Revision of the Pricing Strategy for Water Use Charges: Classification of Social and Commercial projects

Final report prepared for the

WATER RESEARCH COMMISSION

by

PUBLIC AND ENVIRONMENTAL ECONOMICS RESEARCH CENTRE

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EXECUTIVE SUMMARY

As per the National Water Act (36 of 1998), the Minister of Water and Sanitation may establish a Water Pricing Strategy to determine water use charges to fund the direct and indirect costs of water resource management, use and development. As such, the Department of Water and Sanitation developed a pricing strategy in 1999 with a subsequent revision of this version undertaken in 2007. In 2015, the Department released a draft revised pricing strategy for public consultation. Various comments were received from stakeholders highlighting several queries, issues and concerns regarding certain aspects of the revised pricing strategy. As a result, the 2015 pricing strategy needs to be finalised by further exploring and taking these comments into account.

Given the nature of some of the comments received, the Water Research Commission (WRC) commissioned four research projects to undertake further investigations on certain aspects emanating from the set of comments. This report looks at the issue of further classifying water resource users and water resource infrastructure. A sound pricing strategy should ideally attain equity, efficiency, financial stability and environmental sustainability to promote the long-term viability of the country's water resources. These principles pertain to both the current consumptive use of water as well as the investment in future water resources and infrastructure. The 2015 pricing strategy attempted to achieve such goals by categorising users of water resources, as some users will pay the full cost while other users will be subsidised. This is in line with the requirements of the National Water Act that allows for the differentiation among geographic areas, categories of water users or individual water users for social equity purposes.

The 2015 strategy further proposes a classification of water resource infrastructure into social and commercial projects. Classifying infrastructure allows for the appropriate design of a pricing model that utilise certain funding instruments for commercial infrastructure, where costs of infrastructure provision can be recovered, and other funding instruments for social infrastructure, where users of such infrastructure are less able to pay. In addition, revenues generated from charges that are intended to fund water resource development, such as the future infrastructure build charge, should ideally be geared towards social infrastructure and infrastructure for future economic use. Therefore, appropriately defining the different types of infrastructure is fundamental to the application of the 2015 pricing strategy. This important classification process falls solely within the ambit of the Minister of Water Affairs, as per the 2015 version of the pricing strategy.

While the 2015 version of the strategy categorised water users and emphasised the need for proper definitions of water resource users and infrastructure, the strategy itself lacked the appropriate theoretical basis required to define such water resource users. The strategy also lacked clear and objective guidelines required to classify the social and commercial components of large raw water projects. The vagueness in these aspects of the current strategy compromises the overall goal of the pricing strategy to design an appropriate and sustainable long-term financing model for raw water resource infrastructure. In addition, stakeholders also

raised concerns around the merits of providing sole authority to classify infrastructure to the Minister of Water and Sanitation.

Therefore, this report was required to provide the theoretical foundations, guidelines, criteria and the process on which the social and commercial water users and social and commercial water resource infrastructures will be classified. The theoretical approach was anchored on the principles of public finance, where the use of water for private, social or public purposes was used as a basis for defining water users. The study recommended the percentage of total raw water registered to each user group as the base for classification. While some of water user groups in principle could be easily classified as commercial or social, classifying other water users are more complex. For example, the agriculture and municipal users are a composite category of raw water users entailing both social and commercial components within these groups. This report proposes the use of the local government equitable share revenue raising factor as a factorial variable to determine the extent to which a municipal raw water user can be classified as either a commercial and social user. The revenue raising factor of the local government equitable share determines the ability of a municipality to generate own revenues from its local tax base, thus providing a clear indication of the ability of customers within their jurisdiction to pay for general municipal services, including water services. A municipality's inability to recover costs from its local customers for supplying water services suggests that such a municipality will struggle to pay for raw water. Therefore, it will be difficult to recover the costs of raw water infrastructure from municipal users with a largely constrained local tax base.

This project further recommends that the Minister should use the specified guidelines and criteria to classify social and commercial water users and social and commercial water resource infrastructures, as proposed in this project. Moreover, the Minister, in consultation with the Minister of Finance and the Minister of Cooperative Governance and Traditional Affairs, approves the indicators which forms the basis of classification, specifically to identify municipalities as domestic users within specific catchment areas with limited revenue generating potential, as per the annually updated local government equitable share formula. The indicators and basis for classification approved will be applied to annual infrastructure capital expenditure plans as per the 10-year Infrastructure Plan and tariffs will be approved annually though the processes as required by the Treasury Regulation for Trading Entities.

The need for clear guidelines which distinguishes raw water volumes for domestic use in areas with limited revenue generating potential (social users) from raw water volumes for commercial use by other domestic, industry and agricultural users (commercial users) was a key objective of this report. This distinction will provide the basis for a national charge, in the form of the FIBC, and user charges, such as the Capital User Charges (CUC), that will fund the water resource projects. Raw water users in areas that are identified with limited revenue generating potential should benefit from investments made with FIBC funds and should not be liable for CUC. As per the six categories of users defined in the current strategy, this report proposes the use of municipal users of water resources that are identified as socially and commercially with limited revenue generating potential as the basis of the national charge and

subsequent support through the FIBC. Therefore, as part of the process to define social and commercial users, this report recommends the use of the methodology in the local government equitable share formula to identify municipalities with a limited revenue raising potential (as an indicator of social and commercial limited revenue base).

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The research project was done through a collaborative process led by a task team consisting of officials from the Department of Water Affairs and Sanitation, the Water Research Commission and the National Treasury. The task team determined the overall strategic direction of the research and this final product is a culmination of these collaborative efforts. The research team will like to acknowledge the important contribution of the task team members for the classification project, specifically:

- Sizani Moshidi – Department of Water and Sanitation
- Lehlohonolo Nyabanyaba – Department of Water and Sanitation
- Margaret Majola – Department of Water and Sanitation
- John Dini – Water Research Commission
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This project was part of an overall process consisting of four research teams looking at different aspects of the pricing strategy. The PEERC research team appreciates the guidance, support and comments received from other reference group members and research teams, in particular:

- Marissa Moore – Independent Consultant – Operation Vulindela
- Peter Ramsden – Madi Water Solutions - Future Bulk Infrastructure Charge Research Team

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ACRONYMS & ABBREVIATIONS

BS	Basic Services Component
COVID-19	Corona Virus Disease 2019
DWA	Department of Water Affairs
DWS	Department of Water and Sanitations
ES	Local Government Equitable Share
FBS	Free Basic Services
FBW	Free Basic Water
FIBC	Future Infrastructure Build Charge
HBS	Household Budget Survey
HDI	Historically Disadvantaged Individuals
I	Institutional Component
LFS	Labour Force Survey
MAR	Mean Annual Runoff
NT	National Treasury
NTS	Non-trading Services Component
NWA	National Water Act
RA	Revenue Adjustment Factor
RBIG	Regional Bulk Infrastructure Grant
RTS	Representative Tax System
SDGs	Sustainable Development Goals
SMMEs	Small, Medium, Micro Enterprises
StatsSA	Statistics South Africa
TCTA	Trans-Caledon Tunnel Authority
UN	United Nations
WC	Water Conservation
WDM	Water Demand Management
WRC	Water Research Commission
WSAs	Water Service Authorities
WSIG	Water Services Infrastructure Grant
WSPs	Water Service Providers

1. INTRODUCTION

1.1. Background

Water is a key input in production and forms a significant contribution to economic growth and development. However, under certain conditions, it can also become a critical limiting factor to a country's social and economic goals (Cosgrove and Loucks, 2015). The right to access water is a constitutional obligation recognised in Chapter 2 of the Constitution of South Africa that: "everyone has the right to have access to sufficient food and water" (Gowlland-Gualtieri, 2007). Recently, water demand and supply management has been a rising topic of high interest in the policy agenda due to the mismatch between demand and supply for water. As population growth and climate change intensify, scarcity, shocks and access inequalities to water will be on the rise (Garrick, Hanemann and Hepburn, 2020). Thus, there is a need for water sector policy to be re-oriented to manage the demand and supply to attain an equitable, financially stable and environmentally sustainable water governance system. A sound water pricing strategy has been among several tools that have been used to regulate water demand and improve water infrastructure investment to attain policy objectives and ensure the security of future water supply. Moreover, the pricing strategies has been viewed as a tool in improving the water conservation effort, as well as a cost recovering instrument.

The water value chain in South Africa is complex and comprises of several role-players in the system that begins with raw water from a water resource to potable water being provided to a consumer and wastewater disposal at the end of the system. As such, there are various pricing instruments across the water value chain. In terms of raw water, the National Water Act (NWA or the Act) 36 of 1998 allows the Minister of Water and Sanitation (hereafter, the Minister) to establish a pricing strategy for water use charges. Such charges are intended to fund the direct and indirect costs of water resource management, development and use. In addition, the pricing system should promote the equitable and efficient allocation of water.

In giving effect to the Act, the Department of Water and Sanitation (hereafter, the Department) developed a National Pricing Strategy for Water Use Charges (hereafter, the pricing strategy) in 1999 with a subsequent revision of this version undertaken in 2007. In 2015, the Department released a draft revised pricing strategy for comment. The revision of the pricing strategy is mandated by Section 56 of the NWA (1998), which ensures the constant refinement of water pricing practices to match the needs of the country to achieve its social, economic and climate goals.

The 2015 pricing strategy attempted to achieve the objectives of equity, efficiency, financial stability and environmental sustainability to promote the long-term viability of the country's water resources' goals by differentiating between charges based on geographic areas, categories of water users or individual water users. The differentiation of charges between water resource users intends to promote social equity, as it is expected that some users will pay the full cost while other users will be subsidised. The 2015 strategy further proposes a classification of water resource infrastructure into social and commercial projects. Classifying infrastructure allows for the appropriate design of a pricing model that utilise certain funding

instruments for commercial infrastructure, where costs of infrastructure provision can be recovered, and other funding instruments for social infrastructure, where users of such infrastructure are less able to pay. In addition, revenues generated from charges that are intended to fund water resource development should ideally be geared towards social infrastructure and infrastructure for future economic use. Therefore, appropriately defining the different types of infrastructure is fundamental to the application of the 2015 pricing strategy. This important classification process falls solely within the ambit of the Minister of Water Affairs, as per the 2015 version of the pricing strategy.

1.2. Problem Statement

While the 2015 version of the strategy categorised water users and emphasised the need for proper definitions of water resource users and infrastructure, the strategy itself was vague on details of these aspects. Firstly, the 2015 pricing strategy lacked the appropriate theoretical basis required to define water resource users. Secondly, there are no detailed definitions, clear guidelines and criteria to distinguish the social aspects from the commercial aspects of a raw water scheme or project. Thirdly, the suggested process of classifying infrastructure projects, including the Minister's sole discretion to determine the classification of infrastructure, required further scrutiny. Fourthly, the linkage between infrastructure classification and water charges, particularly the Future Infrastructure Build Charge (FIBC), are not clear in the current version of the strategy. Lastly, the alignment between the relevant aspects of the classification approach in the strategy and other applicable policies is not well established. The vagueness in these aspects of the current strategy compromises the overall goal of the pricing strategy to design an appropriate and sustainable long-term financing model for raw water resource infrastructure. Therefore, these areas need to be addressed towards the finalisation of the pricing strategy, particularly as it relates to water resource infrastructure charges.

1.3. Research Objectives

The primary objective of this project is to provide a theoretical basis for the distinction between social and commercial users, social and commercial infrastructure and to clearly define and provide the criteria for separating the social component of water schemes from the commercial components in the draft Pricing Strategy for Water Use Charges. The specific objectives of the project are given as follows:

1) To develop detailed definitions for social and commercial projects/infrastructure/schemes as well as social and commercial users and economic areas as contemplated in the draft Pricing Strategy for Water Use Charges.
2) To outline the theoretical foundations for defining and distinguishing between social and commercial users of water
3) To revisit the theoretical foundations and existing and relevant policy principles and intent underpinning the classification of water resource infrastructure into social or commercial.
4) To make recommendations on the criteria and process for classification of projects, including an examination of the appropriateness of the Minister's sole discretion as provided for in the draft strategy.

As mentioned above, one of the fundamental reasons for classifying raw water users into social and commercial users is to improve issues of equity. Past investments in water resource infrastructure, funded from public resources, tended to have served historically advantaged individuals in specific areas. With the principle of user-pay being introduced in the White Paper in 1997 and the need for the recognition of the economic value and the efficient allocation of water, equity issues have come to the fore. The 2007 pricing strategy limited the growth in water resource infrastructure tariffs to the growth in the producer price index (PPI) plus an additional 10%. However, as costs accrued to the users of specific schemes; the betterment, augmentation and investments in new schemes have introduced significant costs to users in areas of socio-economic with limited revenue generating potential.

The NWA allows for the differentiation of charges by geographic area, category of users and individual users towards the promotion of social equity and remedying inequalities that may have risen historically. Therefore, clearly defining commercial users and social users will not only assist in developing a proper financing model that can recoup costs from users of financially viable commercial infrastructure but also identify areas for social upliftment through social infrastructure investment. As part of the research process towards finalising the 2015 pricing strategy and following discussions with various stakeholders, it is proposed that the FIBC be a national charge and its revenues should be invested in areas of social and economic limited revenue generating potential.

Thus, the need for clear guidelines which distinguishes raw water volumes for domestic use in limited revenue base areas (social users) from raw water volumes for commercial use by other domestic, industry and agricultural users (commercial users) becomes key in this regard. This distinction will provide the basis for a national charge, in the form of the FIBC, and user charges, in the form of the Capital User Charges (CUC) that will fund the water resource projects. Raw water users in areas that are identified as financially with limited revenue generating potential should benefit from investments made with FIBC funds and should not be liable for CUC. As per the six categories of users defined in the current strategy, this report proposes the use of municipal users of water resources that are identified as socially and commercially with limited revenue base as the basis of the national charge and subsequent support through the FIBC. Therefore, as part of the process to define social and commercial users, this report intends to provide the theoretical foundation, guideline, criteria and the process on which municipalities with a limited revenue raising potential (as an indicator of social and economic limited revenue basis) will be identified.

1.4. Report Layout

This report is structured as follows, section (2) discusses the theoretical foundation for classification of water users and infrastructure. Section (3) defines water resource users and provides the methodology used to identify poorly resourced municipalities. Section (4) provides the conceptual framework for defining social and commercial infrastructure while Section (5) establishes the stylised theoretical criteria and empirical guidelines used for the water resource infrastructure classification approach and includes an application to a chosen

case study. Section (6) examines the appropriateness of the Minister's sole discretion while Section (7) concludes the report.

2. THEORETICAL FOUNDATIONS FOR CLASSIFYING WATER USE

2.1. Prelude

This section classifies the current categories of users of water resources, as defined in the pricing strategy, into social and commercial users of water. This, in turn, will form the basis for applying water resources (particularly infrastructure) charges and for the classification of a water resources scheme into social and commercial components, i.e. the portion of a scheme serving social users and commercial users respectively. The draft 2015 pricing strategy categorised six water use categories and these categories will be further classified into either a commercial user of raw water or a social user of raw water. These are outlined in Figure 1.

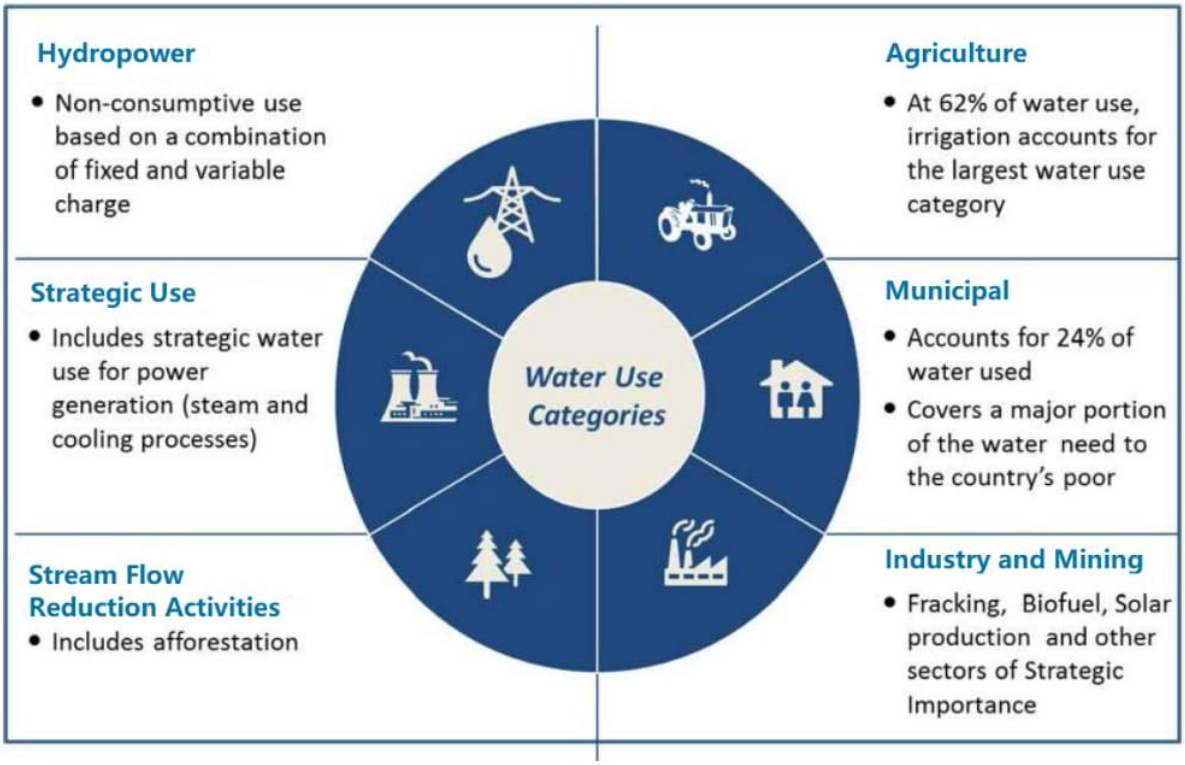

Figure 1: Water Use Categories.
Source: Draft Pricing Strategy (2015)

The overall basis of classifying water users is the actual use of water, i.e. whether it is used towards the production or consumption of a private, public or social good. The primary basis of water use, for the sake of the strategy, is the use of water resources, i.e. raw water. However, it is important to note that some categories of raw water users, specifically municipalities, use water resources to supply potable water to a range of users across the economic and income spectrum. In this case, one needs to distinguish the use of water resources and water services for intra-category situations, as users of potable water within municipalities can be social or commercial users. Therefore, some municipalities may be using raw water to provide potable water to a larger group of more affluent households or businesses. In this case, a municipality can recoup the cost of service provision to these users and, in turn, afford to pay for water resources. On the other hand, some municipalities have a high level of poor water users and

very limited business activities. These municipalities do not have the ability to generate revenue from these households and thus, affordability for water resources becomes a concern. This section outlines the economic theoretical principles used to define water users towards the classification of water resource infrastructure and the payment for such infrastructure.

2.2. Theoretical Principles For Water Use

Economic literature provides the fundamental theoretical principles and guidelines for the classification of public and private goods within public finance/public economics. A fundamental distinction between public and private goods is determined by two attributes namely rivalry and excludability**.** Rivalry can be perceived as competition in consumption, i.e. if one person consumes a particular good, there is less for another person to consume. Excludability refers to the restriction on the usage of a product limited to the people who have paid for it. These attributes provide four types of goods:

1. **Private Goods**: The products which are rival and excludable at the same time, such as clothes, cosmetics and electronics.
2. **Common Goods**: These goods are rival but are non-excludable. These can include a public library and playgrounds which can be used by anyone but with less available whilst in use.
3. **Club Goods**: Such goods are excludable but are not rival. This can include telephone services, which are exclusive for users that pay for such services but can be used by many users at once.
4. **Public Goods**: Public goods are non-rival and non-excludable at the same time, for instance, a road, bridge, and dams are considered as public goods.

Given the characteristics of the various types of goods above, the classification of water remains a fundamental question. This characterisation of water will essentially determine the most efficient and effective way to provide the service, both from an efficiency, cost and equity perspective. Water is the most important resource on the planet and without it no human or any other life could survive. Water resources, however, are finite, and in many areas, water is becoming increasingly scarce. This scarcity, combined with the many competing uses for water, creates complex choices over how water resources should be allocated (Grafton et al., 2013).

In a market economy, market forces typically determine the allocation of scarce natural resources, such as coal, oil, fish, crops and timber. However, water resources have several unique characteristics, which mean that traditional market mechanisms can lead to inefficient and inequitable allocations. This creates questions over whether water should be considered a public, private or mixed good (White, 2015). The following discussions outline the debates regarding the characteristics of water as a good. This is important, as it can assist in determining the most optimum methods of delivering, classifying the users and financing the provision of water services and water infrastructure.

2.3. Water as a Private Good and a Basic Human Right

One of the most basic uses of water is at the household level for domestic use, such as drinking, gardening and showering. This kind of use can be described as **'rival'** in that an individual drinking a glass of water can prevent others from drinking it, and **'excludable'** in that when it has been consumed nobody else can use it. One can see the 'private" nature of water use in this context. Most private goods are traded in markets so that they are allocated to their highest value uses. However, what makes water unique is that it exists both as a private, marketable good and a basic human right.

The UN declares access to safe drinking water and sanitation as a 'human right' (UN, 2010). In the South African context, the Bill of Rights in the Constitution (specifically S 27) makes provision for the right to access safe drinking water and sanitation. As a human right, water cannot be treated the same way as other marketable goods because the transfer of water to those who value it most highly may be morally unacceptable if this transfer means that some people no longer have access to the basic water needed to survive. In this case, water can be considered a "public good" when it is consumed for basic survival needs. However, after basic survival needs for water have been satisfied, additional water use is no longer a basic human right. Households, for example, may use water to fill a swimming pool, water their lawns or take long showers. As such, when basic survival consumption needs for water of a household is exceeded, it becomes a private good and so is best allocated, like other private goods, through markets (Green, 2003; Ward, 2011; Chan, 2012; White, 2012; Ward and White, 2012). This argument defines a "subsistence" level of water use that ensures that basic needs are met (for survival), with this level constituting a basic human right and thus, having water treated as a public good.

The dual aspects of water as a human right (public good) and a private good can be illustrated using indifference curves in Figure 2. Indifference curves show bundles of goods that a consumer value equally and how much a consumer is willing to trade one good for the other while maintaining the same level of satisfaction.

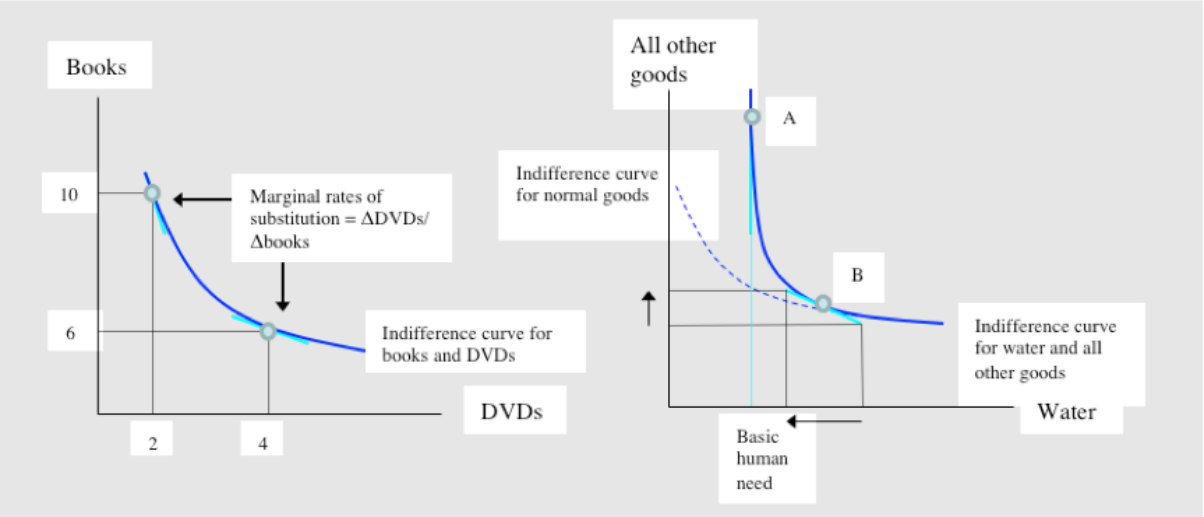

Figure 2: Indifference Curves for Water versus Other Goods.
Source: Grafton et al. (2013)

For example, in Figure 2, the consumer would happily substitute a bundle of 10 books and 2 DVDs for 6 books and 4 DVDs. For most private goods, it is assumed that different goods can be substituted for one another. However, up until the basic needs for survival are covered, water cannot be substituted for any other good so the slope of the indifference curve is vertical, i.e. consumers will not trade water for any amount of other goods (point A in Figure 2). As soon as the basic needs have been met, however, water can be substituted for other goods and so the indifference curve becomes a downward sloping curve, like other private goods (point B in Figure 2).

2.4. Common-pool Resources and Negative Externalities

Having exclusive property rights to a good allows for such a good to be freely traded, i.e. transferred from one person to another. However, water, in its natural state, often doesn't have clearly defined property rights. Those goods for which property rights do not exist are known as open access resources and the lack of ownership or control of these resources can lead to overuse. This is because one person's use does not prevent or reduce its value to others, i.e. they are **'non-rival'**. Overuse can become a serious problem when resources are **'rival'** so that use of the resource reduces the amount available for others, and **'non-excludable'** so that consumers cannot be prevented from using the resource without considerable cost. These resources, such as water in its natural state, are known as common-pool resources. The overuse of common-pool water resources occurs because each user draws the amount of water they require, without fully considering the impact this has on the amount of water available to other users.

In a competitive market, for example, the efficient allocation of goods is reached at the point where the market price balances supply against demand. At this point, each water abstractor uses a level of water where the additional or marginal benefit to withdrawing an additional unit of water is equal to the cost of drawing it. However, unlike in the case of many goods, the use of water can have wider impacts, which are not typically reflected in the costs to the user. This is coined as an externality of water use.

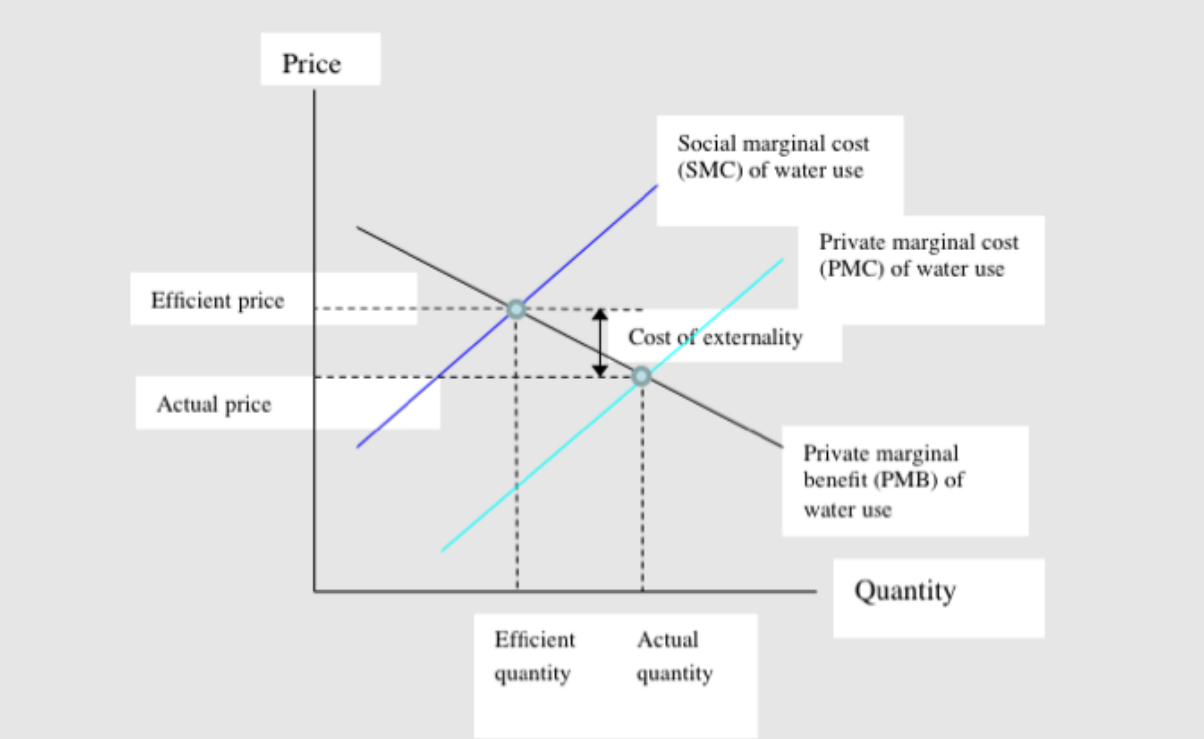

Figure 3: Cost of Externalities.
Source: Grafton et al. (2013)

This concept is illustrated in Figure 3. For example, if a user draws large amounts of water from the environment, they are likely to have to pay for the cost of transporting the water. However, this may create external costs for other water users, such less water being available for crop production, fisheries, recreation, or biodiversity. These external impacts of water use are not typically reflected in market prices and are not borne by the initial user of the water. As a result, they are not included in the costs faced by users, so users do not take them into account when deciding how much water to draw. These effects are described as negative externalities and they create a 'wedge' between the private and social marginal cost of using a resource. Due to these negative externalities, water resources are often undervalued and overused relative to the efficient allocation that ideally includes both private and external costs.

2.5. Club Goods and Public Goods

While the use of water resources can have negative impacts that are not transmitted through market prices, there can also be significant positive externalities such as the human health and development impacts provided by public water infrastructure. When these benefits are 'excludable', such as community-based irrigation schemes that only allow members to use water, they are known as club-goods. In practice, however, it is often difficult to exclude individuals from accessing the benefits of water infrastructure once they are implemented. For example, it is estimated that around 20 per cent of water connections are illegal (Green, 2003).

In many cases, the benefits of water infrastructure projects are both **'non-rival'** and **'non-excludable'**. For instance, when a dam is built, people cannot be prevented from benefiting from the reduced risk of flooding and increasing the number of people who benefit does not

affect the availability of the resource. These resources are described as public goods and, once they are provided for one individual, they are available for all.

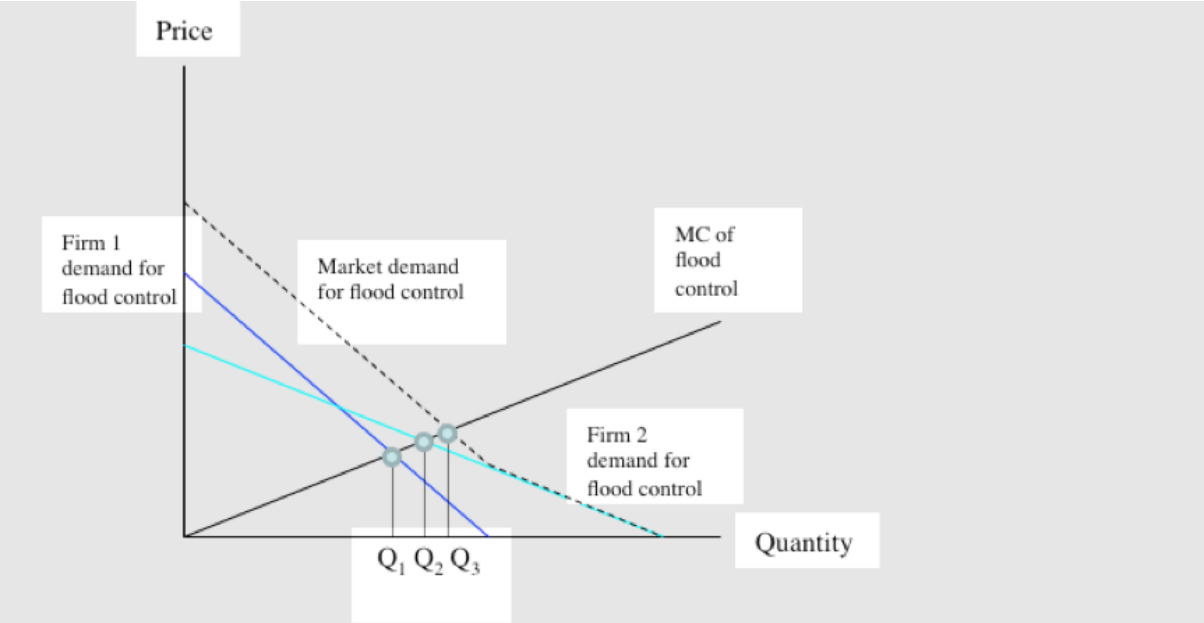

Figure 4: Free Rider Problem with Public Goods.
Source: Shaw (2005)

While club goods may be provided efficiently by private firms who can control access and charge fees, for public goods there is an incentive to wait for others to provide the services then 'free ride' once they are established, thereby leading to an under allocation of public goods. In the case of flood control, for example, suppose there are two private firms that receive different benefits from flood control infrastructure and must decide how much of this infrastructure they want to purchase. This situation is represented in Figure 4 where the horizontal axis represents the quantity of flood control infrastructure purchased by the firms and the vertical axis represents the cost of purchasing the infrastructure.

In a competitive market, Firm 1 decides to invest in flood control infrastructure up until the point where its demand is equal to the marginal cost (at point Q_1 in Figure 4). Since Firm 2 cannot be excluded from receiving the benefits of the level of flood control purchased by Firm 1, they can free ride and receive Q_1 units of flood control for free. Firm 2 may then choose to purchase an additional amount of flood control to reach Q_2, however, this is still short of the efficient amount, Q_3, where market demand is equal to the marginal cost. Thus, unlike for private or club goods where firms receive the benefits of providing them, the public good nature of water infrastructure means that private markets may fail to provide water services efficiently.

In summary, water can be both a public and a private good, as well as somewhere in between. These characteristics mean that water is not a traditional marketable good and markets can lead to poor allocations of water resources, if designed badly. At the same time, market processes can allocate certain aspects of water resources efficiently, if the unique characteristics of water uses are considered. As such, while markets can be used to allocate water resources, careful

design and strong legislation is needed to ensure that the outcomes are both efficient and equitable, and the answer to whether water should be considered a private or a public good depends on the type of resource and its uses.

2.6. Water Used in the Production of Private Goods

The theoretical discussions above can be used to differentiate domestic, i.e. household users of water into social and commercial users. When a household consumes water for survival purposes, water is treated as a public good. Such a household would be considered a social user of water. An indigent household using free basic water (FBW), which is the minimum amount of water required to meet basic human needs, is a social user of potable water. On the other hand, once a household has sufficient resources (ability to purchase) more units of water beyond basic survival needs, then water is considered a private good. In this case, a non-poor household is considered as commercial user of potable water, as the market now determine how much of water to allocate to this user and such a user can pay for its consumption.

Private consumption of water is most apparent in non-domestic users of water. Water forms an important input into various production processes, ranging from large industries, mines, commercial agriculture and small to medium sized businesses. Even in instances where water is not directly used in the production process, water is still used to indirectly support commercial activities, such as sustaining employees or maintaining machinery. Commercial consumption of water is considered as private good and such users are commercial users of water as, again, the market determines the amount of water such users consume and such users are able to pay for its use.

2.7. Water Used in the Production of Merit Goods

Merit goods are usually social goods that, when consumed by an individual or group of individuals, have positive benefits to society at large. Such goods provide some human needs that are of such importance that they merited governmental support or direct government provision. These goods include housing for the poor, school lunches, education and healthcare. Therefore, a good may be classed as a merit good if it causes positive externalities. Education is typically cited as an example. In the absence of government intervention, an individual's choice will lead to under-consumption of a good causing a positive externality[1]. Such merit goods are therefore sometimes subsidised by the government, or directly provided. Many goods and services that increase a system's competitive capacity can also be added to the overall category of merit goods, because they impact the productivity of production factors in an economy[2]. In general, these are infrastructure goods such as the construction of road networks, appropriate and far-sighted urban planning, new railway lines, school buildings, product quality certification centre, a social aid office, disease prevention, and so on. Their role is to increase the direct or indirect advantages and opportunities of the economic system under consideration. Such goods and services are sources of widespread externalities that can stimulate economic, social, and cultural development of a given country.

[1] https://www.oxfordreference.com/view/10.1093/oi/authority.20110803100151458
[2] https://www.sciencedirect.com/topics/economics-econometrics-and-finance/merit-goods

Figure 5 gives a graphical explanation of under-consumption of a good such as healthcare.

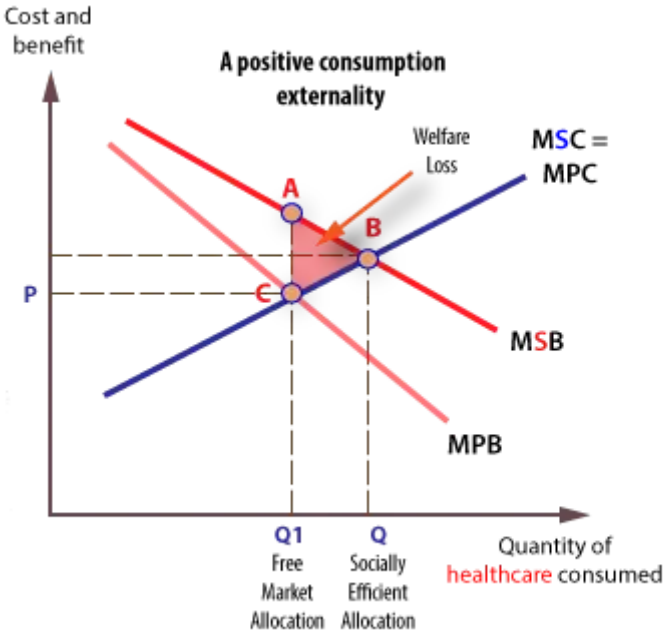

Figure 5: Positive Consumption Externality.
Source: https://www.economicsonline.co.uk/definitions/merit_good.html/

In Figure 5, when a merit good is consumed it generates positive externalities. The most socially efficient allocation of resources to the production of a merit good would occur at the quantity which equates marginal social benefit (MSB) with marginal social cost (MSC) – namely, the output that considers the external costs and benefits, and not just the private ones. If externalities are not considered, as is likely to be the case if merit goods are supplied exclusively by free markets, then there will be a net welfare loss, as shown by area A, B, C. This is because the private individual would only want to consume at Q_1, as he or she does not take the benefit the additional consumption has on society. Hence, such merit goods are therefore sometimes subsidised by the government, or directly provided.

Like with the production of private and public goods, entities that produce merit/social goods also use water either directly or indirectly in the production processes. Given the positive social and economic benefits of merit/social goods, the use of water in these processes should be considered as social, as subsiding its use can result in a greater production and supply of such goods in society.

The above theoretical background provides basis for classification of water users into either social or commercial users and water infrastructure into either social or commercial infrastructure. The understanding of the different characteristics of the water market can provide the rationale for segmenting the water investment (supply side) and users (demand side) into different categories. We will provide the details on the infrastructure/investment/project/scheme and users classification separately as they have different characteristic that require careful considerations.

3. CLASSIFYING WATER USE CATEGORIES FOR WATER USE CHARGES

In the 2015 revised price strategy, the traditional water user groups (2007 strategy) were re-categorised in order to better represent the water user groups and allow for more clearly targeted charges. These groups are illustrated in Figure 1 above. The main changes in these categories are the split of the formerly domestic and industrial category into two separate groups, municipal and industrial/mining, as well as the addition of the strategic users, representing users with an assurance of supply of 99.5%. A category of hydropower has also been introduced to be able to charge for water use by small scale hydropower plants that are due to be developed as part of the energy mix in the country.

Theoretically, user charges are applied to users of raw water that can afford to pay for such services. The discussions above provide an additional theoretical basis for further classifying the water user groups outlined in Figure 1 into social and commercial users, depending on their respective use of water resources. When water resources are used to produce a public or merit (social) good, then the user of such water is a social user. If the water resource is used to produce private goods, i.e. commercially for a return, then such a user is a commercial user. Based on this, Table 1 classifies each of the six user categories into either a social or commercial user, for the sake of water use charges. Industrial/mining, strategic use, stream flow reduction activities use and hydropower are considered commercial users of raw water.

Table 1: Classification of Water User Categories into Social and Commercial Users

S/No.	Water user categories	Classification	Remark
1.	Agriculture	Both social and commercial	Subsistence agriculture is social user of water resources
2.	Municipal	Both social and commercial	Municipalities with a limited revenue base (for collecting municipal taxes and tariffs) indicates a high proportion of social users of potable water, i.e. users that cannot afford to pay for water services. Such municipalities are considered as social users of water resources. Municipalities with a greater revenue capacity (more affluent domestic and non-domestic (business) users of water services) are considered as commercial users of water resources.
3.	Industrial/Mining	commercial	
4,	Strategic Use	commercial	
5.	Hydropower	commercial	
6.	Stream-flow Reduction Activities	commercial	These are commercial forestry users their activities result in production of private goods, i.e. timber, pulp, etc.

Source: Authors' (2022)

Investment in water resource development (water resource infrastructure) is capital intensive with high upfront costs. Section 56(2)(b) of NWA, 1998, outlines the capital costs of projects including costs of investigation, planning design, construction and pre-financing of new infrastructure. The 2015 pricing strategy intends to fund water resource infrastructure through cost recovery instruments, such as the CUC, and a national charge, through the FIBC. User charges, such as the CUC, will be charged to water resource users (only for projects that are not funded by the fiscus, where loan funding is secured to implement the projects) that can afford to pay for the use and development of water resource infrastructure, while the FIBC will be charged to all users. Unlike social users, commercial users of water resources are assumed to have the ability to pay for the cost of water resource infrastructure development through user charges. Therefore, based on the classification outlined in Table 1, the industrial/mining, strategic use, hydropower and irrigation users should be liable for user charges, such as the CUC.

While there is a clear distinction between commercial and social users with the water resource user classifications mentioned in the preceding paragraph, such distinctions are bit more complex in the municipal and agricultural categories, where some users within each category can be social and others commercial users. Within agricultural users, for example, resource poor farmers would be considered as social users, as many of them would use water resources for production that is largely for subsistence purposes, i.e. to maintain their livelihoods. However, current provision exists for schedule 1 users who are exempted from water infrastructure charges and poor resource farmers and tree growers that receive concessions on infrastructure charges. These categories, theoretically, provide social benefits and are social users, but are already catered for in the pricing strategy.

On the other hand, municipal users of raw water are a complex case. Municipalities (via water boards, in most cases) purchase raw water to produce water services, i.e. potable water for the use of households, business and other users within its jurisdiction. These users of water services include both domestic users that can afford water services and those that can't and non-domestic users, which includes industries, mines and other commercial users of water services that can afford to pay for such services. Therefore, utilising "water resource use" as a basis to distinguish whether a municipality is a social or commercial user is complex, as municipalities use raw water to produce both potable water that is used in the value chain towards the production of public, social and private goods.

For the sake of the strategy and to determine the municipalities that are liable for water resource infrastructure user charges, each municipality in the country would have to be classified as a commercial or a social user of raw water **based on the proportion of users of water services within the municipality that are considered as social and commercial users of potable water**. If a municipal user uses raw water to provide potable water to a higher proportion of high-income households and businesses, then such a municipality will be considered a commercial user of water resources. This is due to the municipality having a greater ability to collect own revenues and recoup the costs of providing (water) services to its customers. On the other hand, a municipality that is characterised by a higher proportion of poor households

that consume water for subsistence purposes (social user) would be considered as a social user of raw water.

The approach of implementing water charges on the municipal user will depend on whether the municipal users are more social (limited revenue base) or more economic (relatively affluent revenue base). Furthermore, municipalities that are identified as social users will benefit from FIBC investment and will form the basis for the national charge. Municipalities with a limited revenue base are usually characterised by a large number of indigent households and very limited business activity. As a result, these municipalities face challenges in generating revenues to support the delivery of municipal services, including water services. Recovering the costs of providing water, including the purchasing of raw water and the costs of the water resource infrastructure, is difficult in these areas. In most cases, the socio-economic characteristics of these areas are the result of historically driven asymmetric investment across the country. Therefore, developing water resource infrastructure in these areas will assist in promoting issues of social equity, remedying a legacy of underdevelopment and promoting economic development in poorer areas.

This approach of classifying municipal users for support of social public benefits is based on S56(3)(a)(i) of the National Water Act, which provides that the pricing strategy may differentiate based on different types of geographic areas. Related to this, S56(4)(a) of the Act allows for differentiation by geographic area based on:

1. Socio-economic aspects within the area in question
2. Physical attributes of each area
3. The demographic attributes of each area

Based on our social and commercial classification definitions, poorly resourced municipalities are the primary user which support social and public benefits and will be targeted as the social component of water resource infrastructure to be funded through national charges. Given the provisions of S56(4)(a) of the Act, one needs to develop a methodology that can objectively and methodically differentiate poorly resourced municipalities, taking into consideration the socio-economic aspects, physical and demographic attributes within each area.

3.1. The Case of Municipal Water Resource Users – Identifying Poor Municipalities

Given the discussions above, this section introduces the methodology to identify municipalities with a limited revenue base, as an indicator of areas of socio-economic limited revenue base. This methodology will determine which groups of municipal users can be considered as social users of water resources that are likely unable to pay for water resource infrastructure user charges but will form the basis of and benefit from the national charge, in the form of the FIBC. In this regard, identifying municipalities with a limited tax base, i.e. limited revenue raising capacity is a good indicator of municipalities with a relatively higher number of social users of water services. Social users for water services, as defined above, are not in the position to pay for municipal services due to limited disposable income. Therefore, social users that cannot

pay for water services are also unlikely to pay for municipal services, which, in turn, makes it difficult for municipalities to afford water resource infrastructure charges. **As such, it is proposed that the revised pricing strategy uses the method used in the local government equitable share (LGES) formula to identify municipalities with a limited revenue raising capacity.**

South Africa's three sphere system of decentralised government constitutionally affords local government with a range of service delivery responsibilities. To fund such services, municipalities are also assigned a range of revenue generating powers, including property rates, tariffs on services rendered and surcharges on such tariffs, amongst a range of other local taxes and fees. Local government is also constitutionally entitled to a share of nationally raised revenues in the form of the local government equitable share (LGES). These funds are intended to support service delivery (specifically the delivery of free basic services) at a municipal level and is distributed via a formula. One of the goals of intergovernmental transfers, such as the LGES, is to remedy an inherent characteristic of a fiscally decentralised system where expenditure responsibilities to a sphere usually exceeds the revenue powers assigned to the sphere. As such, such grants are considered as "equalisation grants", covering the difference between the expenditure responsibilities assigned to a municipality and the revenues the municipality can generate from its local tax base.

While the LGES formula is not purely an equalisation grant, as it also funds national policies such as free basic services (FBS), the structure of the formula is still redistributive where funds are allocated to areas of greater expenditure needs, while taking into account the municipality's ability to raise own revenues. As a result, per household allocations are usually higher in municipalities where the ability to raise own revenues is limited due to a constrained local tax base characterised by many indigent households and limited business activities. The current structure of the LGES formula is given as follows:

$$LGES = BS + (I + NTS) \times RA \pm C$$

Where:

- **LGES** is the local government equitable share
- **BS** is the basic services component
- **I** is the institutional component
- **NTS** is the non-trading services component
- **RA** is the revenue adjustment factor
- **C** is the correction and stabilisation factor

The LGES estimates an individual municipality's expenditure needs through the basic services (BS) component, the institutional (I) component and the non-trading services (NTS) component. Given the equalisation structure of the LES formula, a component or factor is required to correct for a municipality's ability to fund these expenditures from own revenue

sources. In order to achieve this, the formula contains a revenue adjustment (RA) factor, which corrects allocations made via the I and NTS components. The RA takes the form of an index, where the bottom 25% of municipalities deemed to have a very limited tax base takes the value of 1, moving down on a sliding scale towards 0 as the revenue potential of a municipality's tax base improves. As such, many of the country' metros and larger secondary cities have an RA value of 0, resulting in these municipalities not receiving funds from the I and NTS components. On the other hand, municipalities with an RA value of 1 receive the full allocation via the I and NTS components, as the formula determined that these municipalities cannot fund this portion of their expenditure needs from their own revenues. This is illustrated graphically in Figure 6.

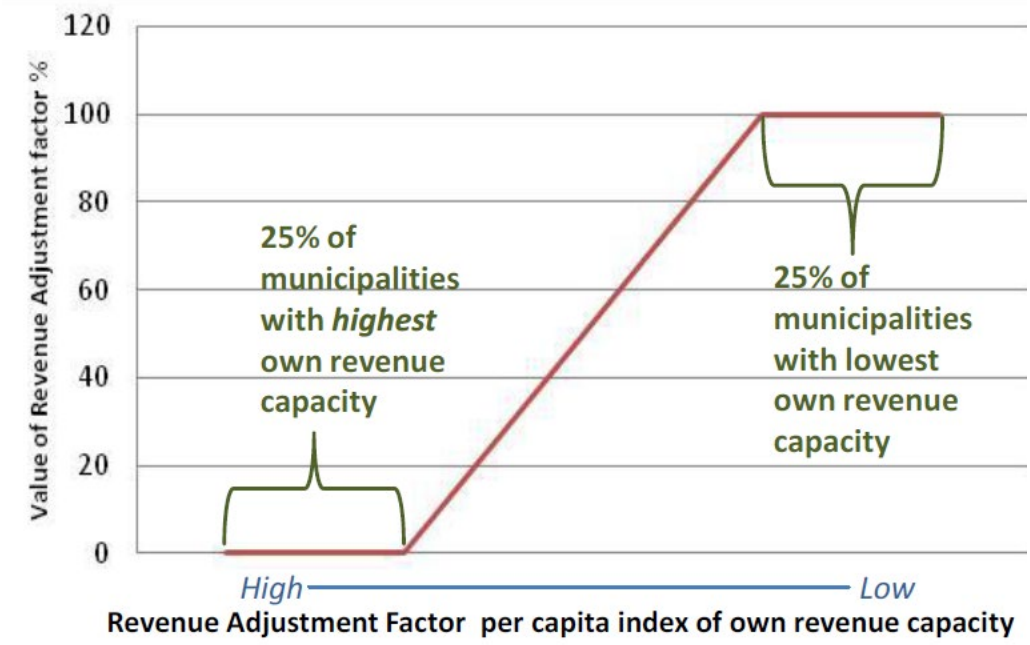

Figure 6: Graphically Representation of the Revenue Adjustment Factor.
Source: National Treasury (2012)

As indicated in Figure 6, 25% of the country's municipalities with the most limited tax bases have an RA index of 1. These municipalities are characterised by communities with high levels of indigent households and low levels of business and economic activity. As such, their ability to generate revenues from their tax base is limited and, as a result, they receive additional allocations via the I and NTS component. With respect to the pricing strategy and water resources, these municipal users of water resources will thus struggle to pay for water resource infrastructure and, in fact, would greatly benefit from nationally driven investments in these areas. Therefore, they are deemed as social users of water resources. Currently in the LGES, there are 54 municipalities that are deemed as socio-economically constrained, i.e. have a limited tax base. Figure 7 shows the distribution of these 54 municipalities across South Africa's provinces. The bulk of these municipalities (87%) are in KwaZulu-Natal (20), the Eastern Cape (17) and Limpopo (10).

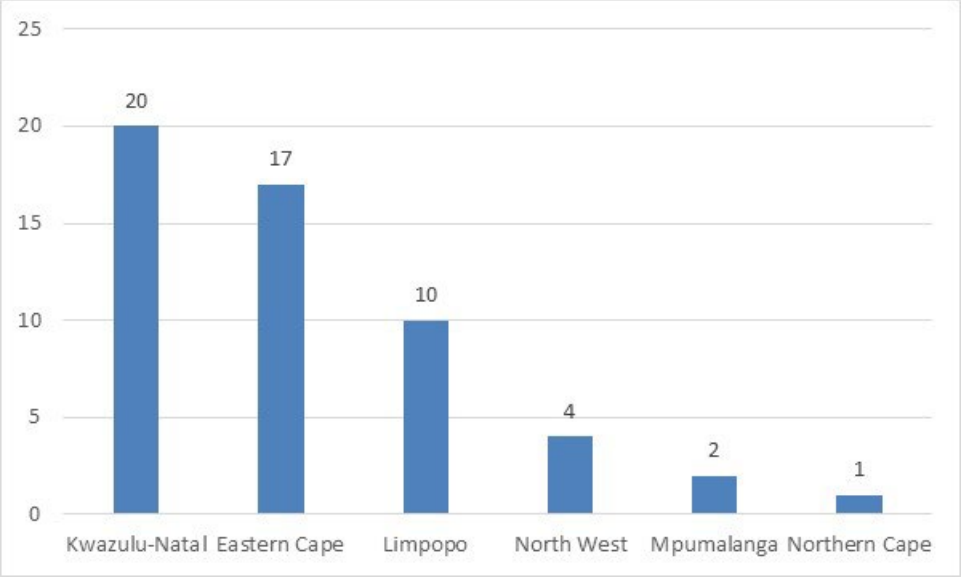

Figure 7: Provincial Distribution of Revenue Constrained Municipalities.
Source: National Treasury (2012)

As per the 2022 LGES formula, the 54 municipalities with a limited tax base consisted of over 2 million households of which 77% was deemed as poor[3]. All these municipalities are category B (local) municipalities and only 4 of them are water service authorities (WSA). Therefore, the corresponding district (category C) municipality provides water services in 50 of these local municipalities.

3.2. Methodology used to Calculate the Revenue Adjustment Component

The section above showed that the RA component of the LGES formula is an index that identifies poorly resourced municipalities (those with a limited tax base) for purpose of allocating the LGES funds. This section briefly describes the methodology used to calculate the RA. While the RA is an index, the basis of the index is the estimation of a municipality's revenue potential from municipal property rates using a representative tax system (RTS) approach with regression analysis. In this approach, a set of indicators (variables) are used to represent a municipality's tax base for property rates and their ability to collect revenues from this tax base is subsequently determined.

Section 227 (2) of the Constitution explicitly states that additional revenues raised by municipalities cannot be deducted from LGES allocations made to them. In addition to its legal precedent, this is also theoretically correct, as the ability of a municipality to collect revenues depends on its financial and institutional efficiency. Total revenues collected by a municipality might not be the most it can collect from its tax base, as inefficiencies in collection may occur. Therefore, the LGES formula uses a scientific method, in the form of the RTS approach to estimate the potential revenues that can be collected given the characteristics of the tax base. This approach accounts for municipal inefficiencies in collecting revenue and thus does not

[3] The LGES formula defines poor households as households earning less than two times the state pension per month for a given year.

reward municipalities with poor revenue collection or punish municipalities with efficient revenue collection.

The approach used in the RA component of the LGES is given by the following equation:

$$y_i = \alpha + \beta_n X_i + e_i$$

In the above equation, y is the actual property rates collected by a municipality while X is a set of explanatory variables that explain the tax base for property rates. The error term (e) accounts for any deviations from the actual property rates (y) from the estimated property rates given by y = f(X). Such deviations will include municipal inefficiencies in collecting revenues. The predicted value of y, as explained by its tax base (y=f(X)) shows the potential revenue that can be collected by a municipality and is used to develop the RA index. Figure 8 shows this concept graphically.

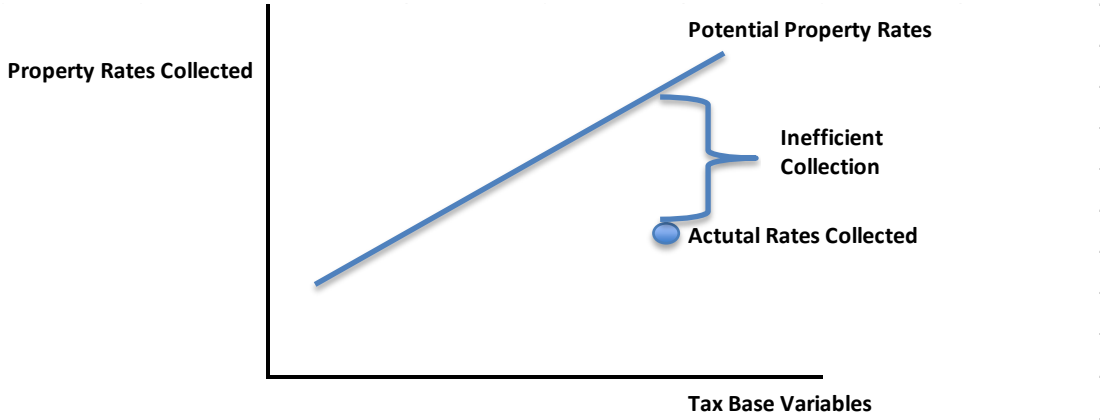

Figure 8: Illustration of Tax Base Regression Concept.
Source: Authors

The regression analysis used in the LGES formula uses the following variables to explain the property rates tax base:

i. Total income of all individuals/households residing in a municipality (as a measure of economic activity and earning)
ii. Total of the reported property values per municipality
iii. Number of households on traditional land per municipality
iv. Employment rate per municipality
v. Proportion of poor households as percentage of total number of households in the municipality

The model is estimated using 2011 Census data, thus the poorly resourced municipalities identified via this process will remain static in the LGES formula until the model is re-estimated.

Property rates, which is a municipal tax, is used as the primary variable to depict the revenue base of a municipality. While municipalities also provide trading services, such as water and electricity, estimating the tax base for these specific services is complex, as there is a degree of cost recovery in the revenue collected from these tariffs. However, the estimation of the property rates tax base uses variables that describe the overall tax base, which will give an indication of the overall ability of communities within the municipality to pay for other services, including water services.

4. CLASSIFICATION OF WATER RESOURCE INFRASTRUCTURE

4.1. Prelude

Frischmann (2009) summarised a demand–side model of infrastructure developed by Kenneth Arrow (1969) that provides a better means for understanding and analysing societal demand for infrastructure resources. This theory facilitates a better understanding of two related issues: how society benefits from infrastructure resources and how decisions about how to manage or govern infrastructure resources affect a wide variety of public and private interests. The key insights from this analysis are that (public) infrastructure resources generate value as inputs into a wide range of productive processes and that the outputs from these processes are often public goods and merit goods that generate positive externalities that benefit society.

Defining Infrastructure from the demand–side

Infrastructure resources are resources that satisfy the following demand–side criteria:

1. The resource may be consumed non-rivalrously.
2. Social demand for the resource is driven primarily by downstream productive activity that requires the resource as an input; and,
3. The resource is used as an input into a wide range of goods and services, including private goods, public goods and/or merits goods.

The first criterion captures the consumption attribute of non-rival and partially (non) rival goods. In short, this characteristic describes the "sharable" nature of infrastructure resources. Infrastructure is sharable in the sense that the resources can be accessed and used by multiple users at the same time. Yet infrastructure resources vary in their capacity to accommodate multiple users and this variance in capacity differentiates non-rival (infinite capacity) resources from partially (non) rival (finite but renewable capacity) resources. Simply put, non-rivalry opens the door to widespread access and productive use of the resource. For non-rival resources of infinite capacity, the marginal costs of allowing an additional person to access the resource are zero. For partially (non) rival resources of finite capacity, the cost–benefit analysis is more complicated because of the possibility of congestion or overuse.

The second and third criteria focus on the way infrastructure resources create social value. The second criterion emphasises that infrastructure resources are intermediate goods that create social value when utilised productively downstream and that such use is the primary source of social benefits. In other words, while some infrastructure resources may be consumed directly to produce immediate benefits, most of the value derived from the resources results from productive use rather than consumption.

The third criterion emphasises both the variance of downstream outputs (the *generic-ness* of the input) and the nature of those outputs (particularly, public goods and merits goods). The reason for emphasising variance and the production of public goods and merits goods downstream is that when these criteria are satisfied, the social value created by allowing additional users to access and use the resource may be substantial but extremely difficult to

measure. The information problems associated with assessing demand for the resource and valuing its social benefits plague both infrastructure suppliers and consumers where consumers are using the infrastructure as an input into the production of public goods or non–market goods. This is an information problem that is pervasive and not easily solved.

4.2. An Infrastructure Typology

To better understand and evaluate these complex economic relationships, Frischmann (2009) provides three general categories of infrastructure resources, illustrated in Table 2, based on the nature of the distribution of downstream activities: commercial, public, and social infrastructure.

Table 2: Typology of Infrastructure.

Type	Definition
Commercial Infrastructure	Nonrival or partially (non)rival input into the production of a wide variance of private goods
Public Infrastructure	Nonrival or partially (non)rival input into the production of a wide variance of public goods
Social Infrastructure	Nonrival or partially (non)rival input into the production of a wide variance of social and merits goods.

Source: Frischmann (2009)

These categories are neither exhaustive nor mutually exclusive. Real–world infrastructure resources often fit within more than one of these categories at the same time. For example, the internet is a combination of all three types of infrastructure. The analytical advantage of this general categorisation schema is that it provides a means for understanding the social value generated by these infrastructure resources and in determining the type of infrastructure being supplied.

4.3. Conceptual Approach and Infrastructure Definitions

It is important to reiterate that this report is focussed only on water resource development (infrastructure) as defined in S56(2)(b) as the costs to investigate, plan, design, construction and pre-financing of infrastructure developments. We propose the classification of such water projects into social and commercial based on the purpose and nature of the water infrastructure investments. We adopt and modify Frischmann (2009) categorisation as presented in Table 2. Infrastructure is considered commercial if it is used as an input in the production of private goods. We modify the social and public definition by combining the two since public and social infrastructure resources are used to produce public goods and social goods, respectively.

The theoretical background in section (2) and (3) provides the basis for classification of users into either social or commercial. The understanding of the different characteristics of the water market provided the rationale for segmenting the demand side of the water market, i.e. the users into different categories. Similarly, one can use the same basis to justify the segmentation of the supply side of the water market (i.e. infrastructure investment) depending on the user of water on the demand side. The basis for classifying a water scheme as a social component

would be the proportion of said scheme that is used to produce social and public goods by social users of water resources.

The classification of water resource schemes and/or projects into social and commercial is based on the users of the water infrastructure investments. To reiterate, commercial infrastructure is infrastructure that is used in the production of private goods while social infrastructure is used in the production of public and merit goods (see Table 2). For both public and social infrastructure, the ability of competitive output markets to effectively generate and process information regarding demand for the required input is less clear than in the case of commercial infrastructure. Due to the similarity for both public and social infrastructure they can all be combined, and, in our case, we refer them as social infrastructure.

Social water project/infrastructure/scheme definition

- The social water infrastructures are nonrival or partially (non) rival input into the production of a wide variance of public goods and social (merit) goods.
- These infrastructures are provided to social water resource users that are not able to pay the full costs of the infrastructure, but that require the infrastructure either because it provides social and economic development according to national development.

Commercial water project/infrastructure/scheme definition

- Commercial water infrastructure resources are nonrival or partially (non)rival input into the production of a wide variance of private goods.
- Commercial water infrastructure provides to economic water resource users that can pay full costs for commercial use.

These infrastructures are proposed on the merit that the significant amount of water that will be supplied will be used to produce the private goods for commercial purposes rather than the access to basic need (social/public good) motive. In line with the definition of commercial infrastructure, commercial water users use water as an input in their production process. Commercial water use includes water used by industry, mining, electricity generation, hydropower, agriculture and forestry users. Many of these projects intend to generate regional economic benefit from the proposed water users and their value chain integrated development objectives.

However, most projects entail both social and commercial components. Therefore, it is important to develop the criteria and guideline that will be used to distinguish the components of the projects.

5. CRITERIA FOR CLASSIFYING WATER RESOURCE INFRASTRUCTURE

5.1. Criteria Framework

The Water World Council (2018) report on "A Typology of Water Infrastructure Projects" proposed classification criteria based on the scope, system, structure, security and sustainability of different projects.

- **Scope** incorporates a range of traditional classifiers including the size and scale of a project, i.e. likely levels of capital commitment, project complexity and government involvement, and its stage in the lifecycle, i.e., from development through to termination.
- **System** incorporates the operating environment for the project, including the role of the public sector in provision, governance and regulatory arrangements, environmental standards, fiscal arrangements, access to local capital, sovereign creditworthiness, devolution and so on.
- **Structure** incorporates project-specific attributes such as ownership arrangements and models of operation, levels of equity and debt, project guarantees, private sector participation, access to financial instruments including green bonds and blended finance.
- **Security** incorporates measures of risk including project development risk, off-taker risk, political and regulatory risk, and currency risk. Includes enforceability of contracts, risk of construction delays and cost overruns, volatility of demand, counterparty, and liquidity risk and so on.
- **Sustainability** incorporates measures of return including financial and non-financial return. Framing could include how the project contributes to the SDGs including reduced poverty, better health, less inequality, decent work, industry and innovation, sustainable cities, etc.

From the general criteria above, some of the stylised factors that can be used in the classification would include the following:

1. The use profile: the socio-economic conditions of the geographical area for which the infrastructure will secure water resources.
2. Contribution/benefits: a commercial project will focus on the increase in the value add and its impact to growth and employment, while the social project will focus on improving the living standard and protecting the society and ecosystem in general.
3. Affordability of users.
4. Sources of market failures: most commercial investments will occur in situations with less market failures and with less price distortion while social infrastructure attempts to remedy areas of market failure.
5. Economies of scale: the cost advantage due to efficiency and the size of the production are important consideration for infrastructure investment in line with demand.

Table 3 shows the criteria to classify a raw water infrastructure project into its commercial and social components derived from the framework and stylised facts above. As has been the argument throughout this report, the primary basis of classifying infrastructure is through the

use of such infrastructure, i.e. the nature of the users of the infrastructure. Depending on the use, other supporting criteria can be applied to determine the nature of the infrastructure. It is important to note that an infrastructure project will exhibit varying degrees of the criteria outlined below and, thus, a raw water project can be classified as social or commercial to varying degrees.

Table 3: Checklist for Classifying Social and Commercial Projects.

S/No.	Criteria	Low	high
A.	**User Assessment Criteria**		
1.	Social users	■	❖
2.	Economic users	❖	■
3.	Affordability of users	❖	■
4.	For public and social/merits goods	■	❖
5.	For private good	❖	■
B.	**Financial Assessment Criteria**		
6.	Cross subsidisation	■	❖
7.	Market failure	■	❖
8.	Commercial viability	❖	■
9.	Expected returns	❖	■
10.	Cost recovery	❖	■
C.	**Impact Assessment Criteria**		
11.	Contribution towards value chain, gross value added and regional growth	❖	■
12.	Contribution towards poverty eradication, social upliftment	■	❖
	❖ Social infrastructures ■ Commercial infrastructure		

Source: Authors' (2021)

The general criteria can be divided into a stepped process to classify infrastructure as follows:

A. The users assessment criteria
B. The financial assessment criteria and
C. The impact assessment criteria.

The primary criteria used to classify raw water infrastructure is the **user assessment criteria**, which defines infrastructure based on its use. As mentioned above, raw water is usually used in the production of goods and services. The social users criterion assesses the percentage share of the total volume of water that is used by social users, which are users with lower affordability using water to produce social/merits goods, which has very little commercial return. Economic users have a greater ability to pay for raw water, as they use such water to produce goods for a commercial return. The social users criterion is complementary to the economic users criterion, such that the sum of percentage of water that is used by the social and economic users will be 100%. As an example, if the percentage of water that is used by the social user is 30% then the project infrastructure is 30% social and 70% commercial. On the contrary, if the percentage of water that is used by social users is 70% then the project infrastructure is 70% social and 30% commercial.

The secondary assessment criteria are the **financial assessment criteria**, which subsequently arise from the nature of the users of such infrastructure (i.e. from the user assessment criteria)

and defines raw water infrastructure based on its financial viability, funding arrangements and productive role in the value chain of markets. As commercial infrastructure is classified as those servicing commercial users that have higher affordability levels. Consequently, such infrastructure is likely to be commercially viable, as the cost of the infrastructure can be recouped from its users. As such, commercial projects are characterised as having little to no (low) subsidization of its initially outlay from the fiscus, can expect higher returns from its use (profitable) and it can recover most, if not all, of the cost of the infrastructure outlay. The contrary applies to the nature of social infrastructure, as such infrastructure serves social users that are characterised by low levels of affordability resulting in such infrastructure being less financially viable.

To reiterate, classifying raw water infrastructure is based on, firstly, the user of infrastructure through the **user assessment criteria**. The nature of the users of infrastructure determines the ability to finance the infrastructure. In this case, the **financial assessment criteria** apply in classifying the infrastructure. The tertiary set of criteria is the **impact assessment criteria** that classifies infrastructure based on its social or economic impact. Commercial projects play a greater role in its impact on the market, value chain of production and gross value added. This is due to this type of infrastructure being used by commercial users towards the production of commercial (private goods produced for a profit) goods that contributes to the value add of markets and the economy. On the other hand, the social component of raw water infrastructure plays a socially betterment role by serving social users (and communities at large) with social and merits goods that have positive benefits to society at large.

The application of the criteria above is sequential and related, thus not all the criteria have to be applied in order to classify infrastructure. The application of the user assessment criteria usually determines the nature of infrastructure. Thus, the user assessment criteria will be applied to an existing raw water scheme to classify the commercial and economic components of the scheme.

5.2. Application of Infrastructure Classification on Existing Water Resource Scheme

Assigning portions of a scheme to a social infrastructure component and a commercial infrastructure component is centred on the users; therefore, the focal point is to identify the portions of the scheme that will service social and commercial users, respectively. During the design of major water resource infrastructure projects, infrastructure implementation plans and feasibility studies provide the demand and projections of future demand of water for different users in both phases of the project. The feasibility studies play a crucial role in providing the important information that can be used in the classification. However, they do not substitute the classification but rather complement it, as not all the information required for classification assessment criteria are found in the standard feasibility studies such as the LGES.

We proposed to use the percentage of total raw water used as registered to each user group to be identified and then we aggregate the percentage of water user groups into social and

commercial to establish the percentage of water that is commercial or social. We apply this classification framework to the **Mkomazi-Mgeni** water scheme.

Table 4. Overview of applying infrastructure classification criteria

S/No.	Water user categories	Classification	Remark
1.	Agriculture	Both social and commercial	Decomposed social from commercial users
2.	Municipal	Both social and commercial	Decomposed social from commercial users
3.	Industrial/Mining	Commercial	
4	strategic Use	Commercial	
5.	Hydropower	Commercial	
6.	Stream-flow Reduction Activities	Commercial	

In Table 4, the percentage of total volume water that goes into industrial, strategic, hydropower and stream- flow reduction activities, users will automatically be considered as commercial. However, the complication comes to percentage that goes into agriculture and municipal users, as each category contains both social and commercial users. We need a factorial variable that would help to disentangle the two components. Thus, we propose to use the LGES index as a factorial variable to establish whether the percentage of total water that is used by the municipality is social or commercial. The LGES index ranges between 0 to 1 (as discussed in section 3), with 0 implying high revenue base while 1 indicating no revenue, with a varying potential of the revenue base within these two extremes. Thus, if a municipality has the index of 0.8 it implies that it can only fund 20% of its expenditure responsibilities from its own revenue instruments (taxes and municipal tariffs). Thus, we can approximate that 80% of this municipality's revenue base consists of municipal customers that cannot pay for municipal services. As a result, it is unlikely that the municipality will recoup the cost of potable water provision from these customers. Therefore, it is logical to appropriate 80% of total raw water used by that municipality to provide potable water to social users and only 20 percent to commercial users. In most cases, the water schemes serve more than one municipality and, in such instances, a detailed decomposition per municipality (basing on the amount of water that is used by each municipality) must be provided and then aggregated to establish the social and commercial components separately. For the Umgeni scheme the Table 5 provide the calculation of the factorial variable:

Table 5: Factorial variable calculation

S/No.	Municipality	LGES score 2018	% Social Users
1.	eThekwini Metropolitan Municipality	0	0
2.	iLembe District Municipality	0,65	65%
3.	Ugu District Municipality	0,73	73%
4.	Harry Gwala District Municipality	0,83	83%
5.	uMgungundlovu District Municipality	0,38	38%
6.	Msunduzi Local Municipality	0,15	15%
7.	King Cetshwayo District Municipality	0,1	10%
	Average LGES	**0,40**	**40%**

Source: Umgeni Water. (2022). Umgeni Water Corporate Profile. Available on: https://www.umgeni.co.za/about/

Table 5 shows a list of 7 municipalities that are supplied water by the **Mkomazi-Mgeni** water scheme. It's a classic example whereby the project cuts across several municipalities (WSAs/WSPs), The LGES revenue adjustment score for each respective municipality as provided in 2018 are provided in column (3). The percentage of water resources that goes to municipal social users (the municipalities identified as having a limited revenue base) should be used to determine the classification and its implications on the funding model. However, we could not get the data on the volume of water for each municipality that could be used to decompose the social and commercial per municipality. As a result, we use the average LGES RA score to provide an indication of the municipal user category that is social users. As indicated in Table 5, the average LGES RA score is 40%. Therefore, we assume that 40% of raw water used by municipalities from this scheme is used to produce social and merits goods to user that cannot pay for such services.

We proposed the use of LGES RA index for two reasons,

1. It stays fixed for many years once it is established. Therefore, there will be no need of reclassification within a short period of time. This fact provides a more consistent classification which allows for both short-run and long-run planning and easily supports alignment of the infrastructure planning to other development plans.
2. We acknowledge that there could be some social and economic dynamics that would influence the income and therefore affordability. However, average poverty, in most cases, have stayed static in absolute terms with household on the margin that benefits while some loses as a result of the changes, therefore, in general using LGES index is valid argument.

Table 6 provides the general procedures for applying the infrastructure classification criteria on an existing water scheme. We provide the empirical classification example on a case study

of **Mkomazi-Mgeni Water Transfer Scheme**[4]. It is important to reiterate that the social component includes the portion of raw water used by municipalities identified as social users as per the LGES RA index provided for in Table 5.

Table 6: A Case Study from Mkomazi-Mgeni Transfer Scheme.

In-basin demands	Million m^3/annum	% Natural MAR	% Utilised MAR	Classification	% Social use	% Commercial use
Domestic	2,17	0,2	1,02	Both Social and Commercial	1,02*0.4= 0,41	1,02*0.6= 0,61
Agriculture	161,02	15,1	75,53	Both social and Commercial	75,53*0.4= 30,21	75,53*0.6= 45,32
Industrial	50	4,7	23,45	Commercial		**23,45**
Subtotal of utilised MAR	213,19	44,9	100		**30.62**	**69.38**
Available MAR	852,81	55,1				
Total Natural MAR	1066	100				

Source: Authors' (2022) data extracted from Mkomazi Main Report (1999)
Note: No data was available for water use by subsistence and commercial farmers. As a result, assumptions were applied to this category.

The original demand projection for user groups is provided in Appendix A. The water user groups in Table 6 are based on the recent categorisation of groups as per the 2015 revised strategy, with the agriculture group being the sum of irrigation, forestry and livestock. The demand projections are given in column (2) measured in million M^3/annum, while the percentage of the total potential are presented in column (3) measured in mean annual runoff (MAR). However, it can be noted that only 44,9 of the potential MAR is utilised and thus we use this as the total raw water that will be consumed and make the percentage of the users based on the subtotal of utilised MAR, which is presented in column (4). Column (5) presents the classification of users as per our definitions. It can be noted that the domestic user group has both components of social and commercial due to the presence of resource constrained municipalities and resource poor farmers[5] which points to social users of raw water, as explained above.

The FIBC is only intended to finance the costs of investigation, planning, design, construction and pre-financing of new infrastructure and the betterment of already existing infrastructure for ***social and economic development stimulus infrastructure*** which includes schemes where there is supply to domestic users that is associated with basic water requirements, whether this is the entire scheme in an identified area or a portion of a municipal supply system. As per the

[4] The 1999 Mkomazi-Mgeni feasibility study was not a good resource to use to provide an empirical example, with the report being more than 20 years old a lot has changed from water user categorisation to the standard feasibility variables. The efforts to get a latest and more appropriate version of a feasibility study from stakeholders were not successful due to a lack of response despite continuous follow-ups.
[5] Resource poor farmers is a person who owns or manages a farm on which they grow crops or raise livestock sufficient only for their own use, without any surplus for trade.

discussions across this report, domestic users that are intended to benefit from investments through the FIBC funds on social and economic development stimulus infrastructure are areas where there are municipalities with limited revenue bases, as identified in the LES formula. These identified areas will be funded through a combination of the national charge relating to future infrastructure build and support from the fiscus to fund the social component of the infrastructure. All water resource users, regardless of user classification, will contribute equally to this charge subject to the FIBC calculations.

In addition to domestic users, industry is also considered to include schemes where infrastructure that will provide for future commercial water use for which there are currently no users or for which the existing users cannot afford the water supply (such as resource poor farmers), but where the water supply is necessary to provide for future economic development. Commercial use will be funded by the FIBC charge and not the fiscus. The full FIBC will be charged to all users as a tariff.

6. ASSESSMENT OF THE MINISTERS ROLE IN CLASSIFYING WATER PROJECTS

The draft 2015 strategy suggested the process of the classification of the projects into social and commercial should be done solely at the Minister's discretion (Section 56 in NWA, 1998). The rationale for this requirement was questioned during the consultation processes for the draft strategy. Therefore, this report assessed the appropriateness of this clause in the current strategy through assessing the strengths and weaknesses of this approach against an alternative. The basis for this assessment was the focus group discussions and interviews with the key stakeholders. The assessment is summarised in Table 5 below.

Table 7: Stakeholders Comments on Minister Sole Discretion.

	Minister sole discretion	Practical guideline
Description	The decision is carried out based on the wisdom or manner which involves subjective judgement.	The decision is carried out based on the facts as presented which involves fixed guidelines, criteria and objective measurements for objective judgement.
Strength	• The decision-making process is easy as is less structured.	• Decision is data driven and highly structured. • It avoids information asymmetry and moral hazard. • It aligns with the principle of fairness, transparency and accountability. • No room for bias and manipulation.
Weakness	• Subjected to personal preferences perceptions and emotions. • Room for biases and manipulations. • Information asymmetry and moral hazards. • Low transparency and accountability.	• High degree of complexity as far as data collection and analysis is concern, since many variables come to play.

Source: Authors' (2022)

Given the proposal used to identify social and commercial users of water resources, it is recommended that the Minister utilises the objective and scientific criteria proposed in this report to determine the classification of infrastructure. The use of this criteria ensures a transparent and objective classification process. Once a classification is done, it is proposed that the Minister consult with the Minister of Finance and the Minister of Cooperative Governance and Traditional Affairs, to ensure that the financing implications and the application of the LGES index is appropriately addressed. The indicators and basis for classification approved will be applied to annual infrastructure capital expenditure plans as per the 10-yr Infrastructure Plan and tariffs will be approved annually though the processes as required by the Treasury Regulation for Trading Entities.

7. PROPOSALS FOR THE REVISED STRATEGY

The WRC commissioned this research to assist towards the finalisation of the 2015 version of the national pricing strategy for water use charges. The 2015 strategy was not clear on the definitions of social and economic users of raw water and a set of criteria to classify water resource infrastructure into its social and commercial components. This classification is important in determining the funding arrangement for current and new raw water infrastructure and to inform the roll-out of new infrastructure to promote social equity and future economic growth.

This report provided the theoretical foundations and principles to classify raw water users and raw water infrastructure. It also provided definitions with clear guidelines and criteria that will be used to classify the social and commercial water users and projects. Based on the research, the following is recommended to the Department towards the finalisation of the strategy:

1. The Department should adopt the definitions provided in this report to define social and commercial users of raw water based on the nature of the use. Given that raw water is generally used towards the production of goods, it is proposed that social users be defined as users of raw water that produce public, social and merit goods, which benefit society, in general, and the poor, in particular and commercial users be defined as users that use raw water to produce private goods

2. Applying the definitions above, the Department should consider the classification of the six water resource user categories outlined in this report and use such a classification to determine users that will be liable for user charges towards funding raw water infrastructure

3. The Department should note that the agriculture and municipal water use categories contain specific users within each category that can be classified as both social and commercial users

4. The Department should consider using the revenue raising adjustment factor in the local government equitable share to determine social municipal users of raw water. As such, there are currently 54 municipalities identified in the LGES formula as having a limited revenue base and is resource constrained

5. It is recommended that social users of raw water, as defined in recommendation 4, should not be liable for user charges but should be liable for a national charge in the form of the FIBC. Water use in the 54 poorly resourced municipalities should form the basis for the FIBC national charge

6. It is recommended that areas that fall within these 54 municipalities should be targeted for infrastructure investment through funding from the FIBC and the fiscus

7. It is recommended that the raw water infrastructure be classified into social and commercial components using the stepped criteria approach proposed in this document. The primary criteria that should be used to classify infrastructure is the share of such infrastructure used by social users and commercial users respectively.

8. It is recommended that the Minister utilises the objective and scientific criteria proposed in this report to determine the classification of infrastructure. The use of this criteria ensures a transparent and objective classification process. Once a classification is done, it is proposed that the Minister consult with the Minister of Finance and the Minister of Cooperative Governance and Traditional Affairs, to ensure that the financing implications and the application of the LGES index is appropriately addressed. The indicators and basis for classification approved will be applied to annual infrastructure capital expenditure plans as per the 10-yr Infrastructure Plan and tariffs will be approved annually though the processes as required by the Treasury Regulation for Trading Entities.

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Appendix

Appendix Table 1:

S/No.	In-basin demands	Million m^3/annum	% Natural MAR
1.	Environment	265,12	24,87
2.	Irrigation	69,1	6,48
3.	Forestry	83,32	7,82
4.	Industrial	50	4,69
5.	Livestock	8,6	0,81
6.	Domestic	2,17	0,20
	Subtotal of utilised MAR	478,31	44,87
	Available MAR	587,69	55,13
	Total Natural MAR	1 066	100,00

Mkomazi Main Report (1999)