women, youth, end users & the disabled	Ward level participation in WQ studies (household, surface and groundwater) and WASH awareness raising (e.g. septic tank promotion, household water storage) sensitisation activities helps build knowledge and support in the community. Education on wastewater management solutions should be prioritized in line with National Standards for Domestic Wastewater Effluent (2019). Women, youth and water and sanitation users' groups should be targeted.	• Active community engagement leads to increased awareness, action on WASH issues and behaviour change • **Implementation:** Water quality studies and awareness raising

Key Actions **Summary**

Godawari Municipality

Start

1 Start an IUWM process to integrate all planning and implementation of urban water and sanitation

Seek Out

2 Actively seek out new technical and financial partners

Assess

3 Assess and pilot alternative decentralized sanitation solutions

Assess & Understand

4 Assess and understand existing water supply sources/systems (traditional & modern) and water quality

Engage

5 Engage community groups in assessments, planning and implementations to increase awareness and ownership

Godawari Municipality

with support from

german cooperation
DEUTSCHE ZUSAMMENARBEIT

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