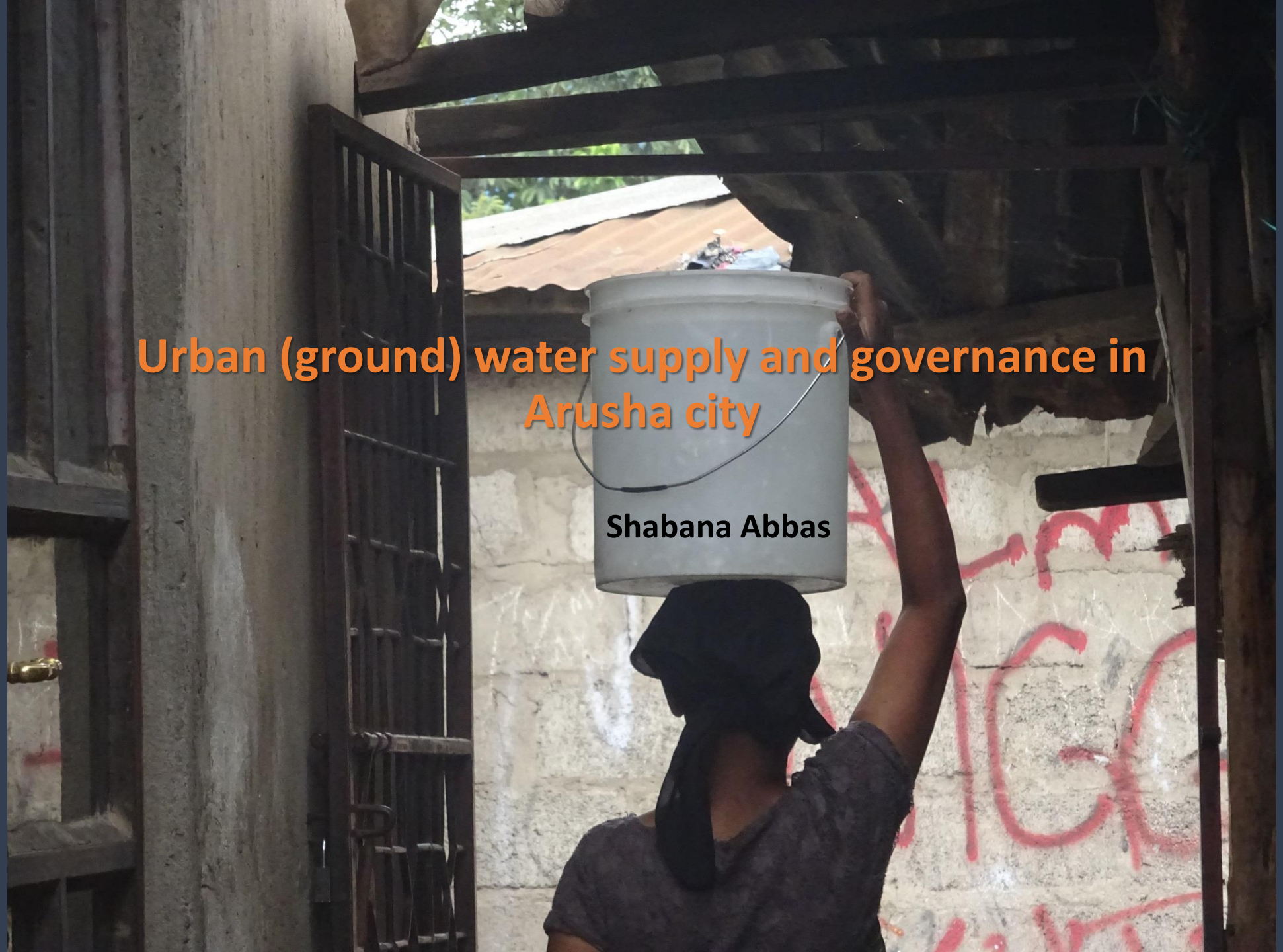
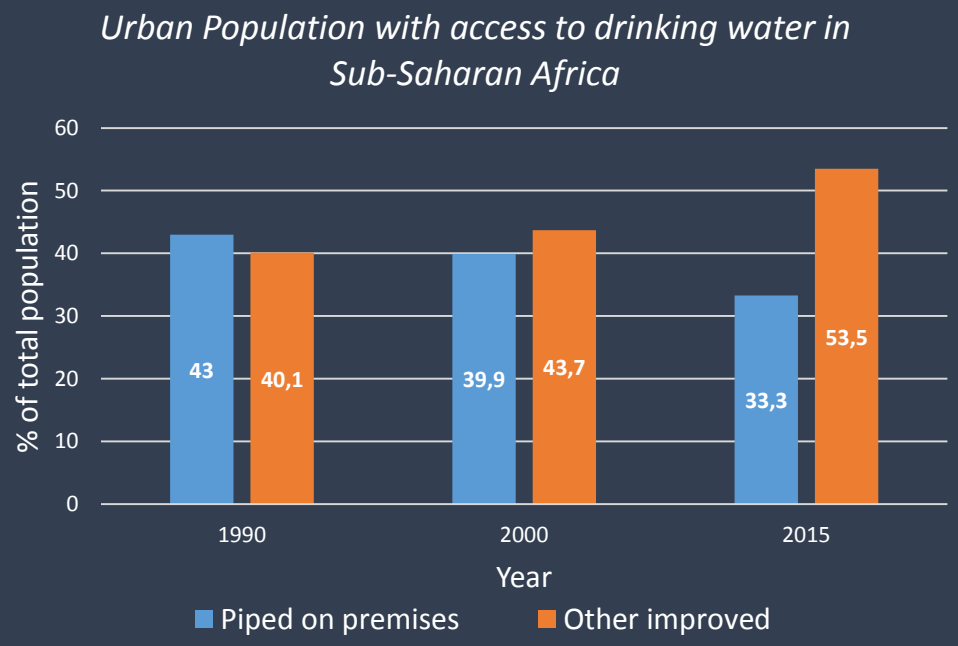


Urban (ground) water supply and governance in Arusha city

Shabana Abbas

Problem Statement

- Limited data on groundwater use in developing cities.
- Progress on MDG for water in Sub-Saharan Africa: other improved sources (springs, wells).
- Focus on equity of access for piped water, urban (ground) water ignored.
- Some attention to groundwater governance. Mostly instrumental.



Source: WHO/UNICEF, 2015

Background

UPGRO: Groundwater as an improved source of drinking water for the poor.

T-GroUP: What social, technical and political changes are needed to make the shift towards **sustainable groundwater management for urban poor** – and how can those changes be achieved?

UP Gro Unlocking the Potential of Groundwater for the Poor

UKaid from the British people

NERC 50 SCIENCE OF THE ENVIRONMENT

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Context

- Tanzania: for urban areas 28% piped; 49% other improved sources *(WHO/UNICEF, 2015).*
- Over abstraction of groundwater in Pangani basin.
- Indirect evidence of increasing groundwater use in Arusha city.





Research Objectives

- **Understand the role of groundwater in urban water supply in Arusha – who is using it, where and why?**
- **How is the use governed for both environmental and social needs?**

Research Questions

- **ROLE OF GROUNDWATER:**
  - **WHO** is using groundwater, and **WHERE**?
    - RQ 1 – How is groundwater used by different users in the city?
  - **WHY**?
    - RQ 2 – How do users decide to use groundwater?
    - RQ 3 – How are individual decisions for groundwater use shaped by urban authorities?
- **GOVERNANCE:** Outcomes of RQ 1, 2, 3 (differences between users, what shapes user decisions/options)

Conceptual points of reference

Groundwater governance

Governance political, contested process.

Governance determines uneven distribution of resources and risks within society.

Informality: informal practices

Not limited to a specific location (informal settlement vs. formal housing), set of people (informal resident vs. government official) or a type of technology (decentralized vs. centralized).

Not as an object of state regulation but rather as produced by the state itself *(Roy, 2005).*

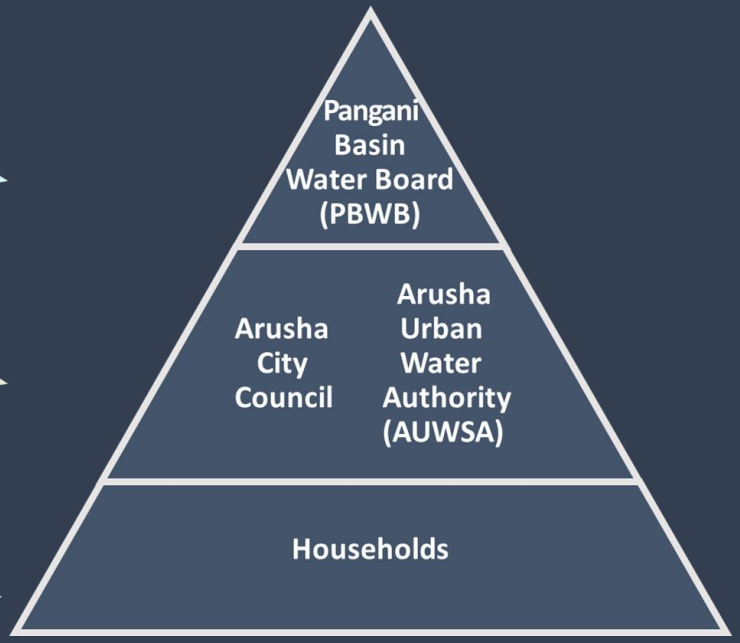
Equity of access

How is access to water different for different groups of people.

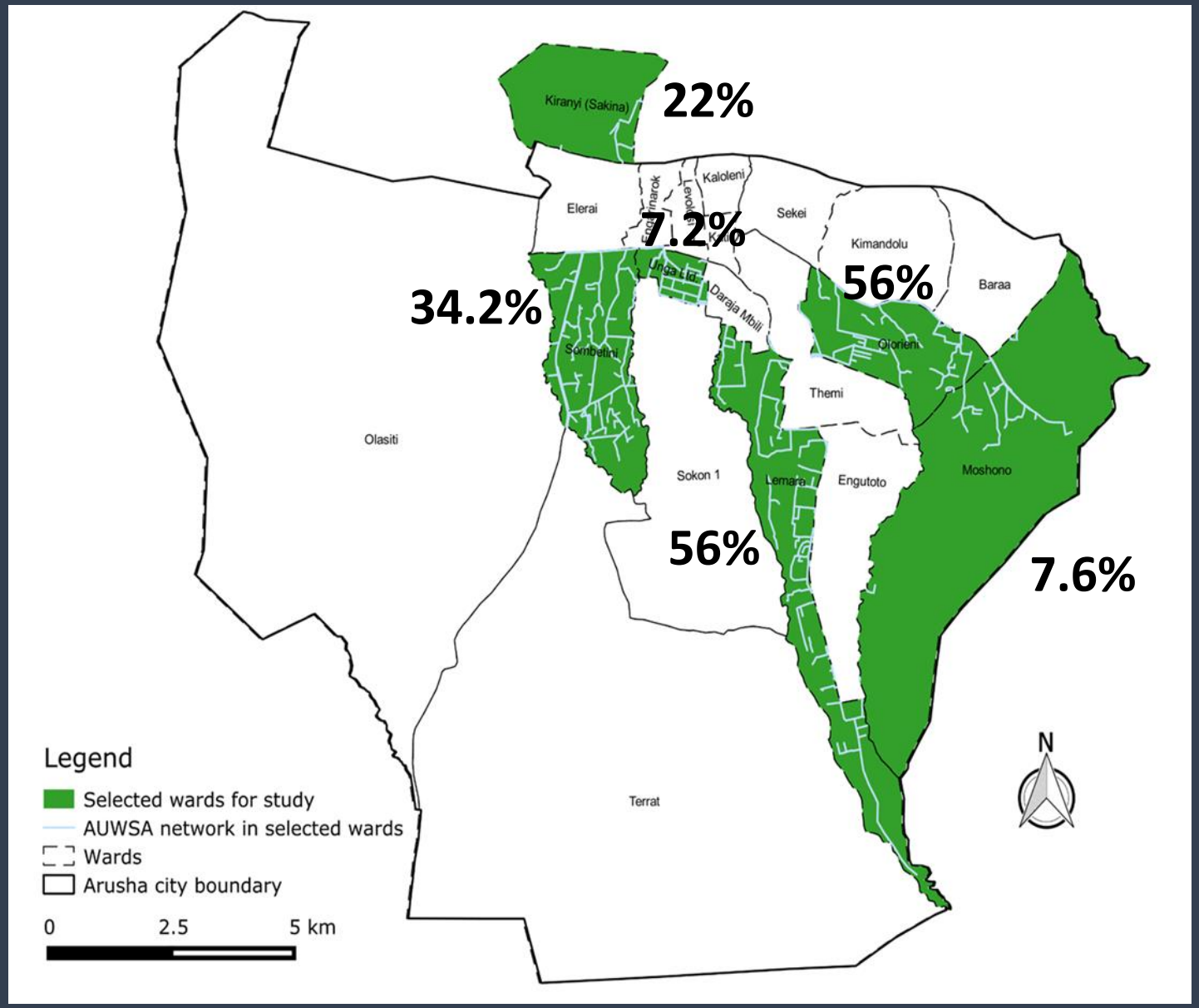
Differences between higher and lower income users.

Methodology

- Qualitative research
- Multi-scale approach:
  - Basin (Pangani)
  - City (Arusha)
  - Wards (Households)
- Semi-structured (65) /in-depth interviews (32)
- Document analysis
- Field observations



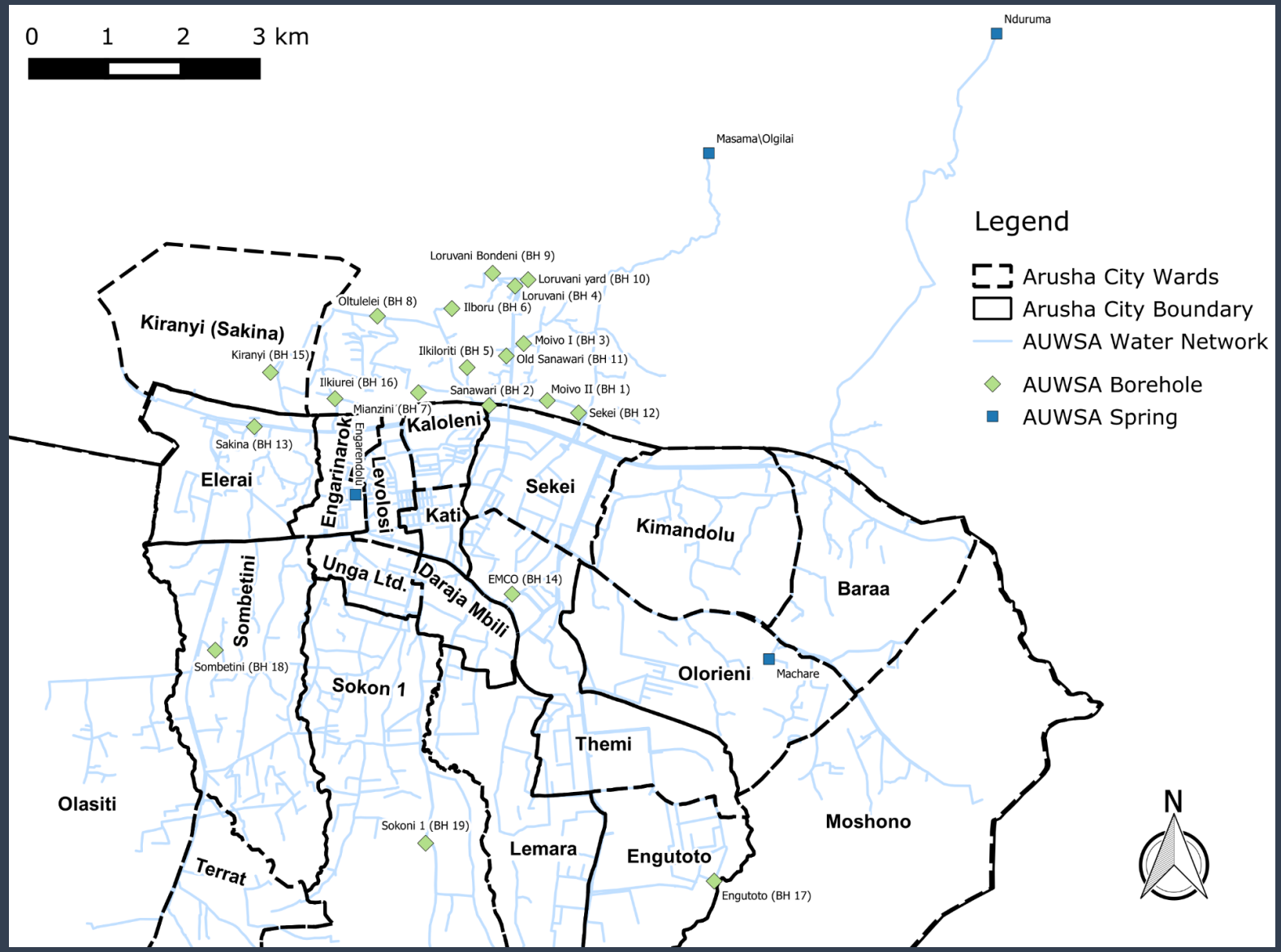
Selected Research Sites (Six Wards)



Ward	Ward Category
Unga Limited	Urban
Sombetini	Mixed
Olorieni	Urban
Lemara	Urban
Moshono	Rural
Sakina	Mixed

- Different residential areas – socio-economic class.
- Different AUWSA coverage (% private connections).

RQ1 – Groundwater use: WHO – Urban water utility (AUWSA)



- **41% boreholes; 46% springs.**
- Increased contribution during dry season.
- Borehole water mixed with spring/river water.
- Shortage of supply: 47,000 m^3/day.
- Unreliable supply across 44% of the urban coverage.

RQ1 – Groundwater use: WHO & WHERE – Domestic users



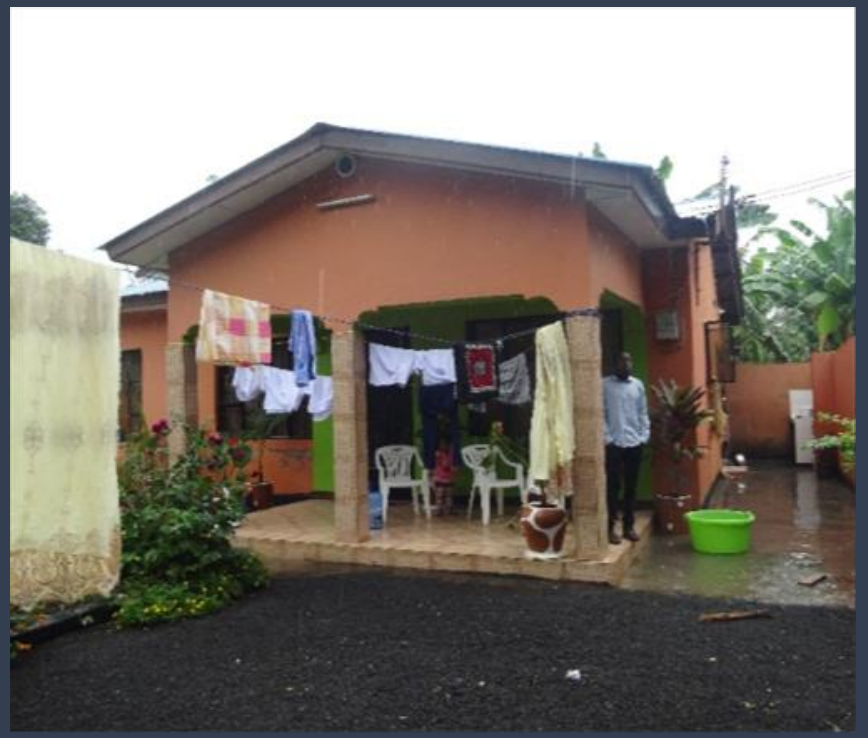

- Used in combination with better quality water sources (AUWSA via connection, kiosk or bottled).
- 28 household water supply combinations, 50% include borehole/well.




RQ1 – Groundwater use: WHO & WHERE – Domestic users

Availability of AUWSA connection

- 40% of all combinations include use of borehole/well with AUWSA.
- Who uses and where does not depend on presence of piped connection.
- It does change the way it is used.
- Without connection: rely on groundwater; With connection and can afford: opt out or supplement with AUWSA.



A household using borehole water from neighbour along with AUWSA and bottled water.

RQ1 – Groundwater use: WHO & WHERE – Domestic users

Socio-economic status

- High socio-economic class – more water supply options.

- High socio-economic class – combine borehole/well with AUWSA/bottled water.

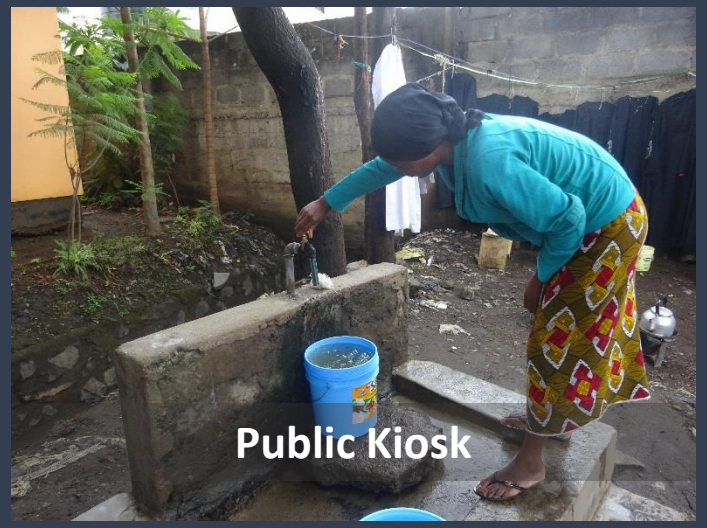
Cost of drilling for 30 m deep borehole

Driller Category	Unregistered drillers (amateur)	Dams and Drilling Agency (govt.)	Registered drillers (private)
Drilling cost ($)	2,000	2,300	3,000

RQ1 – Groundwater use: WHO & WHERE – Domestic users

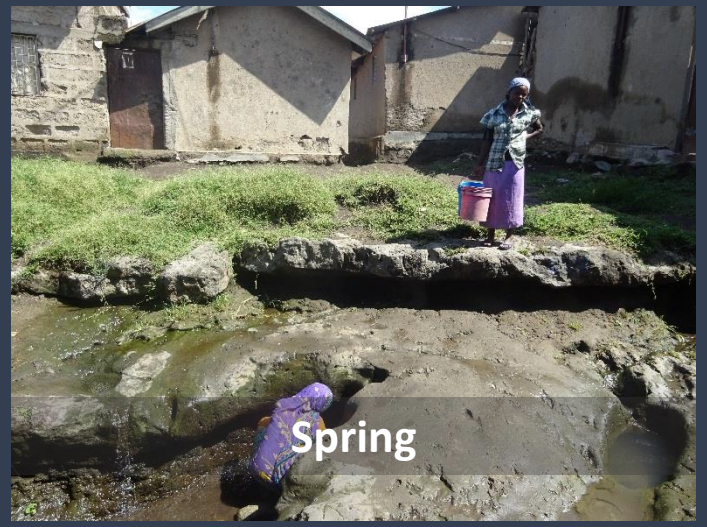
Socio-economic status

- Low socio-economic class – AUWSA from neighbours/kiosk, borehole water from neighbours or springs (if present).


Public Kiosk


AUWSA from neighbour

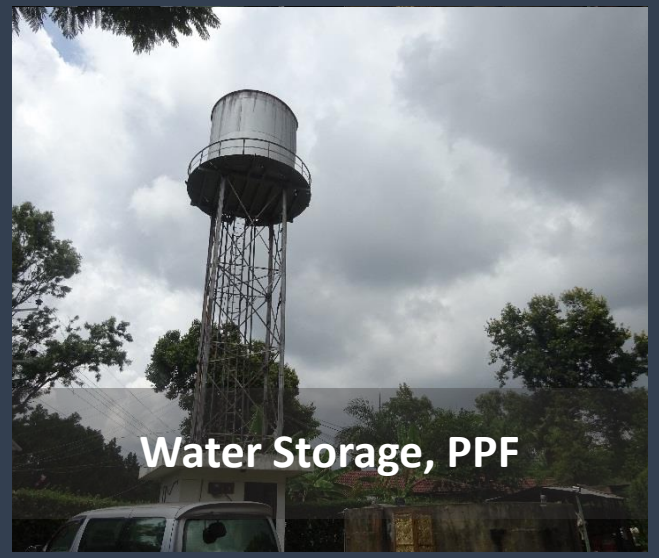

Borehole water from neighbour


Spring

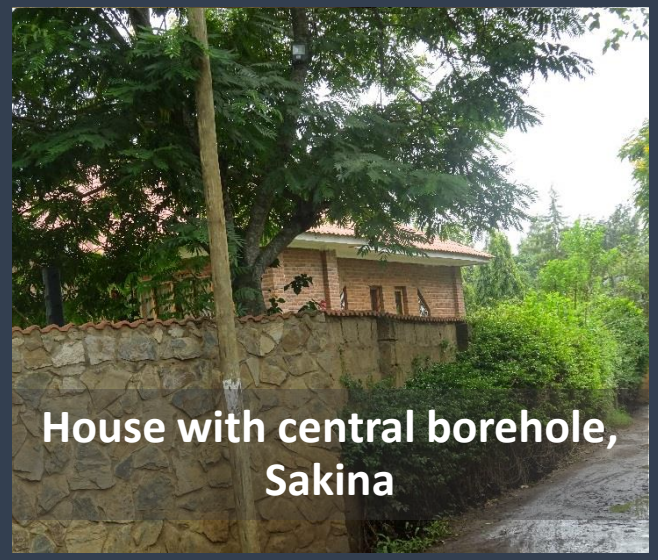
RQ1 – Groundwater use: WHO & WHERE – Domestic users

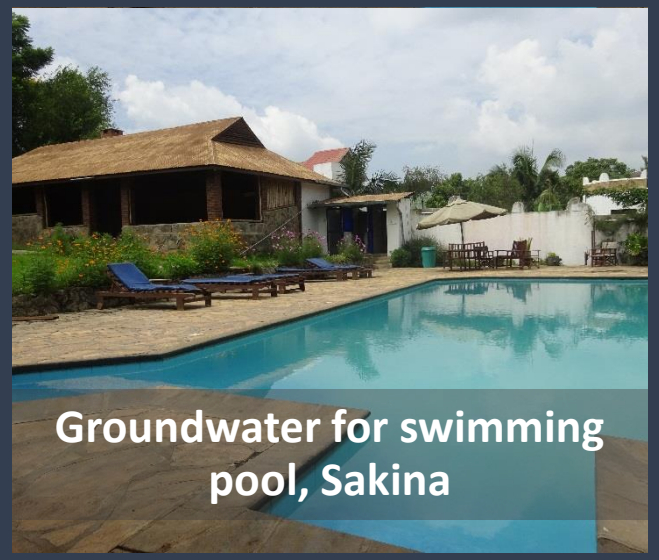
Special housing areas & groundwater

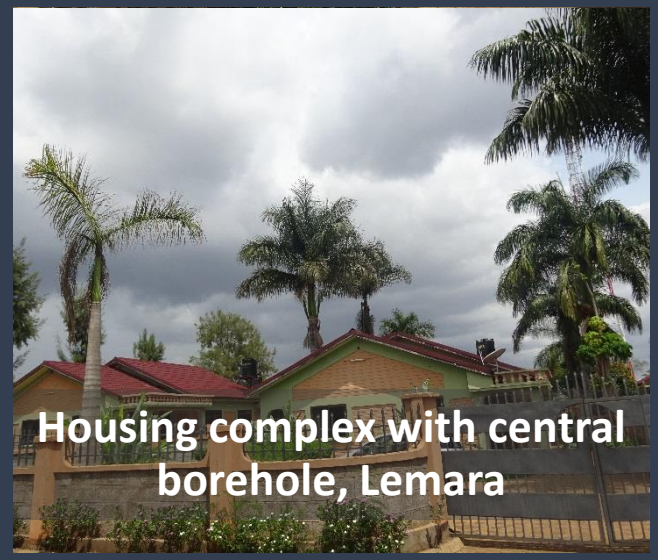

Gated community, PPF


Water Storage, PPF


AUWSA/borehole water for Swimming pool, PPF


House with central borehole, Sakina


Groundwater for swimming pool, Sakina


Housing complex with central borehole, Lemara

RQ2 – How do users decide to use groundwater?

RQ2 – What criteria informs domestic groundwater user decisions?

Based on multi-dimensional criteria of access

1. Reliability of AUWSA supply

- High socio-economic class less affected, able to afford alternatives.
- Low socio-economic class more affected – less alternatives.
- AUWSA unreliable, still preferred – better quality and price (per unit).

A day with no supply at AUWSA kiosk

2. Water Price

"I had my own AUWSA connection, but then I entered into a quarrel with them because they charged me a high bill when I was not getting any water. I then decided to disconnect my AUWSA connection".

Borehole user, Osterby, Unga Limited

6000 Dispenser water

4500 Bottled water

100-120 Neighbour borehole/well

50-100 AUWSA from neighbours
Regulated price: 20 TZS

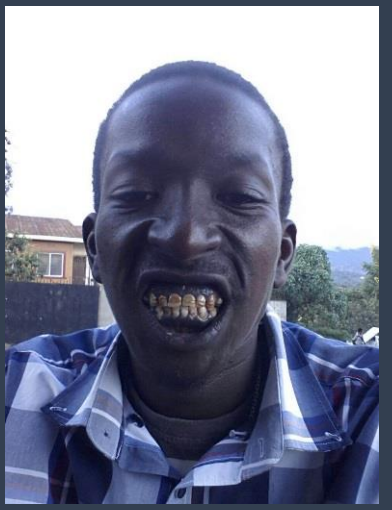
20-100 AUWSA kiosk
Regulated price: 20 TZS

Note: prices per 20L in TZS

3. Water Quality

- High fluoride concentration in groundwater.
- Groundwater (brackish) limited to non-potable uses.
- Unreliable AUWSA but also quality of groundwater – how it is used.
- More options for better quality for high socio-economic class.

Polluted spring



A resident of Arusha with brown teeth

Fluoride in groundwater and drinking water standards (mg/L)

Groundwater in Arusha	WHO standard (drinking water)	Tanzania standard (drinking water)	AUWSA water
4-36	**1.5**	**4**	**3.32**

RQ3 – How are individual decisions shaped by urban authorities?

RQ3 – How are individual decisions shaped by urban authorities?

- Recent regulation.
- Limited/no records of boreholes/volumes abstracted.
- Resource constraints, challenges for monitoring & enforcement.
- Selling of borehole water per bucket unregulated.

Informal practices

"Some do not want to understand the need for permits, some do not know the procedures and some do not want to follow".
PBWB official

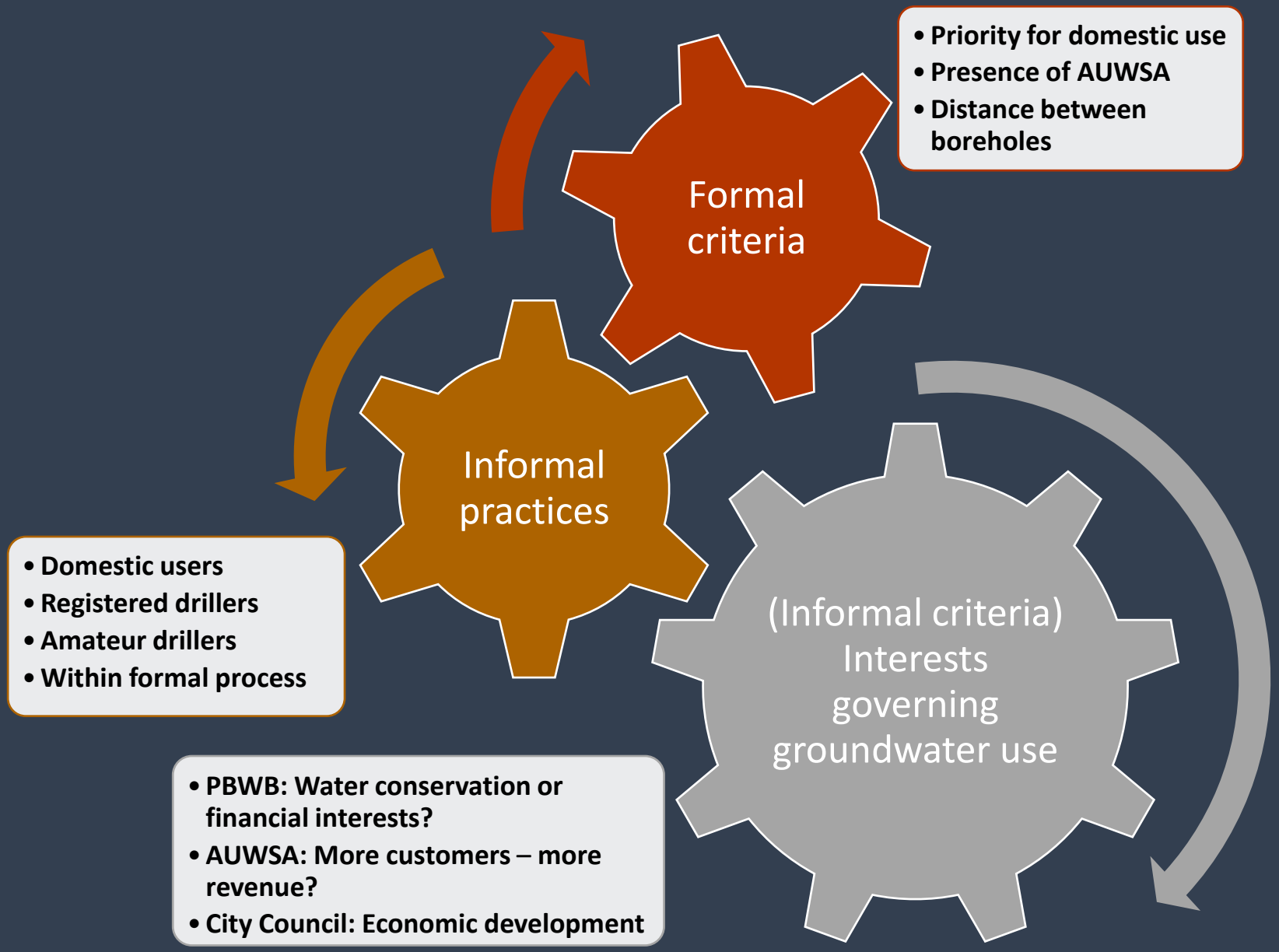
"It is difficult to monitor illegal drillings, especially if drillings happen over night, during weekends and in closed premises".
PBWB official

"Some clients do not want a geological survey and want the company to drill directly. We sometimes take the risk and drill without formal survey and permit".
Private driller

"The formal process is not always easy. We have to send cars and also pay some additional 'facilitation fee' to PBWB".
Private driller

"We target borehole owners in urban centres as it is easier to collect user fee from them. They pay easily as the amount is not a lot for them".
Permit officer, PBWB

Urban groundwater governance process



Conclusion – ROLE OF GROUNDWATER IN URBAN WATER SUPPLY IN ARUSHA

RQ 1 – How is groundwater used by different users in the city?

WHO?

- Urban water utility, domestic users.
- Centralized system (AUWSA), semi-centralized (boreholes in private networks by housing estates), or decentralized (individual boreholes, dug wells, springs).
- Combination with other water.

WHERE?

- Within and outside the piped network.
- Different social groups access groundwater differently, and have different relationship between groundwater use and network.
- Socio-economic status most important determinant of borehole/well use and ability to supplement with AUWSA, or opt out.

RQ 2 – How do users decide what to use?

RQ 3 – How are individual decisions for groundwater use shaped by urban authorities?

WHY?

Unreliable AUWSA supply main criteria for use of borehole/wells.

Price of water and quality equally important.

3 key criteria, important, but in different ways for different social groups.

Formal regulation not effective, very little control on drilling of borehole and abstraction rates.

Costs of formal process not prohibitive as there are unregistered drillers/go around current regulation.

Final reflections

HOW is groundwater use governed for social equity and environmental sustainability?

- Neither meeting social nor environmental needs from equity perspective.
- Governance process tolerates informal/unregistered drilling practices.
- Access based on affordability.
- How groundwater is combined mostly depends on reliability of AUWSA supply.
- Inequity of access to groundwater between income groups.

Thank you for your attention!