PROTECTING AND UNLOCKING JOBS THROUGH WATER STEWARDSHIP: A CASE STUDY LINKED TO THE UMBOGINTWINI INDUSTRIAL COMPLEX, ETHEKWINI

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Trade & Industrial Policy Strategies (TIPS) is a research organisation that facilitates policy development and dialogue across three focus areas: trade and industrial policy, inequality and economic inclusion, and sustainable growth

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ABOUT THIS PUBLICATION

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It is complemented by a Synthesis Report and two other case studies on:

- Essential Amathole: A Case Study of Unlocking Green Jobs in the Bioprospecting Sector; and
- Unlocking and Retaining Jobs in the Alien Vegetation Added Value Chain through Industrial Symbiosis: Case Study on Wood Pellets.

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- A Project Steering Committee, including Glenda Raven (WWF-SA); Gaylor Montmasson-Clair (TIPS); Eureta Rosenberg (Rhodes University, Environmental Learning Research Centre), and Olivier Grandvoinet (Agence Française de Développement [AFD]);
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"Based on water Reconciliation Strategy studies, surface water availability and its remaining development potential will not be sufficient to support the growing economy and associated needs in full." (National Water Resource Strategy II, 2013)

"Alleviating constraints to development requires an integrated, systems approach to economic development and water resources planning. This approach will need to recognise the interdependent nature of water resources and economic development…" (GreenCape, 2015)

"Good water stewards understand their own water use and catchment context… Shared water challenges represent opportunities to create shared value through collective action" (Alliance for Water Stewardship, in the AWS Standard)

"Water stewardship brings with it the explicit responsibility of each actor to contribute to the public good, a central tenet of the concept which raises a question: where there is a tension between individual and collective interests – where the need for a trade-off presents itself – will a given corporate (or other water steward) pursue its individual objective or opt for collective benefit?" (Newborn and Dalton, 2016)

EXECUTIVE SUMMARY

Much of the framing of the relationship between water and development in South Africa has been based on the assumption that while water is essential for development, its availability is not a constraint on development. In a global economy firms derive competitive advantage by sourcing inputs, including energy, water and labour, in ways that reduce the cost and risks associated with these inputs. At the same time governments need to manage developmental processes in ways that create economic value, including business profits, tax income and job creation, while simultaneously enhancing social justice and environmental sustainability. Where the demand for water starts to approach the available supply, investments will be required to increase the supply and reduce the demand. At some point trade-offs need to be made by government on how to allocate a scarce resource. This allocation is made more complex by the need for water to maintain ecosystems and the fact that access to water is seen as a basic human right required to sustain life. Given recent estimates (WWAP, 2016) that three out of four jobs in the global workforce are heavily or moderately dependant on water, constrained or expensive water supply is therefore a significant threat to existing jobs. However, managing water resources may also have the potential to create jobs as the value of water increases. This review explores both the significance of jobs at risk in South Africa and the potential to protect and create jobs through water stewardship.

At the global level South Africa is ranked as the 30th driest country in the world and is a highly water stressed country (WRI, 2015). This scarcity is created not only by a lack of economic resources to develop and use available water resources. It extends to physical scarcity where there is, or is about to be, inadequate natural water resources to supply the country's demand.

It is estimated that by 2030 South Africa will have a water deficit between supply and demand of 17%. Given that there are many countries in the rest of the world that have sufficient water, or where the current scarcity is economic scarcity rather than physical scarcity, it is extremely likely that water scarcity will become an increasingly influential consideration in where companies locate their operations or source resources for their supply chains. This will have significant implications for South Africa's ability to create jobs.

In this context South Africa will need to make a number of decisions related to managing and increasing supply, reducing demand and re-allocating where water is used to achieve strategic goals. Increasing supply can include more traditional responses such as building dams and desalination but could also include better management of catchments, reuse and recycling of water and better management of wastewater.

Reducing demand could include reducing losses such as leaks, increasing efficiency in agriculture, industry and domestic use, changing energy provision to low water use sources and matching water quality to the purpose for which it will be used. As the costs associated with the different options rises, and sensitive issues related to leaving water in the system for ecological functioning or providing water as a human right for basic needs become more pressing, it will be necessary to make trade-offs between water uses and thus the sectors to which water is allocated.

The greatest potential for trade-offs will be between different commercial uses of water. These can be considered at different levels of detail but most simply between irrigated agriculture and commercial and industrial consumers. The question that emerges is on what basis does a country make these trade-offs. One possibility considered in this review is to make the decisions on the basis of benefits relative to costs. One example of this is to consider the gross domestic product (GDP) per water unit or Rands generated per cubic metre (m^3) of water used. Another possibility is to use employment per water unit or number of jobs per m^3. In R/m^3 and jobs/m^3, the commercial and industrial sectors far outperform the agricultural sector (R489/m^3 relative to R3/m^3 and 1746/m^3 relative to 134/m^3 respectively). However, this simple cost benefit analysis ignores important considerations about linkages between sectors and the social impacts of moving water from one sector to another.

Given the high number of variables, all of which will have varying impacts as different decisions are made, it was not possible to provide a definitive number for jobs that would be protected, lost or created due to water scarcity or the implementation of a particular water management model. Rather what this review does is suggest that water stewardship, which increases supply through better catchment management and reduces demand through greater water efficiency, is likely to be an important contributor to addressing water scarcity in South Africa. The job creation potential directly related to water stewardship is therefore explored. The issue of water allocation between sectors is a highly political process with a wide range of considerations and variables that cannot be reduced to simple cost-benefit analysis. However, given the complexity of modelling all of the variables, a decision was made to present a number of scenarios and their implications for job protection, creation and loss. These scenarios are intended to be used to stimulate discussion and to raise some of the pressing issues around job creation related to water supply, demand and allocation.

To better understand the variables and how they may impact a particular situation, a case study that linked business, government and civil society was identified and examined. This case study is located within the Mbokodweni catchment in the southern part of the eThekwini Metro in KwaZulu-Natal. The case study explores the interaction between a number of community groups involved in water catchment management (and other socio-ecological initiatives) in the Mbokodweni catchment and the Umbogintwini Industrial Complex. This complex houses 12 major companies and more than 50 smaller businesses, and extracts water from the Mbokodweni river to support operations within the complex. Over the past three years the owner of the industrial complex, namely AECI, and various levels of government have worked with a community initiative called Wise Wayz Water Care (WWWC) to better manage a part of the Mbokodweni catchment directly upstream from the industrial complex. Based on insight from this case study, a systems diagram reflecting the interactions and interests of different roleplayers was developed.

Some key leverage points were identified through this systems approach. These included the importance of both efficiency within the factory fence and catchment protection, and community engagement beyond the factory fence. It also highlighted the important role that government is likely to play in allocating water to different sectors to maximise taxable income and maintain social

cohesion. This social cohesion will be influenced by both access to services, including water, that enable a safe and healthy community, and access to jobs that enable communities to access basic needs including housing, food, education and transport.

Some of the obstacles to better water management that were identified within the contextual review and case study include:

1. Government is still mainly working on the assumption that water supply is not a limiting factor since supply can be guaranteed through investment in infrastructure (e.g. dams).
2. Supply enhancement through catchment management is mainly being conducted through the Extended Public Works Programme (EPWP) and CSR programmes, thus resulting in the jobs being temporary and uncertain. In fact, the assumption is that the jobs are short term and that participants should become self-financing or externally employed in a relatively short time frame, usually one to two years.
3. The lack of financial instruments to pay for water supply measures such as catchment management means there is no financial incentive for business or communities to become involved in catchment management.
4. The low price of water means that internal efficiency interventions in agriculture, industry and the domestic sector is seeing diminishing returns with many of the financially viable options having already been implemented.
5. Water use licences appear to be allocated on a first-come, first-serve basis rather than careful consideration of the most beneficial use of the water.
6. Complex modelling on the socio-economic-ecological implications of water allocations is hampered by outdated and incompatible data.

Based on these identified obstacles to decision-making and the ability of decision-makers to understand the implications of these decisions on jobs, a number of possible advocacy interventions have been identified. These include:

1. Highlight the potential implications of a 17% water deficit by 2030 through direct links to the impact that this deficit is likely to have on jobs, a key challenge the country currently faces. This includes developing both systemic representations and scenarios around which to engage key roleplayers in dialogue.
2. Advocate for a longer-term view of water stewardship work that occurs in catchments and that contributes to water supply. For decent jobs to be created, it will require that this kind of work be viewed as permanent employment beyond the short-term EPWP and CSR project cycles.
3. Numerous reports have been developed highlighting the need for some kind of financial mechanism for paying for ecosystem services and the water in ways that reflect the value created by these activities. This work urgently needs to be developed further and implemented.
4. An increase in the price of water will be required to make ongoing investment in water efficiency more attractive to water users.

5. The allocation of water needs to be done based on a more careful consideration of the socio-economic-ecological implications of this allocation. By providing scenarios, more nuanced discussions may emerge to refine decision-making processes and outcomes.
6. A case being made for developing the data sets required to make more informed decisions about water management and allocation.

In terms of job creation, it is evident that as water becomes a limiting factor within South Africa there are likely to be a number of implications. These include:

1. It is extremely likely that, given the high percentage of water that irrigated agriculture uses relative to the GDP and job creation per unit of water, further limitations are likely to be placed on the amount of water allocated to this sector. This is likely to result in job losses in this sector. This in turn will require reskilling to support a just transformation as this occurs. (One option may be developing no-till rain fed agriculture.)
2. At a global level it is also likely that companies requiring highly water dependent inputs into their supply chains will look to reduce costs and risks by sourcing these inputs from countries that have higher levels of water security. Again, it will be important to start to identify these sectors and plan to make them more competitive/ efficient or start a process of supporting a just transition into other sectors for vulnerable workers.
3. Existing EPWP and CSR programmes provide the basis from which to build longer-term career paths in catchment and water management. If and when financial mechanisms are put in place to support this kind of work, the skills need to be developed to fill the emerging job opportunities. There is significant job creation potential if the financial mechanisms recognise the value of water.
4. It is unlikely that water efficiency work within agriculture, industry or the domestic sector will create significant job opportunities. However, it is likely that existing farmers, plumbers, process engineers and artisans will require upskilling in terms of identifying and responding to water inefficiencies within these sectors and addressing them through implementing new techniques and technologies.
5. By enhancing supply through the better management of catchments, and reducing demand through efficiency and better allocation of water use, it will be possible to avoid the situation that water becomes a limiting factor in our development as a country. This has the potential to create many jobs into the future. The use of scenarios may help us to think through how we get to this point, which kinds of jobs may be created, and potentially how many.

Based on the insights from both the national context and the more local implications identified within the case study, four scenarios were developed. These scenarios are built along two main axes.

The first axis relates to the level of water stewardship implemented. This varies from narrow stewardship focused on internal efficiencies to broad water stewardship that includes both internal and external (beyond the fence) efficiency and catchment management.

The second axis relates to the level of water stress and varies from minimal water scarcity where it is possible to balance supply and demand with no regrets investment in water stewardship to major water scarcity that requires a fundamental reorientation of water use including recycling most water, using fit for purpose water, and initiatives such as revamping wastewater treatment plants.

Based on these two axis the four scenarios are as follows:

1. This is the baseline using existing figures. Some internal efficiency gains are assumed, limited and short-term EPWP and CSR kind projects are assumed, and current allocations across sectors are assumed. (Current supply 15 billion m^3 a year).
2. There are diminishing returns on internal efficiency, and there is growing tension resulting in water being taken from the agricultural sector and made available to the other sectors. (Supply by 2030 reaches 16 billion m^3 but demand is for 17.7 billion m^3).
3. Water stewardship initiatives implemented both in terms of efficiency and catchment management allow South Africa to match demand of 17.7 billion m^3 in 2030.
4. Water stewardship expands significantly into water reuse and recycling at levels fit for use. Substantial investment in the water sector enables South Africa to match demand of 19 billion m^3.

The challenge in putting any figures to these scenarios, or in fact any project on jobs and water interactions is that as Turton (2015) notes: “Since 2004 little planning information has been gathered. In addition, no updated water account – a record of water use, allocation, and supply at a specific moment in time (similar to a financial balance sheet) – has been made available since 2000.”

Given these data challenges this review represents a first pass at developing a framework for understanding the potential, blockages and possible approaches for protecting, creating and transitioning jobs that are highly or moderately dependent on water. Through a process of consultation and advocacy it is proposed that the insights developed so far are refined and that data availability and gaps are identified with experts and key roleplayers from the government, business, academic and civil society sectors.

TABLE OF CONTENTS

ABBREVIATIONS

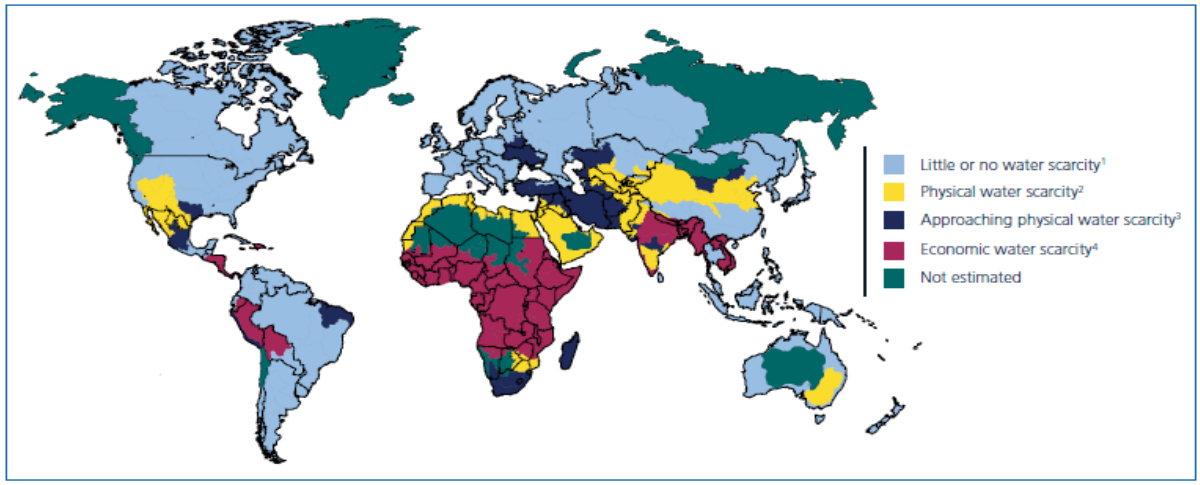
AECI CEDT	AECI Community Education and Development Trust
AFD	Agence Française de Développement
AOS	Acacia Operations Services
AFD	Agence Française de Développement
AWS	Alliance for Water Stewardship
CAWMA	Comprehensive Assessment of Water Management in Agriculture
CDP	Carbon Disclosure Programme
CSI	Corporate Social Investment
CRS	Corporate Social Responsibility
DWA	Department of Water Affairs (now DWS)
DWS	Department of Water and Sanitation
EPWP	Extended Public Works Programme
GDP	Gross Domestic Product
IWMI	International Water Management Institute
SAMs	Social Accounting Matrices
TIPS	Trade & Industrial Policy Strategies
UIA	Umbogintwini Industrial Association
UIC	Umbogintwini Industrial Complex
UN	United Nations
WBCSD	World Business Council for Sustainable Development
WRG	Water Resources Group
WRI	World Resources Institute
WWAP	World Water Assessment Programme (UN)
WWWC	Wise Wayz Water Care
WWF-SA	World Wide Fund for Nature, South Africa

1. INTRODUCTION

In a UN report (2016) entitled *Water and Jobs*, it was estimated that, globally, three out of four jobs are heavily or moderately dependant on water. More specifically 95% of jobs in agriculture, 30% of jobs in the industry sector and 10% of jobs in the service sector are heavily dependent on water. Based on these figures the report (using 2014 figures) calculated that 1.35 billion jobs or 42% of the world's total active work force are heavily dependent on water. In addition, a further 5% of jobs in agriculture, 60% of jobs in the industry sector and 30% of jobs in the service sector are moderately dependent on water. In total, 1.15 billion jobs or 36% of the world's total workforce are likely to be moderately water dependent while 78% of the jobs constituting the global workforce are water dependent.

Given this extremely high reliance on water for the creation of jobs (and the water needed to ensure the ongoing functioning of ecosystems and the basic human right to water for life and hygiene), the availability of water should be a high priority in economic, social and environmental planning.

Figure 1: Global physical and economic water scarcity



Notes:

[1] Little or no water scarcity. Abundant water resources relative to use, with less than 25% of water from rivers withdrawn for human purposes.
[2] Physical water scarcity (water resources development is approaching or has exceeded sustainable limits). More than 75% of river flows are withdrawn for agriculture, industry, and domestic purposes (accounting for recycling of return flows). This definition – relating water availability to water demand – implies that dry areas are not necessarily water scarce.
[3] Approaching physical water scarcity. More than 60% of river flows are withdrawn. These basins will experience physical water scarcity in the near future.
[4] Economic water scarcity (human, institutional, and financial capital limit access to water even though water in nature is available locally to meet human demands). Water resources are abundant relative to water use, with less than 25% of water from rivers withdrawn for human purposes, but malnutrition exists.

Source: International Water Management Institute, 2007

The global map in Figure 1 gives a high-level picture of water availability related to demand. This relationship is key since dry areas may not have high demand and therefore little scarcity. What is immediately apparent is that many areas in the world have abundant water relative to use. South Africa is not one of these and is approaching physical water scarcity, meaning that more than 75% of river flows are withdrawn for agriculture, industry and domestic purposes. In fact, it is estimated that more than 95% of the water resources are allocated to use and demand is still growing.

At a global level there is little information on the extent to which water considerations are driving investment decisions. Some anecdotal evidence is starting to emerge through the CDP (previously Carbon Disclosure Programme). The following quote is illustrative of this point.

> "Companies are talking more openly – more than even two years ago – about the possible option of re-locating production or processing plants because of water problems. As an example of water and related factors weighing on a company decision regarding the viability of its operations in certain locations, Pepsi-Co states in its disclosure to CDP in 2014: 'We have experienced situations where lack of water availability and the resulting environmental, social and financial impacts have outweighed the business benefit of keeping a manufacturing site open and we have therefore closed the plant'." (Newborn and Dalton, 2016)

Some "tough decisions at the public policy level will have to be worked out in concert with producers" (McKinsey, 2009, p.104). For example, "in many cases, it may be more efficient to 'relocate' some crops like 'grain' to areas where water is less scarce' or to 'import those crops', so as to reduce water demand within the national territory" (McKinsey, 2009, p.104). The 2016 World Bank report *High and Dry – Climate Change, Water and the Economy* (World Bank, 2016) notes: "With water in short supply, there will be changes in what is produced" and "where it is produced". Davis, Rulli, Seveso and D'Odorico (2017) suggest that "reshaping the global distribution of crops within current rain-fed and irrigated croplands based on total water consumption, would feed an additional 825 million people while reducing the consumptive use of rainwater and irrigation water by 14% and 12%, respectively".

Even a quick look at the map showing physical and economic water scarcity makes it very clear that South Africa is not well positioned when it comes to water availability. There will be substantial pressure on government and business (including agriculture) to address water issues if the country plans to continue attracting new water-reliant foreign companies. Even companies within the country are starting to consider these issues carefully, as illustrated by this quote from a representative of a large South African-based company:

> "The water supply in the basin where the company's principal plants are located is adequate now, but with the country, it seems, entering into a dryer period, future supplies cannot be guaranteed." (Newborn and Dalton, 2016)

The implications of this global picture on the relationship between water and jobs cannot be ignored in South Africa where addressing water scarcity and job creation are both pressing issues. This study provides a first pass at identifying and framing some of the key issues for discussion with roleplayers from government, business and civil society.

The purpose of this contextualised case study is to clarify the links between water as a resource and job creation. Water stewardship is used to frame the on-site (in this case, the Umbogintwini Industrial Complex) and catchment-based actions (in this case, the Wise Wayz Water Care). This context, framing and case study will be used to identify the potential to protect and unlock jobs through water stewardship. This will include an analysis of obstacles to job creation and advocacy work with stakeholders on the removal of these obstacles.

2. NATIONAL CONTEXT: WATER AS A RESOURCE FOR ECONOMIC DEVELOPMENT

Much of the framing of the relationship between water and development in South Africa has been based on the assumption that while water is essential for development, its availability is not a constraint on development. (DWA 2010 cited in GreenCape, 2015) This assumption reflects a view that new supply sources can be secured through dams, inter-catchment transfers and desalination and that water quality issues can be dealt with through new treatment works.

There are at least three issues that challenge these assumptions and views. First, South Africa is predicted to have a substantial supply to demand deficit by 2030. Second, infrastructure development will come at a substantial cost that will increase the cost of business. And finally, tough trade-offs will be required between social needs, the ecological reserve and economic development, all of which are linked in a complex water system.

Before looking at water demand and supply it is sobering to apply the global percentages of water dependency of jobs to the South African employment data to get an indication of the impact that water scarcity would have.

Table 1: Jobs-water dependency ratio

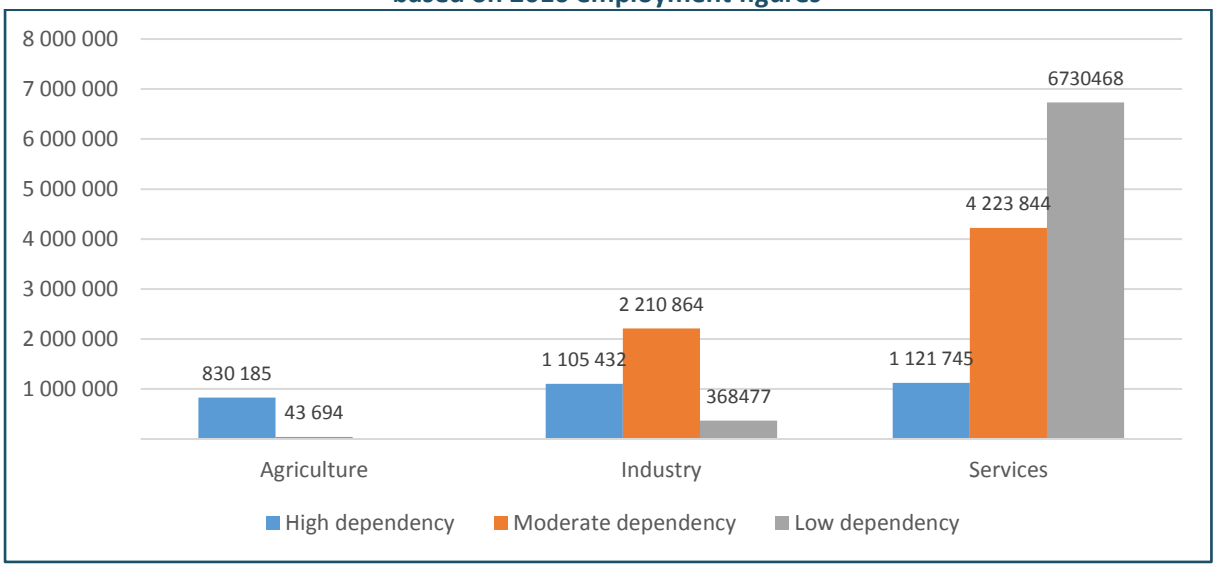
	Degree of dependency	
	High	Moderate
Agriculture	95%	5%
Industry	30%	60%
Services	10%	30%

Source: WWAP (2016)

These degrees of dependency (Table 1) were used to estimate the number of jobs that are highly and moderately water dependent in South Africa. Based on the 2016 employment figures, these estimates are presented in Figure 2.

The agricultural sector has the greatest proportion of high water dependency, with about 830 185 jobs falling in this category. Industry, with 30% of the jobs being highly water dependent, gives a figure of 1 205 432 jobs. In the services sector there is a relatively low dependency on water with about 10% of the jobs being highly-water dependent, though it is a high figure in terms of numbers as this constitutes about 1 121 745 jobs. It can be estimated that 3 057 362 jobs are highly water-dependent, which shows the extent of impact a water shortage would have on the South African labour force.

Figure 2: Number of jobs shown by degree of water dependency based on 2016 employment figures



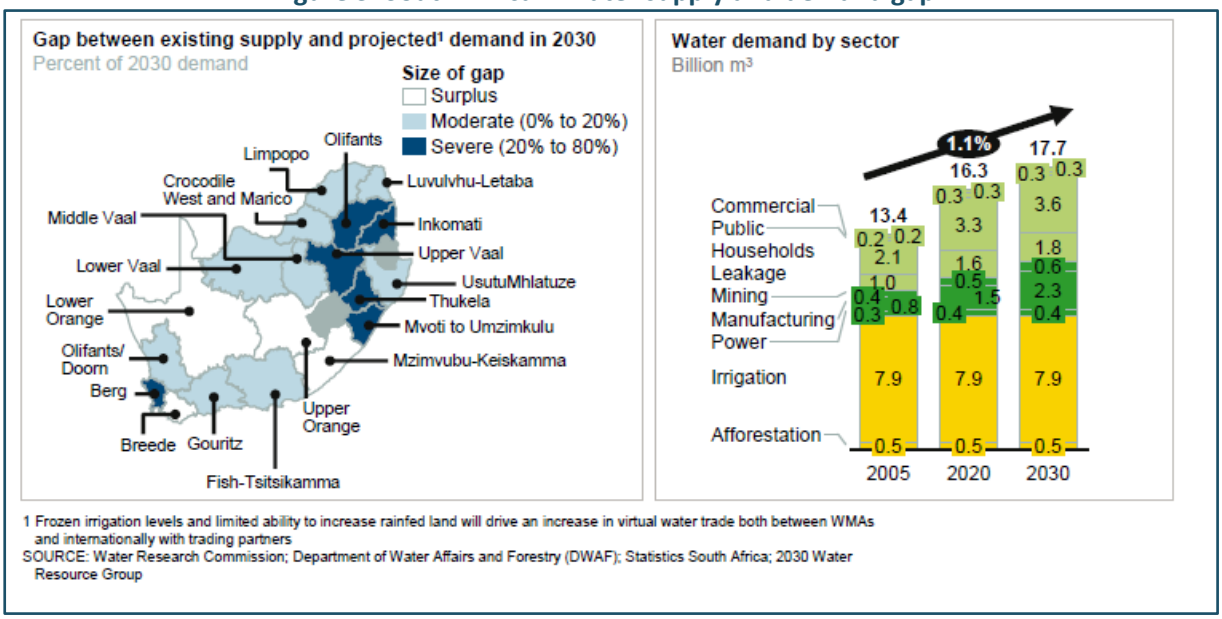
Source: Authors, based on data from Stats SA (2017)

Current (2017) water supply in South Africa amounts to 15 billion m^3 and demand is projected to rise to 17.7 billion m^3 by 2030. This will result in a shortfall between water supply and demand of 17% by 2030. "Even though this shortfall is significant, it is likely to be an underestimate as it excludes uncertain impacts of climate change and the declining water quality in the country." (Askham and Van der Poll, 2017)

It must be emphasised that the shortfall will act as a constraint on development since other than reducing the ecological reserve, or denying citizens access to the social reserve, it is not possible to go into water deficit. Of course the water resources are not spread evenly across South Africa and thus, while some areas may have a surplus, others will experience shortages of between 20% and 80%. "Because of this estimated shortfall, businesses will need to anticipate disruptions in water supply, and face higher water bills and more stringent water regulations." (ibid)

The National Water Resource Strategy II (DWA, 2013) estimates that R700 billion will be needed in capital investment in new water infrastructure, in the refurbishment of existing infrastructure and in sustainable water management programmes to respond to water quantity and quality issues over the next 10 years. To put this in perspective, an equivalent of R70 billion will be required per year compared to the total budget of R10.2 billion allocated to the Department of Water and Sanitation in the 2013/14 financial year. This will require substantial investment by the private sector to keep the water flowing and clean.

Figure 3: South Africa – Water supply and demand gap



Source: WRG, 2009

Given the very significant shortfall in funding available for investment in water infrastructure and sustainable water management programmes, some catchments will experience significant water shortages. Due to the relatively low cost of water (which does not reflect the value of water) and its high volume, it is prohibitively expensive to transport large quantities over great distances unless gravity feed systems (into existing water courses) can be used. Competition between uses and users will become an increasing reality with social needs, the ecological reserve and strategic industries (such as power generation), mining, manufacturing, agriculture and a range of other economic sectors.

How allocation decisions are made in the context of scarcity, cost and competing demands is likely to be a deeply political process with underlying mechanisms varying from economic modelling to arguments for socio-ecological justice. In South Africa, the current unemployment rates and the poverty and inequality implications will mean that the issue of jobs will play a central role in these decision-making processes. In terms of economic modelling, calculations based on productivity (product units/m^3 of water) have been used at the macroeconomic level to calculate GDP generated per unit volume of water nationally. It has also been used to calculate jobs per unit volume.

Water efficiency calculations have tended to be used at more micro-scales, for example, within an industry sector to calculate and compare the volume of water used per product produced. Both of these calculations are likely to become increasingly important as allocation and water licensing decisions are made into the future.

Table 2: Example of Productivity Assessment

Sector	Gross Domestic Product per water unit (Rand /m3)	Employment per water unit (number / million m3)
Urban sector: commercial and industrial consumers	R498.8	1746
Rural – subsistence agriculture	R0.9	22
Commercial irrigation	R2.8	134
Commercial forestry	R2.0	57

Source: GreenCape, 2015

The issue with the above mentioned metrics is that the use of GDP as a proxy for development and even the use of jobs as a proxy for addressing poverty are extremely problematic. For example, in the context of high (and persistent) levels of inequality and unemployment (or informality) as well as environmental externalities, many people and the resources that they rely on are excluded from GDP calculations. As a result, GDP and GDP per capita are poor proxies for human welfare. Similarly, the definitions of jobs and the difference with 'decent work' also raises issues about the use of jobs as a proxy for 'well-being'.

Recognising these challenges, Cartwright et al. (2013), working in eThekwini, developed a set of criteria that placed people and their well-being at the centre of climate change adaptation project selection. More recently, GreenCape set out to use this framework to develop cost-benefit analysis models that would result in metrics such as 'well-being per drop'. As these approaches develop, it will become possible to provide a more holistic assessment of the most appropriate water resource infrastructure and sustainable management investments for the most appropriate development scenarios.

However, these approaches have a number of challenges linked to the subjectivity of the criteria and/or the complexity of data requirements related to input/output tables and social assessment matrices. While this work is beyond the scope of this study, suggestions have been made about developing this level of information in future studies. In this study, GDP and jobs per unit of water have been used to provide a baseline for discussion and to stimulate discussion during the engagement with stakeholders that will form part of the process of this review.

3. EMPLOYMENT ISSUES

The central focus of this case study is the identification, preservation and unlocking of jobs related to water. The National Development Plan: Vision 2030 targets the creation of 11 million jobs by 2030 (the same year by which the country is predicted to have a 17% shortfall in water availability). The National Growth Path looks to green industries, agriculture, mining, manufacturing and tourism to create most of these job opportunities. However, the economic growth required to preserve existing jobs and create new jobs will be possible only through the optimisation of existing water resources (both efficiency within industries/ domestic use and conservation of catchments), expensive imports (either through transboundary schemes or as embedded water in products) and/or re-allocation between competing sectors based on productivity and efficiency considerations.

The National Water Resource Strategy II recognises the following potential job creation areas related to water:

- Water infrastructure development: major water infrastructure, regional bulk water infrastructure and municipal water infrastructure.
- Water functional management: Operation and maintenance of infrastructure; water conservation and water demand management; wastewater turnaround programmes; infrastructure asset management; and integrated catchment management and resource protection.
- Water provisioning to economic sectors: “The greatest job opportunities lie within economic sectors such as agriculture, mining, industry, and tourism … water is the critical resource that is required for improved viability of these important high-water-use sectors, including the energy and manufacturing sector.”

Figures for water infrastructure development and water functional management will be looked at later in this report and are not available at present as a disaggregated amount.

Table 3 thus provides a rough estimate of national figures for the water provisioning to economic sectors, the GDP per water use for each of these sectors and the corresponding job creation. The figures provided are based on 2014 estimates and were calculated by Hedden (2016) based on data provided in over 20 documents.

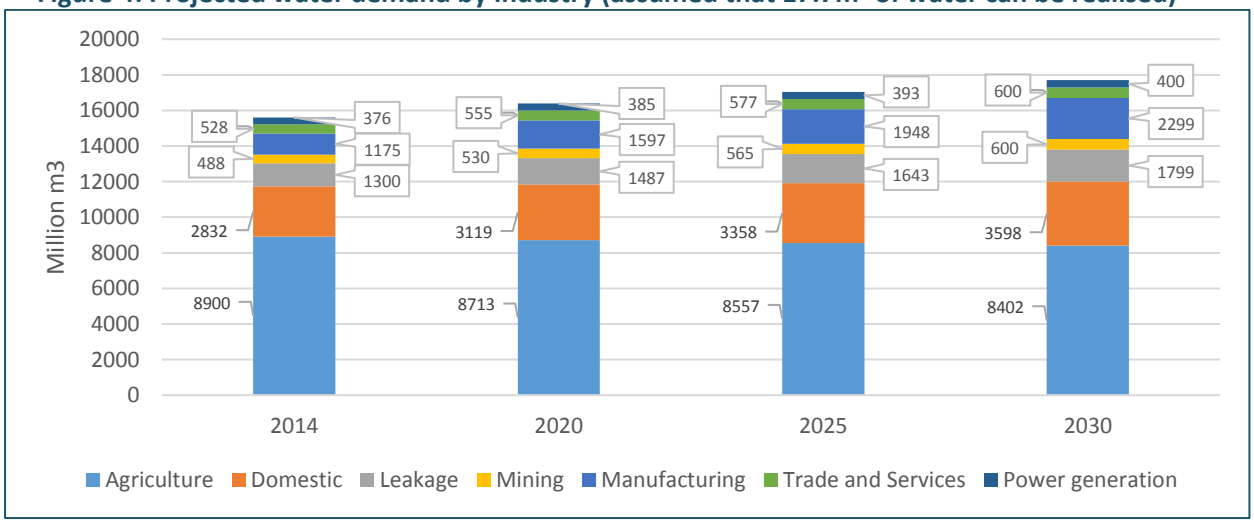
Table 3: Water provisioning by sector estimated for 2016

	Percentage of total water use	Water use (million m^3)	Employment (based on QLFS)	GDP in R million (Stats SA)	GDP (in ZAR) per m^3 of water used	Jobs per million m^3 of water used
Agriculture	57,05%	8900	702 000	76 041	9	79
Power generation	2,41%	376	117 000	67 515	179	311
Mining	3,13%	488	428 000	227 522	466	876
Manufacturing	7,53%	1175	1 760 000	382 006	325	1 497
Trade and services	3,39%	528	10 906 000	1 832 638	3 470	20 652
Domestic	18,15%	2832				
Total water usage	100%	15600	15 146 000	3 023 826	194	971

Source: Authors, based on Hedden (2016), DWS (2015), and Stats SA (2017); 1995 and 2000 figures from Stats SA (2006)

Based on a range of studies, the estimated water usage per sector for years 2014, 2020, 2025, and 2030 are shown in Figure 4. Water consumption by the manufacturing sector is expected to grow much faster than any other sector, while agricultural water usage will see a slight drop.

Figure 4: Projected water demand by industry (assumed that 17.7m^3 of water can be realised)



Source: Authors, based on Hedden 2016; DWS 2015; Stats SA 2006; WRG 2009

4. WATER STEWARDSHIP

Within the global and national water crisis outlined, a number of responses have emerged. One of the most promising is the notion of water stewardship. This broad notion is used to provide a framing for the case study that follows and the quantitative modelling that follows it. Water stewardship can be defined as "the use of water that is socially equitable, environmentally sustainable and economically beneficial, achieved through a stakeholder-inclusive process that involves site and catchment-based actions" (AWS, 2014). 'Economically-beneficial' refers to water use that 'contributes to long-term sustainable economic growth, development and poverty alleviation…' (AWS, 2014).

Many businesses have, or are taking steps, to manage water resources better but are mostly focussing within their own plants/premises on technical interventions that improve efficiency. Stewardship, however, goes beyond efficiency at individual sites and includes an understanding of and response to water challenges within a catchment as well as engagement in collective action with other water users and stakeholders. It is not only about developing a portfolio of CSR projects that are funded by modest (compared to realised profits) charitable arms of corporates "if and when the company feels like it" basis.

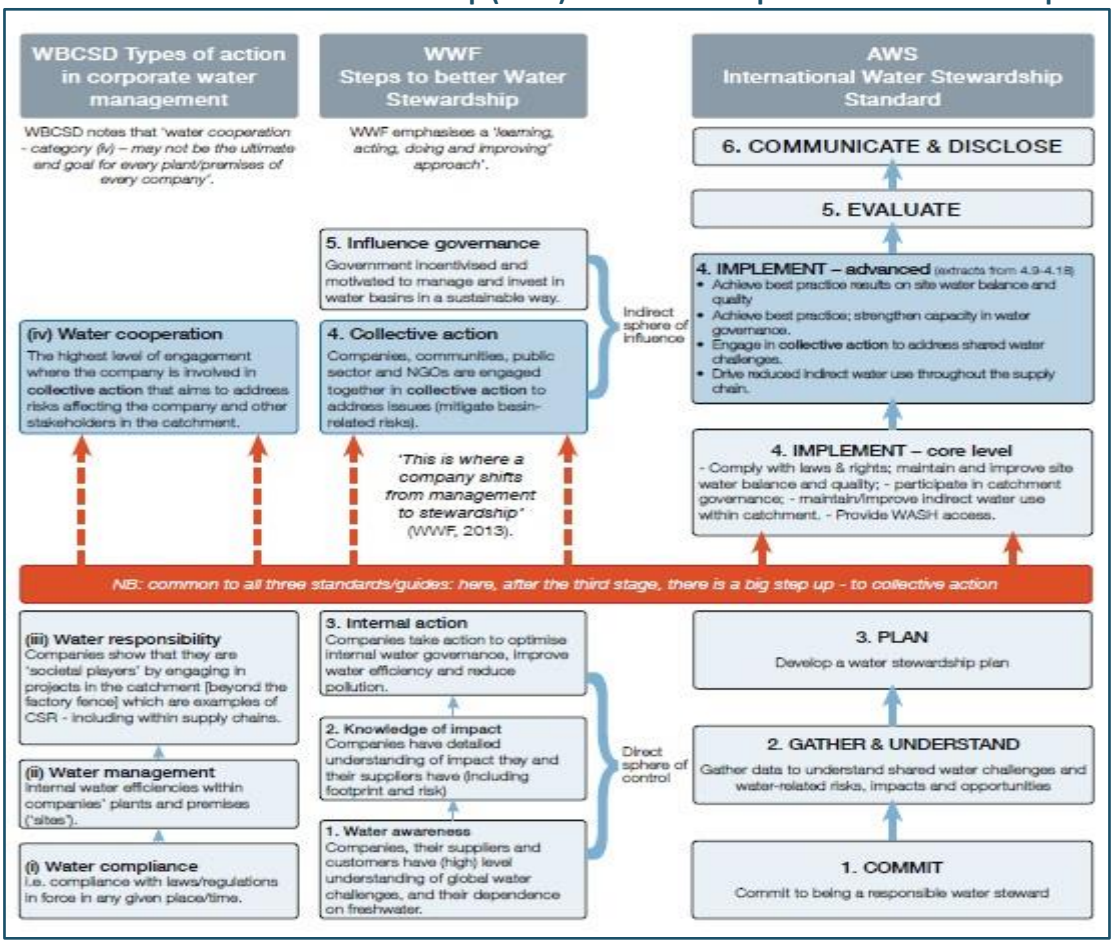
Figure 2 shows the three main models of water stewardship that have been developed and are used by the World Business Council for Sustainable Development (and the National Business Initiative in South Africa), the World Wildlife Fund (and thus WWF-SA) and the Alliance for Water Stewardship (including its national office in South Africa). Across all three models, there is a significant progression from step 3, where companies are working largely within areas under their direct control (on-site efficiency and effluent management) to step 4 which entails "'the sustainable management of shared water resources in the public interest through collective action with other businesses, governments, NGOs and communities" (WWF, 2013; Morgan and Orr, 2015). "Becoming a good water steward necessitates shifting from ad hoc and philanthropic initiatives (even with associated reputational enhancement) to recognising water as a strategic and core business issue that is material to profits and long-term opportunities for growth" (Orr 2013 cited in Newborn and Dalton, 2016).

The following extended quote from the National Water Resource Strategy II acknowledges the importance of individual industry action as well as its limitations. It opens the link between water stewardship and payment for ecosystem services:

> "Municipalities, businesses and public owners are making significant investments in reducing water usage and improving effluent quality compliance. However, at some stage, a point of 'diminishing returns' is reached, with industry facing a situation of having to make substantial investments to obtain relatively small water savings or meet effluent quality specifications. Innovative ways and mechanisms are required to facilitate a process to redirect investment to where maximum impact would be achieved, within the requirements of the Water Act. Such process would provide an opportunity to users upstream of water resources to gain a larger water saving or assisting to meet effluent compliance specifications, thereby allowing more

water to remain in the system. Although the NWA and the NWRS allow for mechanisms such as water offsetting and water trading, the concepts need to be refined and operationalised as part of a policy review process."

Figure 5: The World Business Council for Sustainable Development (WBCSD), WWF and Alliance for Water Stewardship (AWS) actions and steps for water stewardship



Source: Newborn and Dalton, 2016

In the context of weakening government capacity (also known as the "public governance gap"), business and civil society are stepping into the gap. However, while it may be tempting for government to lessen the cost to the public fiscus, it is unlikely that civil society will be able to take up a significant part of this work and it may well be extremely risky to leave this up to the private sector. As Sojamo (2015), working in South Africa, noted, "[a] lack of public sector capacity to fulfil its mandate, to take care of the public interest and to counter-balance corporate power was blamed to be the main reason behind the need for the [stewardship] initiatives, but continued to be the main reason complicating their execution". Where "those asymmetries are very pronounced, mediators and facilitators will be needed to 'help in levelling the playing field', but ultimately the capacity and position of the weaker parties – not least the public sector – to initiate and participate should be strengthened" (Sojamo, 2015).

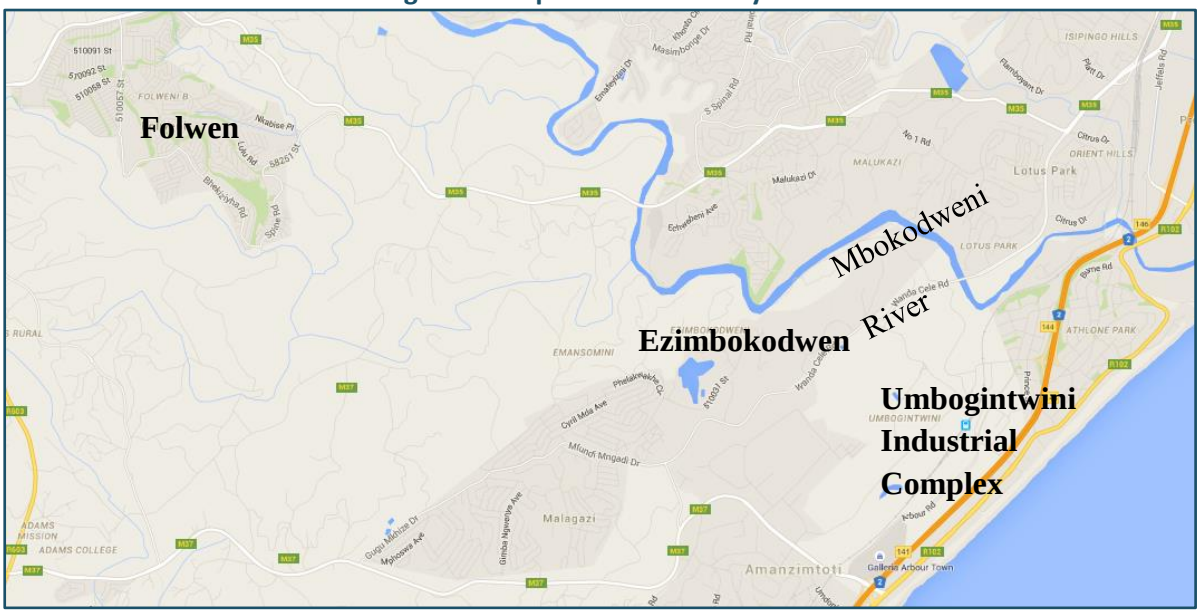
5. CASE STUDY

5.1. Background

The case study is located within the Mbokodweni catchment in the southern part of the eThekwini Metro. More specifically, the case study explores the interaction between a number of community groups involved in water catchment management (and other socio-ecological initiatives) in the Mbokodweni catchment and the Umbogintwini Industrial Complex.

Poverty levels within the settlement are fairly high and much of the population has low skills levels and thus limited economic opportunities. The Folweni Adams Local Area Plan (which includes Uzimbokodweni) describes the area in which the community groups work as one of the poorest regions in eThekwini, despite the settlements being strategically located next to one of the city's main industrial hubs, namely the South Durban Basin.

Figure 6: Map of the case study area



Source: Authors

In terms of the catchment, Folweni has some formal storm water infrastructure, although this is inadequate to deal with frequent high rainfall periods. The other settlements in the area do not have formal storm water infrastructure. Folweni is also serviced by waterborne sewer infrastructure but most of Uzimbokodweni is not. However, the infrastructure seems to be poorly maintained and sewage does seem to surcharge from both the formal waterborne sewerage system and the informal pit latrines into the water courses. Most of the drainage in the area is via the natural water courses and a small number of houses in the Uzimbokodweni area appear to be within the one in 100 year floodplain of the Mbokodweni River. There are some areas of stagnant water, where the smaller streams become choked by solid waste or alien plant infestation, exposing the community to various water borne diseases.

Some key environmental programmes that are identified in the Local Area Plan include:

- The rehabilitation and protection of environmentally sensitive areas, particularly the edges of the Ezimbokodweni river where major pollution was reported by community members; and
- The identification and training of environmental monitors/champions to assist with monitoring and reporting of environmental challenges.

5.2. The Umbogintwini Industrial Complex

The Umbogintwini Industrial Complex is the closest large industrial complex to both Folweni and Umzimbokodweni in which the community groups are located and work. Other than the industrial complexes, the locally generated employment opportunities are fairly low and most of the employed people in the area earn income levels lower than the required poverty eradicating minimum living levels.

The Umbogintwini Industrial Complex (UIC) is a multi-use industrial complex covering about 220 hectares. It currently houses 12 major companies and around 60 smaller businesses providing employment for about 2 000 people, the majority of whom are resident within a 40 km radius of the complex. Of the 12 major companies, 11 manufacture a range of chemical products, human and animal food products and textiles. The twelfth, Acacia Operations Services, supplies a range of services to the site, including potable water and electricity, and is also responsible for maintenance of the site infrastructure. Five of the major companies at the UIC, including Acacia Operations Services and ImproChem (a manufacturer of speciality water treatment chemicals) are owned by AECI.

In terms of organisational structure, the Umbogintwini Industrial Association (UIA) was established to promote the common interests of the businesses operating within the UIC. The UIA appoints a Community Liaison Officer to facilitate communications between the companies operating on the UIC and the surrounding communities.

Finally, Acacia Operations Services (AOS) is a registered Water Service Provider. This allows AOS to extract water from the Mbokodweni River and to purify it for sale and use within the UIC. In 2014, water use by the major companies in the UIC stood at 2 838 mega-litres, the vast majority of this coming from the Mbokodweni river.

5.3. History of the Wise Wayz Water Care initiative

AECI, as the owner of a number of the larger companies, including Acacia Operations Services, is supporting the community groups through a project known as the Wise Wayz Water Care. This project is funded through the AECI Community Education and Development Trust (CEDT) Initiative and seeks to build the capacity of the community groups to monitor and enhance river health in the Mbokodweni catchment.[1]

[1] For a more comprehensive review of Wise Wayz Water Care, see Ward (2016).

The origins of the Wise Wayz Water Care project are linked to sever flooding in Folweni in 2009. This flooding had been exacerbated by dumping of solid waste into natural water courses. As a result, Durban Solid Waste (Municipal Government) and the local community started to work together to clean up the area. For three years, more than 200 community members worked on local clean-ups. One of the community groups (Emvelo-Wise) won the Mayors Excellence Award in 2013. In 2014 the Department of Sanitation and Water (DWS) approached the Community Liaison Officer: Acacia Operations Services to support the group and, following a visit from the Corporate Social Investment department of AECI, it was agreed that it would provide additional support. Much of this support focused on building capacity for the governance of the community-based organisations.

In 2014, eThekwini won the Greenest Municipality Competition and DWS motivated that some of the money from this award be allocated to Emvelo-Wise. This funding was linked to the EPWP and was managed through the African Conservation Trust (a national non-government organisation). The project ran from March 2015 to February 2016 and, although funding was available for 60 EPWP workers, it is estimated that 120 people shared the EPWP wages.

During this period, Emvelo-Wise submitted a funding proposal to the AECI CSI committee. However, this committee felt that greater capacity was needed by the community groups working in the area and GroundTruth (a private company specialising in water quality issues) was contracted to work with Emvelo-Wise to implement a water-focused project. At the same time, a new community group was brought on board that had a history of working with a range of social issues in Uzimbokodweni, adjacent to the Umbogintwini Industrial Complex. This group is known as Rural Community Upliftment and is comprised mainly of youth. In 2016, a split occurred within the Emvelo-Wise group, with a new group, Qondimvelo Development Project, forming.

Launch events of the AECI-funded Wise Wayz Water Care Project (in February and April 2016) brought the three community groups, Acacia Operations Services, AECI CEDT, Durban Solid Waste and GroundTruth together. Through these events and a series of field visits and interviews, a number of narratives were evident. For the community groups, some of the main motivations for being involved were expressed as a “love for the community and love for the environment”. In addition, there was a desire to build collective capacity to make a difference and to “move away from the mindset that says we have to wait for the government to do things for us”. This commitment was an important motivating force for the involvement of both DWS and AECI in the community work.

It was, however, not the only motivation for the community groups and was not the only motivation for the AECI to become involved. As one of the company representatives from a company owned by AECI said at one of the launch events:

> “We are here today with a common interest; to making a difference in our lives where we live, in our communities, in the country and thereby globally – preserving the scarce and precious resource; water… Today we are three teams coming together to work daily on this river programme… One Team, One River, One Mission! This is our identity and commitment.”

This focus on water was reiterated at a subsequent event when a representative of Acacia Operations Services shared a similar aspiration in noting that:

> "We need to take responsibility ourselves and make a difference. We only have one planet and a few rivers and the water we use comes from those rivers. So we say thank you for what you do on the primary side of the river. You help Acacia and AECI to ensure that each time we drink water on the site it is good water. Because we look after mother Earth we look after each other."

Mark Graham from GroundTruth also stressed this aspiration of coming together and referring to the initial approach by AECI CEDT said:

> "From a small phone call from Nicole (AECI CEDT) to this large community has been a wonderful journey. Like a river, many different streams needed to come together to make today possible. From AECI, ImproChem, AOS, eThekwini Water, Durban Solid Waste and all of the community groups represented here. We come together to make a healthy river, the kind of river that Leon (AOS) would like to see coming into Acacia … We are growing stronger like that river… through skills development and equipment, we will make a difference here and we can show the country what we can do."

Building on these aspirations of the various partners, the Wise Wayz Water Care project has over the past two years (2016-2017) sought to build the capacity of the community groups (Emvelo-Wise has withdrawn from the project). This capacity building has focused on governance of community-based organisations, alien invasive plant identification and clearing, solid waste removal, income generation, including small-scale permaculture and recycling initiatives and door-to-door engagement with the community on water-related issues.

Occasions of community protests, including the burning of a community hall, are evident. This protest manifested as a discontent with the community leaders but appeared to be underpinned by issues of service delivery in the area. This was obviously disruptive to companies since many of their workers were prevented from coming to work during these protests.

Despite these protests the community groups involved in Wise Wayz Water Care project continued to build a shared interest in solid waste, water quality, catchment management and community upliftment. The interest of Acacia Operations Services and all of the industry at the UIC to ensure that the water quality entering the water treatment works was of a standard that did not increase purification costs is closely aligned to the community group's interest in reducing pollution and the associated risk of flooding and disease. Similarly, the municipality's responsibility to manage solid waste is closely aligned with the desire for a safe and healthy environment for the community in which the community groups are located.

This very real shared interest is key to the developing relationship between Acacia Operations Services and the three community groups. The inputs from GroundTruth in terms of helping the community groups to understand and articulate the importance of water quality and the links to catchment

management are no doubt beneficial to Durban Solid Waste, to all of the businesses benefitting from enhanced water quality at the UIC, and to the community groups as they grapple with catchment management issues.

The opportunity to benefit from EPWP funding and, more recently, from the capacity building offered through the Wise Wayz Water Care project should not be underestimated. The community groups have volunteered both before and subsequent to the EPWP funding, showing a deep commitment to the environmental and social issues in the community. However, the funding provides an opportunity to generate an income and address these pressing issues. This has resulted in a strong desire to develop project management expertise but even more importantly develop projects that both respond to community priorities and generate income.

This ability to take ownership of the projects that affect and benefit the local communities was strongly communicated in all of the interviews. Not only did the community groups express this desire but so did DSW, AOS and AECI CEDT representatives.

Income-generation ideas as of November 2017 have focused on establishing vegetable gardens with a view to using proceeds from the sale of produce to cross-subsidise the river care work. However, as stressed by ACT, the gardens and nurseries will not generate enough income to cover the costs of river care work. “There is no financial sustainability in the river clean-ups. It is always going to be EPWP kind of work. We have not figured out a way of making it sustainable.”

This statement seems to be at odds with a comment made by one of the business representatives in a video made of the WWWC project in which it is stated: “If we don’t have this water, the industrial park will cease to exist and the community will cease to exist.”

The National Water Resource Strategy made a very similar point when it noted that “businesses can no longer take water for granted regardless of the industry sector they operate within”. The strategy went on to note that “neither government nor business alone can solve water issues” and that “leadership now demands a transparent engagement with stakeholders including water users from poor communities”.

The Wise Wayz Water Care project, building on initiatives from government, civil society and business, thus offers an extremely relevant example of the potential and importance of developing replicable models for addressing environmental issues. The ability of the current initiatives to respond to pressing issues within the community, including flooding and deteriorating water quality, waste management, health, food security, skills development and employment, points to the relevance of these initiatives.

This case is thus seen as a niche activity which is somewhat protected from the need for financial sustainability by the support from a corporate social investment (CSI) budget. However, this leaves the entire initiative vulnerable to the shifting funding priorities of the CSI managers. This is particularly evident in the need to annually apply for funding that the underlying structure that recipients should develop the capacity to raise their own funding.

Alternative models for financing activities that create value for business, government and civil society/ communities need to be explored further.

A detailed study of the financial and legal instruments for paying for ecosystem service is beyond the scope of this study and has been raised in a number of publications both locally and internationally. The research, advocacy and implementation of a range of economic models for water stewardship should be continued in the ongoing work being done around unlocking green jobs.

5.4. Insights from the case study

The water sourced from the Mbokodweni river is important to AOS and to the businesses within the industrial complex. Both the water quality and amount of water is likely to be influenced by the work being done by the WWWC teams with support from the AECI CEDT and municipal government. A transition to better catchment management would benefit the complex and the community due to reduced risk of flooding and the accumulation of solid waste within the catchment.

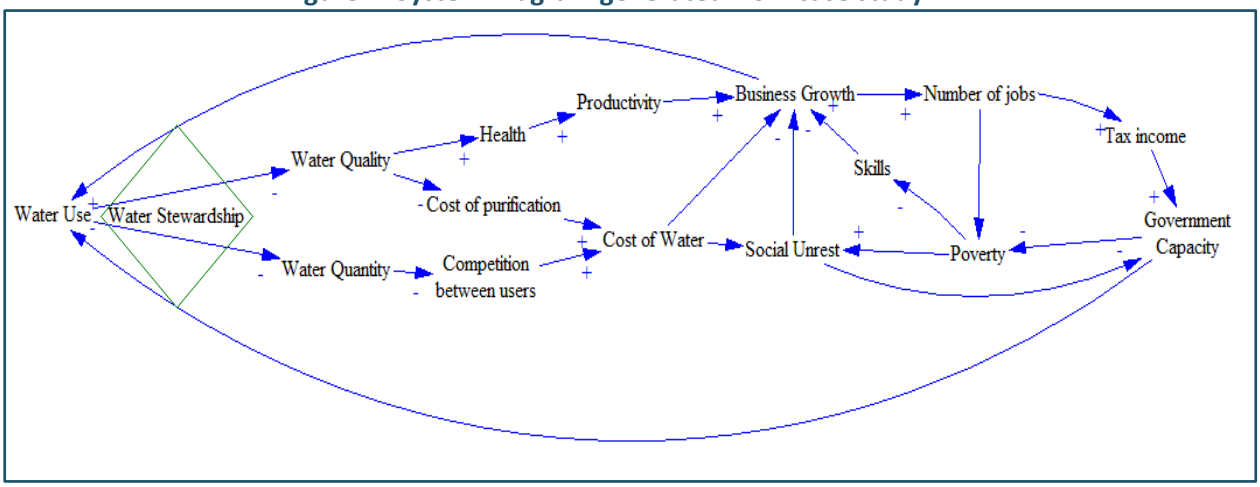
The process of transition is not necessarily an incremental, rational and consensus-orientated debate about the best solution to clearly defined and shared problems. Rather, transition processes are often characterised by differing perspectives and interests that may or may not result in shared understandings of the best course of action. One of the challenges is finding ways to reflect these transitions in ways that make the accessible for consideration and change. “The sustainability transition literature refers to multiple factors and processes that steer system evolution. But the question arises: How can they be explicated for a concrete action context?” (Ulli-Beer, 2013)

Furthermore, “the mapping tools developed in the field of system dynamics are helpful for consistently explicating and communicating the important causal mechanism of a socio-technical system.” (ibid)

Based on the above national context and the case study, Figure 7 provides an overview of the key components of the water management issues and the possibility offered by water stewardship.

Without water stewardship, an increase in business growth will increase water use, which will have two main implications. The first is that water quality will deteriorate resulting in a decrease in health and productivity, thus decreasing business growth. A deterioration in water quality will also increase the cost of water purification, and thus the cost of water, also resulting in decreasing business growth. The other main implication of increased water use is a decrease in water quality and thus an increase in competition between users, pushing up the cost of water. Given that water is a basic necessity, an increase in the cost of water will have a negative impact on business growth while also increasing social unrest which, in turn, will hamper business growth. One of the implications of a decrease in business growth will be a decrease in the number of jobs which will increase poverty and social unrest while simultaneously having a negative impact on skills.

Figure 7: System Diagram generated from case study



Source: Authors

Note: the + sign means that the change happens in the same direction (a decrease in health will result in a decrease in productivity) while the – sign means that the change will happen in the opposite direction (a decrease in quality will result in an increase in cost of purification)

Both these factors will decrease business growth. A reduction in job numbers will also have a negative implication for tax income and thus governments ability to manage water use. Government's ability to govern will also be negatively impacted on by social unrest. Quick and destructive feedback loops include a reduction in job numbers, both contributing to poverty directly and reducing tax income. This results in increased poverty and an undermining of the government's ability to address poverty. This, in turn, leads to social unrest which reduces government support and ability to govern. The other reinforcing feedback loop is the decline in business growth, which leads to a decline in the number of jobs. This increases poverty which both undermines the skills base and increases social unrest. Both of these have a negative impact on business growth. The reinforcing loops have the potential to focus both government and business on addressing job numbers, poverty, skills and social unrest without engaging with some of the longer, slower feedback loops linked to water use.

However, as the cost of purification and the competition between users starts to push up the cost of water, resulting in social unrest and a decrease in business growth, it is likely that both government and business will focus their attention increasingly on better management of both water quality and quantity.

One option that has the potential to make a significant difference is the insertion of water stewardship into the system. This has the potential to increase water efficiency (essentially increasing the quantity available) and increasing water quality in catchments. These two impacts can increase people's health, reduce the cost of purification, reduce competition between users and, ultimately, slow the rising cost of water. These are slower processes but, if they are not addressed, the right-hand side of the system diagram will ultimately succumb to the forces at play on the left-hand side of the diagram.

6. QUANTITATIVE APPROACH

Water stewardship can take the form of internal efficiency within sectors and/or the better management of catchments. How the socio-technical transitions play out will depend on a wide variety of political, economic and social decisions as well as long-term environmental trends and sudden shocks. Due to the uncertainty in these processes, a scenario approach has been developed to model some possible socio-technological transitions and the implications that these would have for job protection, job creation and the possibility of a just transition where some jobs will be lost.

Given the complexity of the relationship between water and jobs, including the potential to prioritise different sectors of the economy based on a range of considerations, it is difficult to make a prediction of both what is likely to happen and the implication that this would have on employment figures.

The remainder of this study describes four scenarios with the intention that they will raise some key issues which in turn will stimulate discussion, learning and change. However, due to the complexity and cost of accessing data (much of which was last updated in 2000 and reported in 2006), conscious decisions were made to simplify the initial round of scenario planning. This enables to put forward some initial figures for consideration and discussion, despite the limitations to these figures. Consequently, two further levels of analysis that need to be incorporated to make the scenarios more robust are also outlined.

6.1. Level 1 Analysis (including four scenarios)

Based on the insights from both the national context and the more local implications identified within the case study, four scenarios were developed. These scenarios are built along two main axes. The first axis relates to the level of water stewardship implemented. This varies from narrow stewardship focused on internal efficiencies to broad water stewardship that includes both internal and external (beyond the fence) efficiency and catchment management.

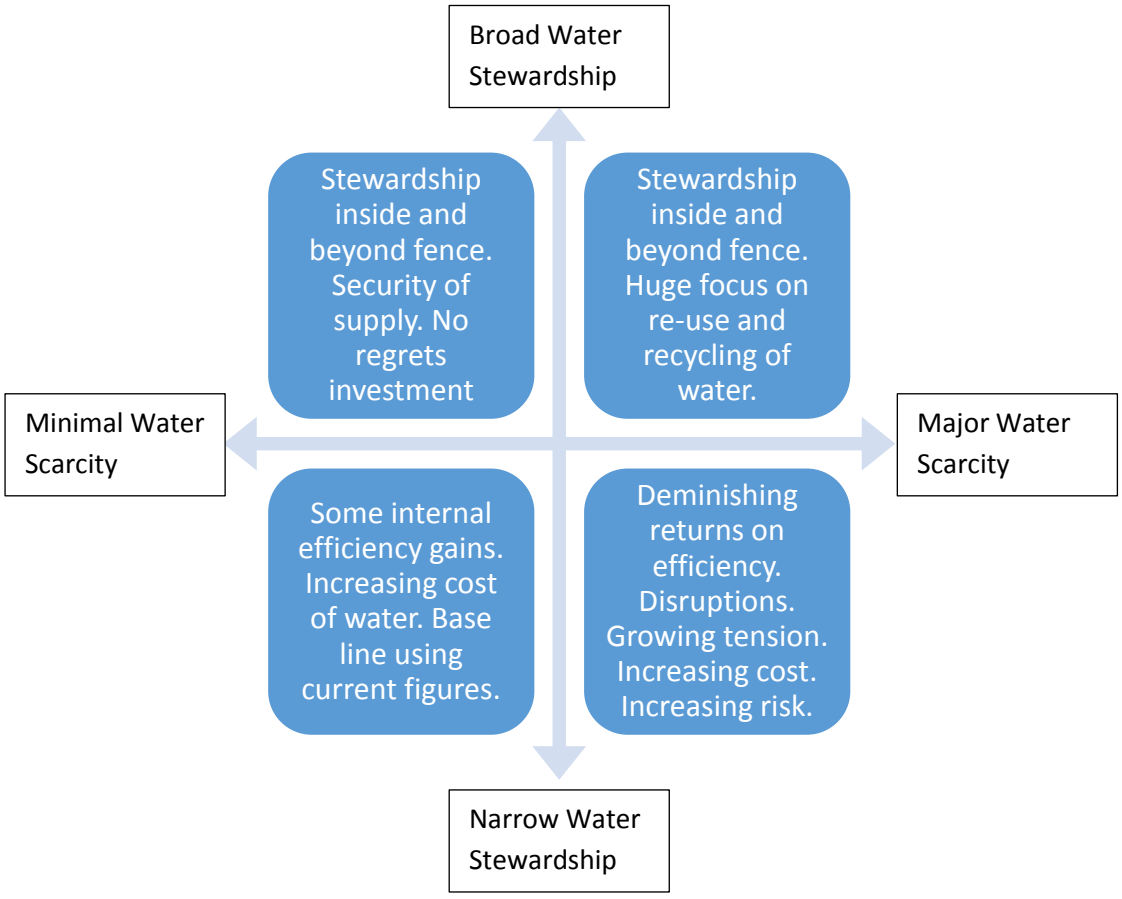
The second axis relates to the level of water stress and varies from minimal water scarcity where it is possible to balance supply and demand with no regrets investment in water stewardship to major water scarcity that requires a fundamental reorientation of water use including recycling most water, using fit for purpose water, and initiatives such as revamping wastewater treatment plants.

Based on these two axis, the four scenarios are as follows:

1. This is the baseline using existing figures. Some internal efficiency gains are assumed, limited and short term EPWP and CSR kind projects are assumed and current allocations across sectors are assumed. (Current supply 15 billion m^3 a year).
2. There are diminishing returns on internal efficiency, and there is growing tension resulting in water being taken from the agricultural sector and made available to the other sectors. (Supply by 2030 reaches 16 billion m^3 but demand is for 17.7 billion m^3) Assume 15% reduction in water going to agriculture and that this is distributed to sector with highest jobs/m^3 (This assumption is made for scenarios 2,3 and 4).

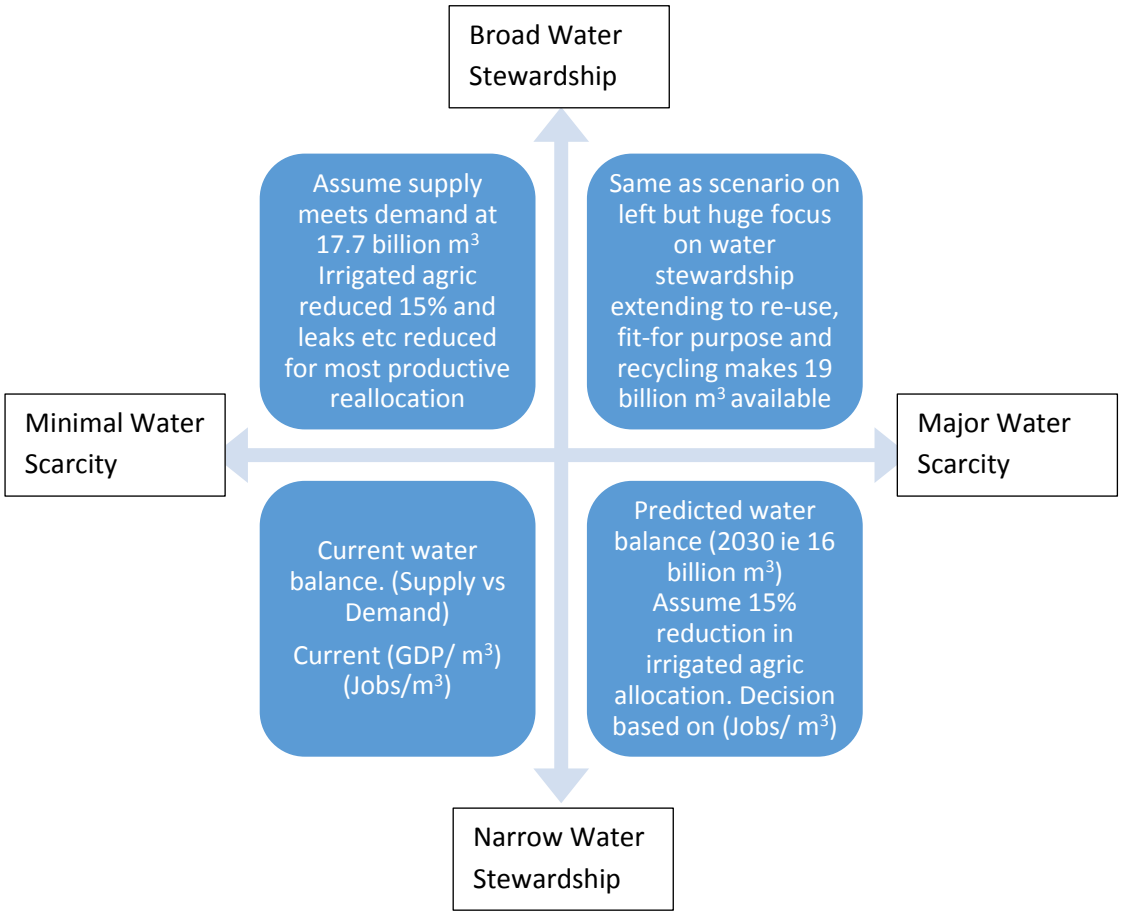
3. Water stewardship initiatives are implemented both in terms of efficiency and catchment management allows South Africa to match demand of 17.7 billion m^3 in 2030.
4. Water Stewardship expands significantly into water reuse and recycling at levels fit for use. Substantial investment in water sector enables South Africa to match demand of 19 billion m^3.

Figure 8: Scenario narratives



Source: Authors

Figure 9: Scenario metrics



Source: Authors

6.2. Considerations for further analysis

Inclusion of input/output tables

The above scenarios ignore the input-output relationships between the different sectors. Thus, for example, the agricultural sector provides outputs that feed into the food processing/manufacturing sectors which, in turn, have inputs/outputs related to the other sectors. A next level of analysis would thus require some input-output modelling across the sectors to give a more realistic model of the extent to which it is possible to shift water allocations based on GDP/volume of water and Jobs/volume of water.

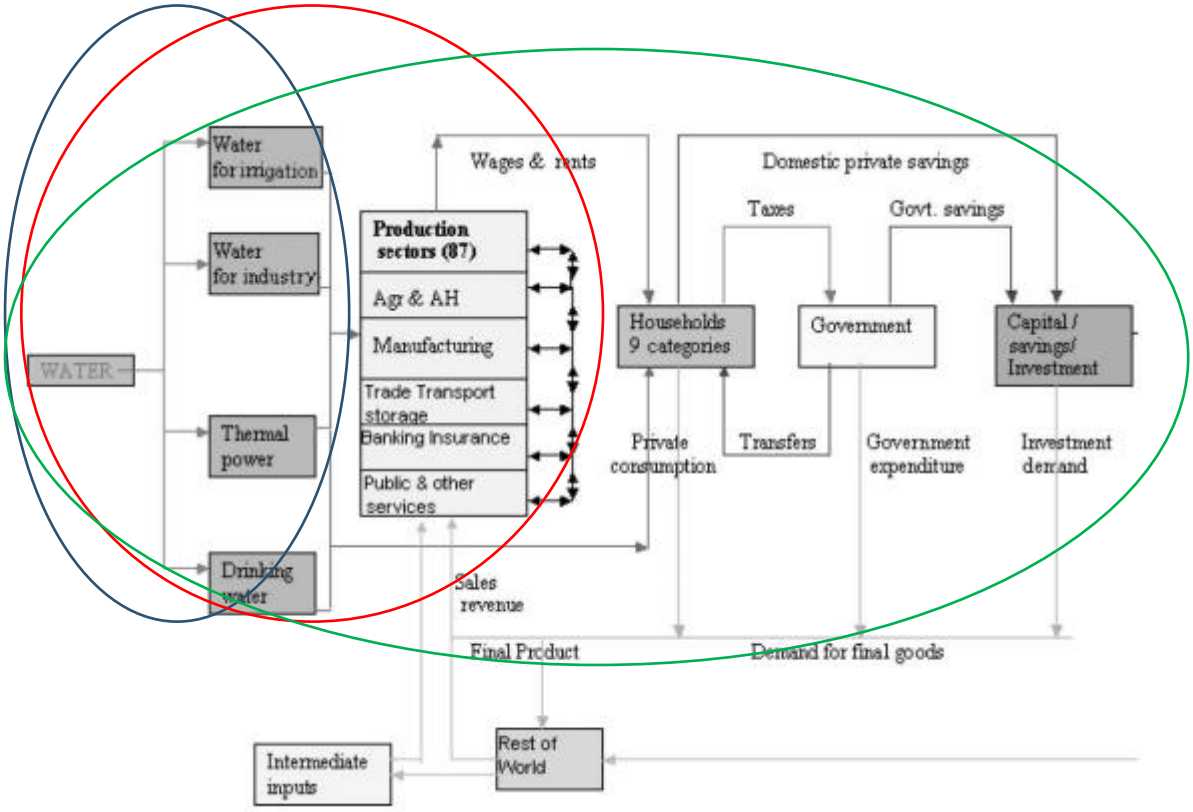
Inclusion of social accounting matrices

The last level of analysis would be to add social accounting matrices (SAMs) to the previous levels above to get a better picture on the overall benefits being created by different scenarios.

While Input/ Output analysis would provide a disaggregation of the system of production and illustrate the interactions within it, SAMs go further by describing the inter-relationships of income and transfer flows between different institutional units. This could help identify the most affected jobs, investment needs and adequate employment policies, and determine how water is used as an input by different subsectors.

Figure 10 illustrates the different levels of analysis. The blue oval represents level 1, the red oval represents level 2 (includes I/O analysis) and the green oval represents level three (includes social accounting matrix).

Figure 10: Levels of Analysis



Source: Bhatia et al, 2006

7. CONCLUSION

The global and national context and the local case study all indicate that the relationship between water and jobs is becoming increasingly important to understand. However, the data available in South Africa at present makes it extremely difficult to model the impact that water scarcity or water stewardship will have on job protection, creation or retention. What is evident is a number of obstacles that currently exist for job planning, some areas that would benefit from focused advocacy work, and some likely scenarios that could inform further discussion and action. These aspects of the study are summarised below.

Some of the obstacles to better water management that were identified within the contextual review and case study include:

1. Government is still mainly working on the assumption that water supply is not a limiting factor since supply can be guaranteed through investment in infrastructure (e.g. dams).
2. Supply enhancement through catchment management is mainly being conducted through EPWP programmes and CSR programmes, thus resulting in the jobs being temporary and uncertain. In fact, the assumption is that the jobs are short term and that participants should become self-financing or externally employed in a relatively short time-frame, usually one to two years.
3. The lack of financial instruments to pay for water supply measures such as catchment management means there is no financial incentive for business or communities to become involved in catchment management.
4. The low price of water means that internal efficiency interventions in agriculture, industry and the domestic sector is seeing diminishing returns with many of the financially viable options having already been implemented.
5. Water use licences appear to be allocated on a first-come, first-serve basis rather than careful consideration of the most beneficial use of the water.
6. Complex modelling on the socio-economic-ecological implications of water allocations is hampered by outdated and incompatible data.

Based on these identified obstacles to decision-making and the ability of decision-makers to understand the implications of these decisions on jobs, a number of possible advocacy interventions have been identified. These include:

1. Highlight the potential implications of a 17% water deficit by 2030 through direct links to the impact that this deficit is likely to have on jobs, a key challenge that the country currently faces. This includes developing both systemic representations and scenarios around which to engage key roleplayers in dialogue.
2. Advocate for a longer-term view of water stewardship work that occurs in catchments and that contributes to water supply. For decent jobs to be created will require that this kind of work be viewed as permanent employment beyond the short-term EPWP and CSR project cycles.

3. Numerous reports have been developed highlighting the need to some kind of financial mechanism for paying for ecosystem services and the water in ways that reflect the value created by these activities. This work urgently needs to be developed further and implemented.
4. An increase in the price of water will be required to make ongoing investment in water efficiency more attractive to water users.
5. The allocation of water needs to be done based on a more careful consideration of the socio-economic-ecological implications of this allocation. By providing scenarios more nuanced discussions may emerge to refine decision making processes and outcomes.
6. A case be made for developing the data sets required to make more informed decisions about water management and allocation.

In terms of job creation, it is evident that as water becomes a limiting factor within South Africa there are likely to be a number of implications. These include:

1. It is extremely likely that, given the high percentage of water that irrigated agriculture uses relative to the GDP and job creation per unit of water, further limitations are likely to be placed on the amount of water allocated to this sector. This is likely to result in job losses in this sector. This in turn will require reskilling to support a just transformation as this occurs. (One option may be developing no-till rain fed agriculture.)
2. At a global level it is also likely that companies requiring highly water dependent inputs into their supply chains will look to reduce costs and risks by sourcing these inputs from countries that have higher levels of water security. Again, it will be important to start to identify these sectors and plan to make them more competitive/efficient or start a process of supporting a just transition into other sectors for vulnerable workers.
3. Existing EPWP and CSR programmes provide the basis from which to build longer-term career paths in catchment and water management. If and when financial mechanisms are put in place to support this kind of work, skills need to be developed to fill the emerging job opportunities. There is significant job creation potential if the financial mechanisms recognise the value of water.
4. It is unlikely that water efficiency work within agriculture, industry or the domestic sector will create significant job opportunities. However, it is likely that existing farmers, plumbers, process engineers and artisans will require upskilling in terms of identifying and responding to water inefficiencies within these sectors and addressing them through the implementation of new techniques and technologies.

Given these data challenges, this review represents a first pass at developing a framework for understanding the potential, blockages and possible approaches to protecting, creating and transitioning jobs that are highly or moderately dependent on water.

Through a process of consultation and advocacy, it is proposed that the insights developed so far are refined, and that data availability and gaps are identified with experts and key roleplayers from the government, business, academic and civil society sectors.

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