Water Accounts: South Africa

WRC Project K5/2419

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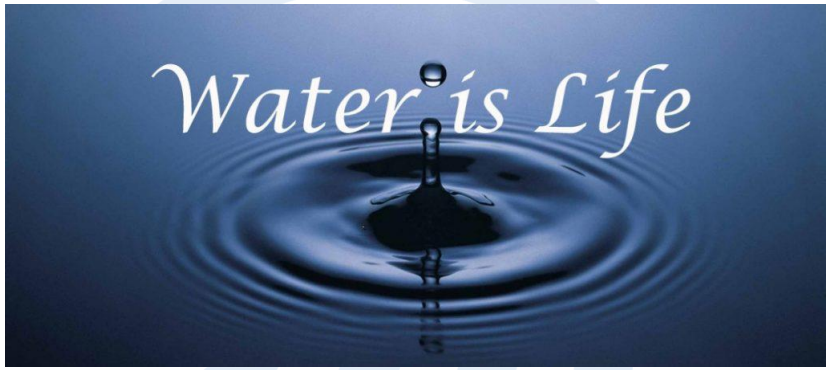
Scientific evidence and intuition tell us that water is valuable



How valuable?

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Economic evidence and casual observation are telling us that water is not valuable

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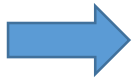
WRC – StatsSA: Study aims

1. Provide a methodological framework for the Water EEAs for South Africa according to international best practices
2. Consultation through engagement with all relevant role players
3. Create a framework, structure and knowledge base for these accounts to enable more frequent updates and potentially more detail accounts in the future
4. Provide a research document containing an overview of the methodology, water tables and Water EEAs for South Africa that can be published in collaboration with Stats SA
5. Provide the water tables and Water EEAs for South Africa in Excel to enable ease of use for integrated impact and policy analysis



1. Flow
2. Quality

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Foundation and methods for estimating water value

WSSD 2002, South Africa

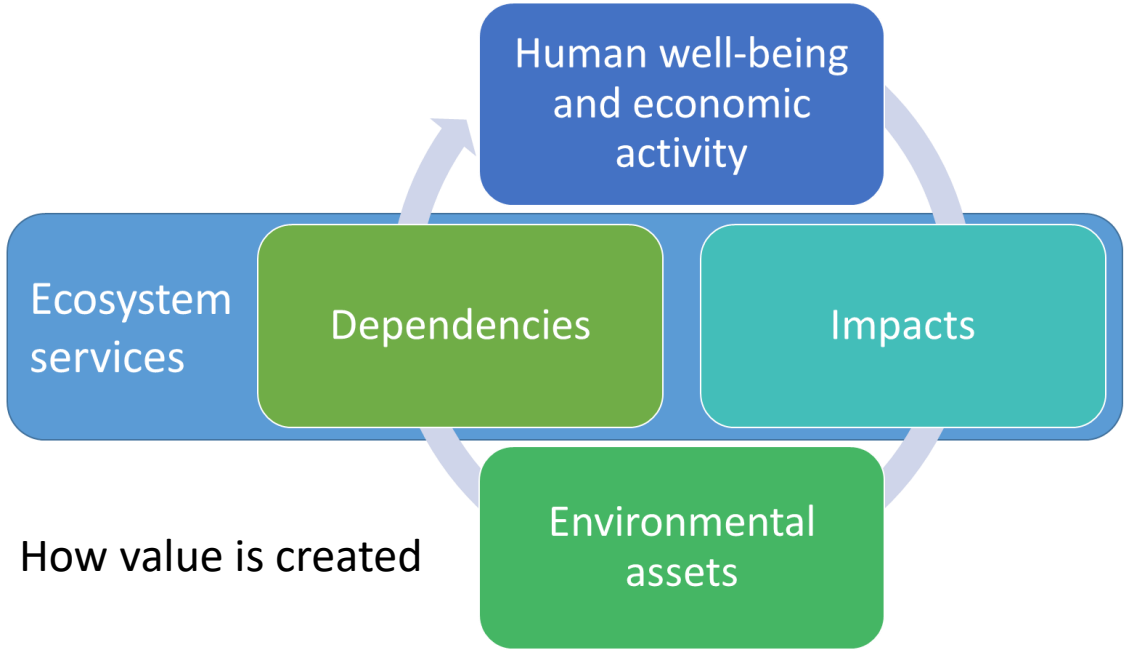
MEA: Ecosystem Services

Water Act 1998, Water Resources

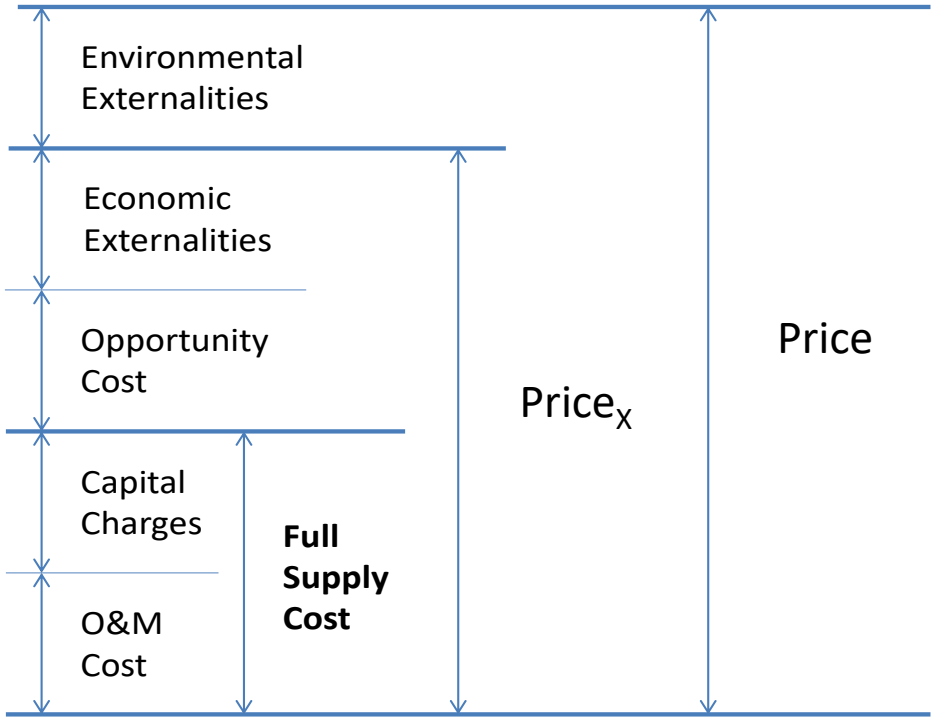
DWS / WRC: Water Resource Classification System

90 years of resource economics best practices

Excellent data available from Stats SA



How value is created



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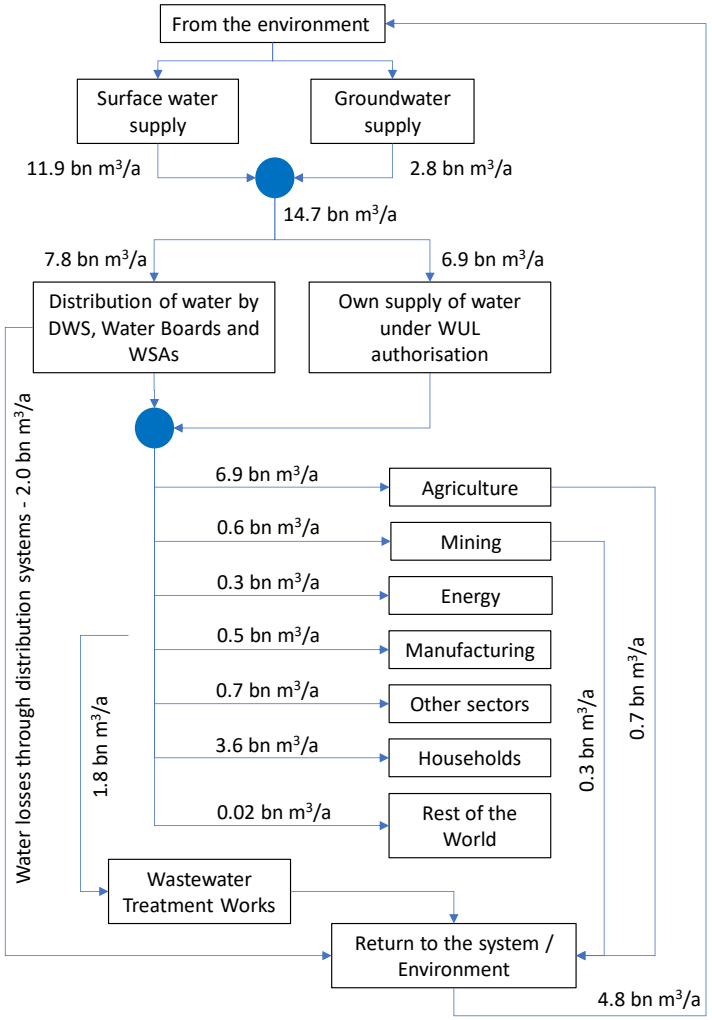
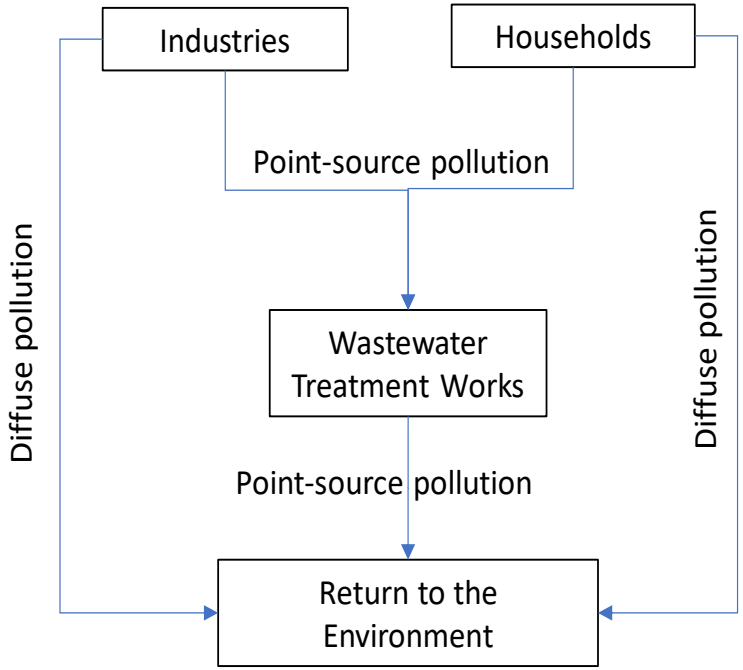
What does a water (flow) account look like?



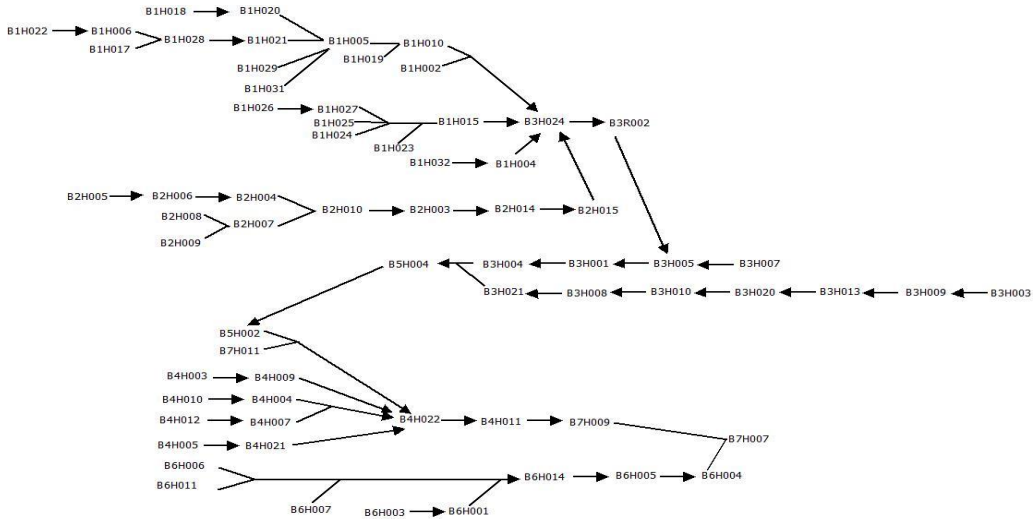
Million m³/a		SIC 1 Agriculture, Forestry & Fishing	SIC 2 Mining	SIC 3 Manufacturing	SIC_41 Electricity, Gas, Steam and Hot water supply	SIC_4200 (Local) Collection, purification and distribution of Water - Local	SIC 5 Construction	SIC 6 Wholesale and retail trade	SIC 7 Transport, storage and communication	SIC 8 Business Services	SIC 9 Government Services	Households	Accumulation	Rest of the World	Flows from the environment
(I) Sources of Abstracted Water	Inland Water Resources														
	Surface Water	6,927	600	514	339	2,006	13	301	54	217	103	3,583	n/a	17	14,675
	Groundwater												n/a		
	Soil Water	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Total	6,927	600	514	339	2,006	13	301	54	217	103	3,583	n/a	17	14,675
	Other water sources														
	Precipitation	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sea Water	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Total														
	Total Use of Abstracted Water	6,927	600	514	339	2,006	13	301	54	217	103	3,583		17	14,675
(II) Abstracted water	Distributed water	-	486	127	3	2,006	13	301	54	217	103	3,583	n/a	-	6,895
	Own use	6,927	114	387	335	-	-	-	-	-	-	-	n/a	17	7,780
	Total	6,927	600	514	339	2,006	13	301	54	217	103	3,583	-	17	14,675
(III) Wastewater and reused water	Wastewater received from	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	-
	Own treatment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	-
	Reused water														
	Distributed use	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	-
	Own use	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	-
	Total														
(IV) Return flows of water	Return flows of water to the enviro														
	To inland water resources	691	328	-	-	2,006	-	-	-	-	-	-	n/a	n/a	3,025
	To other sources	-	4	65	67	-	7	154	28	111	53	1,273	n/a	n/a	1,762
	Total returns flows	691	332	65	67	2,006	7	154	28	111	53	1,273	-	-	4,786
(V) Other	Evaporation of abstracted water	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Transpiration	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Water incorporated into products	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total nett use		6,236	268	449	271	-	6	147	27	106	50	2,310	-	17	9,889

What does a water (quality) account look like?



	Water Sector (SIC 4)	Indus-try	House-holds	Environment																	
Water Management Area				WMA 1						WMA 2			WMA 3			WMA 4					
Collection by other economic units																					
TDS (mg/L)																					
PO_4 (mg/L)																					
Emissions received by the environment / Flow to the rest of the world																					
DWS monitoring site				A7H008Q01			A5H008Q01			B7H017Q02			X2H036Q01			V5H002Q01			W4H009Q01		
Measure				Min	Ave	Max	Min	Ave	Max	Min	Ave	Max	Min	Ave	Max	Min	Ave	Max	Min	Ave	Max
TDS (mg/L)				33.3	57	102	224	411	698	262	363	413	174	272	440	95.4	132	185.8	286	388	504
PO_4 (mg/L)				0.005	0.005	0.005	0.05	0.046	0.2	0.005	0.0078	0.013	0.021	0.048	0.1	0.017	0.049	0.1	0.019	0.0358	0.066
NO_3 (mg/l)				0.01	0.066	0.324	0.025	0.233	1.00	0.025	0.095	0.216	0.13	0.266	0.447	0.04	0.236	0.6	0.04	0.076	0.152

	Environment														
Water Management Area	WMA 5			WMA 6			WMA 7			WMA 8			WMA 9		
Collection by other economic units															
TDS (mg/L)															
PO_4 (mg/L)															
Emissions received by the environment / Flow to the rest of the world															
DWS monitoring site	C9H024Q01			D8H004Q01			D4H001Q01			G4H007Q01			G1H023Q01		
Measure	Min	Ave	Max	Min	Ave	Max	Min	Ave	Max	Min	Ave	Max	Min	Ave	Max
TDS (mg/L)	538	630.6	741.2	172.7	374	684	1457	2000	2489.6	49.1	69.5	88.01	500.37	866.8	1360
PO_4 (mg/L)	0.005	0.01	0.014	0.005	0.005	0.014	0.005	0.256	0.819	0.005	0.0068	0.019	0.027	0.0623	0.162
NO_3 (mg/l)	0.025	0.0387	0.084	0.025	0.174	0.261	0.025	1.245	3.84	0.0025	0.196	0.437	0.04	0.708	1.91



Data sources and quality

Colour Codes within Water Accounts	
White	Expected empty cells
Green	Good statistics from official reports
Khaki	Good statistics from unofficial reports
Yellow	Good statistics but had to aggregate/disaggregate based on additional sources
Red	Poor statistics causing imbalance in the accounts - Manual corrections were made

Data source	Data points dependent on this source	Number of data points that used this data source*
DWS Green drop 2015 data	Volume of wastewater treated	40
DWS no drop system 2015 data	System input volume per municipality	40
Stats SA NFCM 2005/6	Municipal water sources	40
Water resources 2012	Total mean annual runoff, flows between catchments and other countries	36
DWS Catchment and all town reconciliation strategies	Source of water and water use	30
DWS Groundwater Strategy 2010	Volume of groundwater extracted and used	10
Stats SA Electricity LSS	Volume of water used in the electricity industry	10
DWS RQIS directorate	Water quality data	
Water Boards' annual reports	Water supply by water boards in the country	10

Highlights - Mandate

- An international standard exists for constructing water accounts: the System of Environmental Economics Accounts (SEEA) of the United Nations Statistics Division (UNSD)
- Statistics SA has the mandate for the implementation of the SEEA.
- Statistics SA pioneered Water Accounts for South Africa and have developed methodologies and a very novel data collection system through data-mining of its internal databases. The remaining challenge has been to develop a methodology that enable annual update of the water accounts and publication in the annual compendium of environmental economic accounts.
- A number of technical challenges had to be overcome. These challenges included alignment of water sector and ISIC classification, assessment of data quality, spatial disaggregation, integrating diverse data sources (physical and monetary), designing a sustainable structure (referring to nomenclature) and architecture (referring to types of tables) of tables.

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Highlights - ZAR

- Water Sector (SIC 4200) annual revenue ~ R70 billion. This is about:
  - 11% of the size of the Mining Sector
  - 15% of the size of the Retail Sector
  - Smaller than the size of the beverage manufacturing sector (78%)
- Growing at an annual rate of 7.4% since 2012 (R45.5 billion).
- The derived weighted average water costs (which captures both tariffs and cost of own water management) vary considerably, from R0.13/m^3 for irrigation to more than R16.00/m^3 for the construction industry.
  - These values are distorted, as own water management costs of sectors such as irrigation and Electricity generation are captured elsewhere in the economy, and more work is required to improve tariff accuracy.
- For a sector of such strategic importance, these economic numbers are small, and indicate that significant strategic thinking is required to sustainably position the sector for infrastructure investment planning.

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Highlights – Way forward

- A national water accounting methodological framework has been developed to a point where annual publication of the monetary flow accounts is possible.
- The framework developed here ideally to be institutionalised by Stats SA through an appropriate publication and through the development of a national water accounting sources and methods document.
- Wrt continuous improvement, the most significant data gaps lie with (a) the physical flow of water and (b) water quality.
- Water pricing is an important economic instrument – but poorly developed and implemented. The accounts provides an instrument through which to develop this.
- For water accounts to become truly useful, clear applications of water accounts need to be developed and continuously improved. Stats SA, as provider of official data, has a limited responsibility for the development of such applications. Rather there is a joint development responsibility on water managers, in collaboration with Stats SA.

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The Economy is not a zero-sum game

Water resources and infrastructure need investment

Regulation alone is not changing behaviour

Without departing from our policy objectives, we need a radical smart new approach to the business of water

1. Deeper understanding of the how it works
2. Smart pricing
3. Smart billing
4. Reflecting water resource value in property prices
5. Regulated ES trading mechanisms