



Water Accounts: South Africa

WRC Project K5/2419

12 September 2019

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Scientific evidence
and intuition tell us
that water is
valuable

How valuable?





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



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

Foundation and methods for estimating water value

WSSD 2002, South Africa

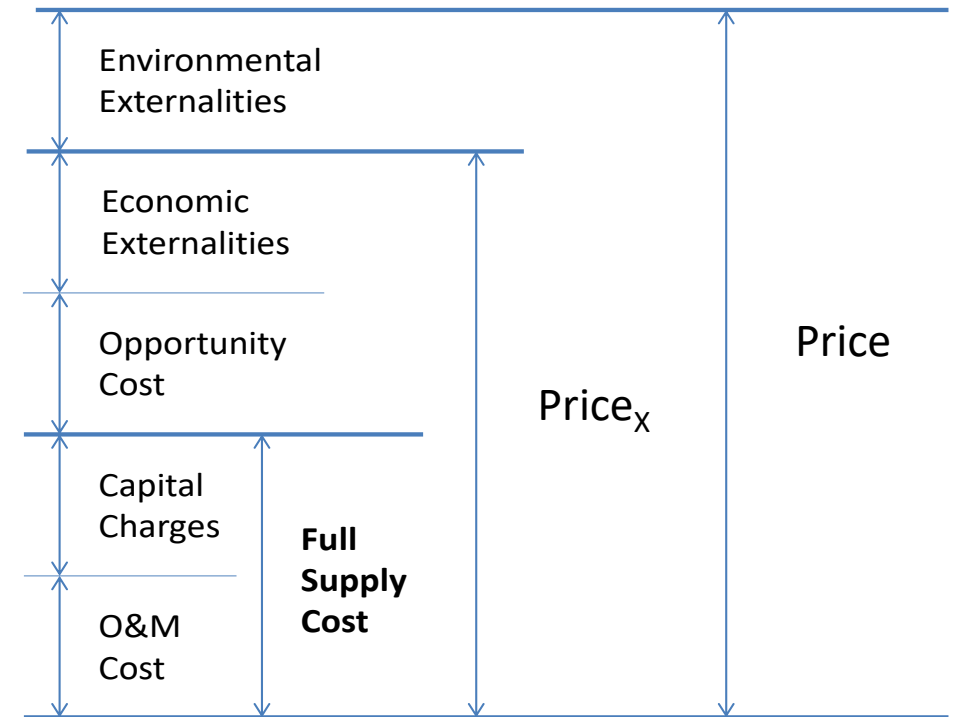
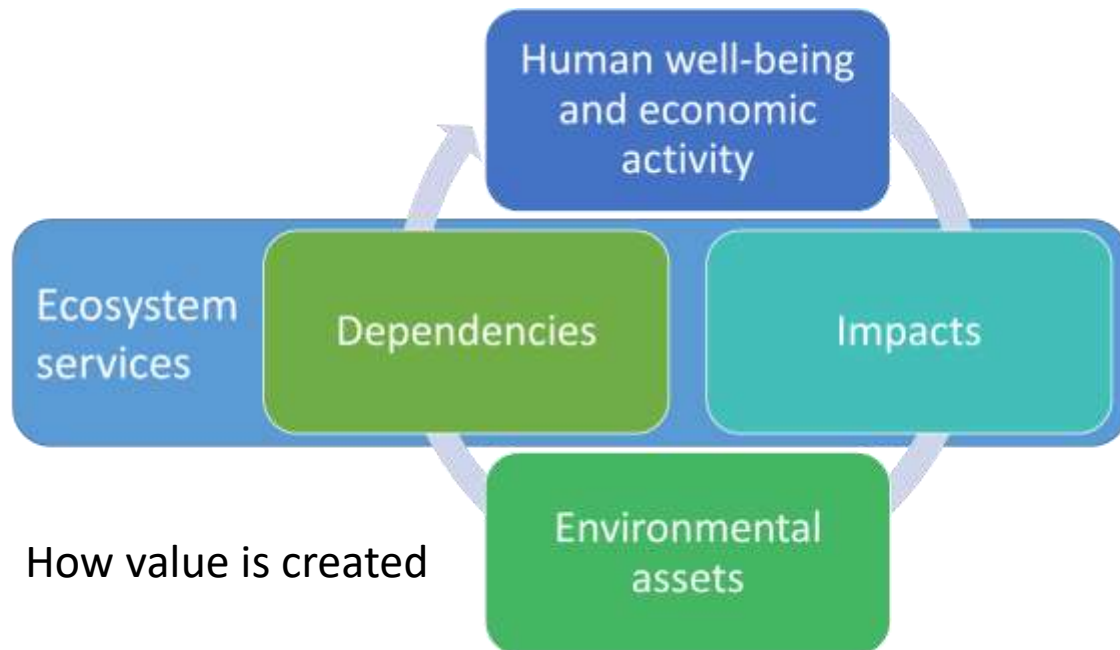
MEA: Ecosystem Services

Water Act 1998, Water Resources

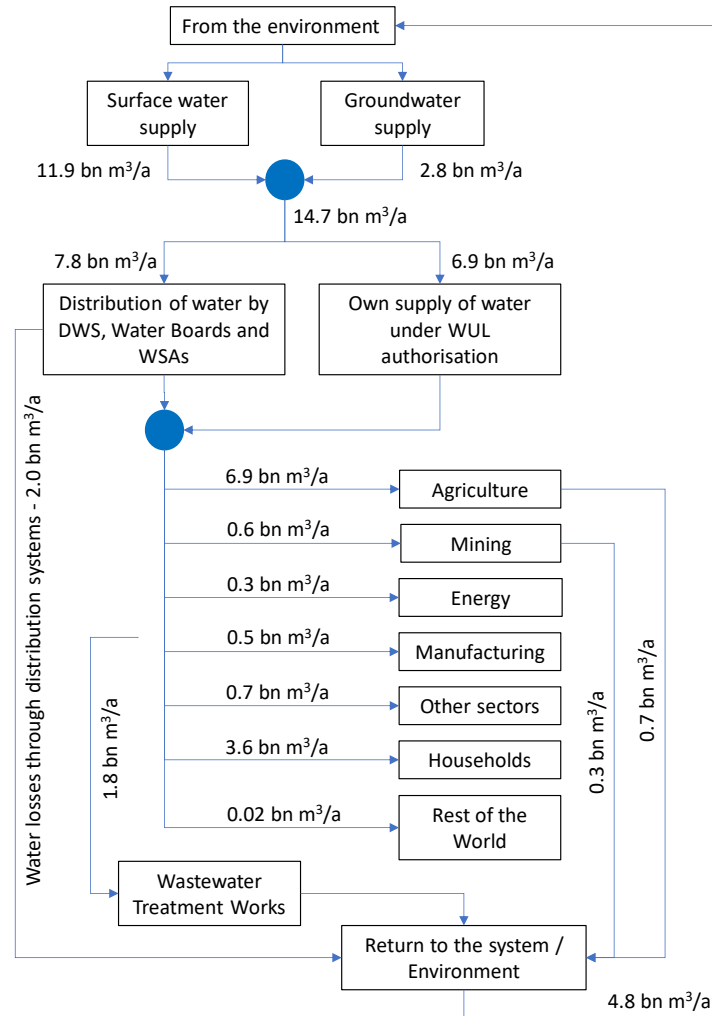
DWS / WRC: Water Resource Classification System

90 years of resource economics best practices

Excellent data available from Stats SA

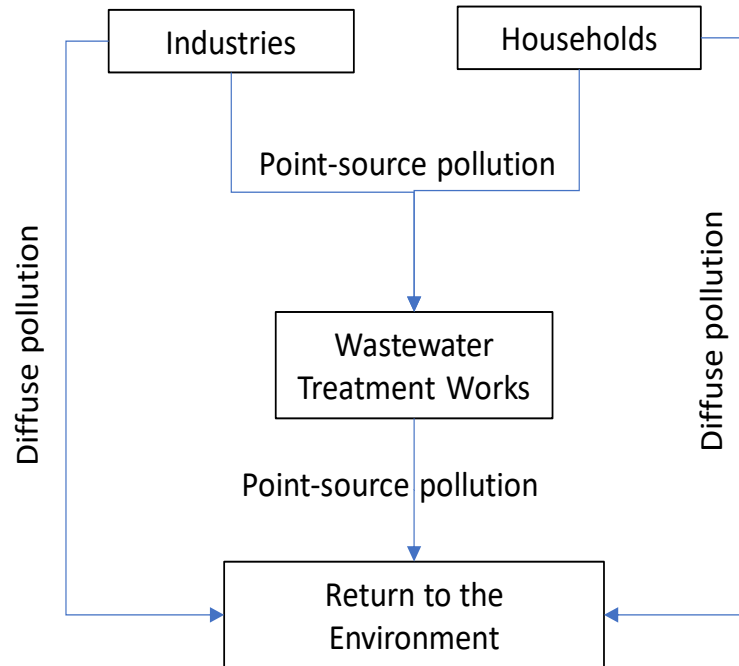


What does a water (flow) account look like?



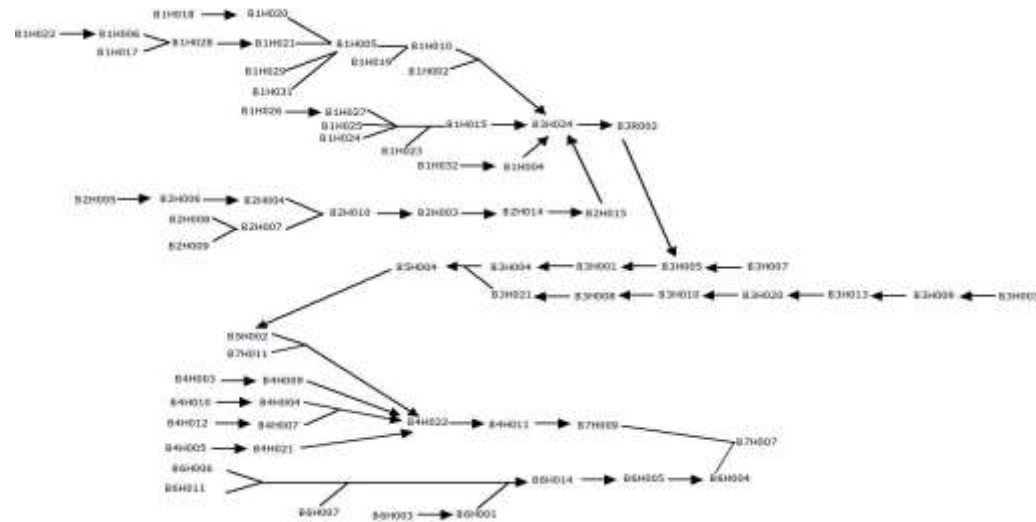
| Million m³/a | | SIC 1 | SIC 2 | SIC 3 | SIC_41 | SIC_4200 (Local) | SIC 5 | SIC 6 | SIC 7 | SIC 8 | SIC 9 | Households | Accumulation | Rest of the World | Flows from the environment |
|-----------------------------------|--|---------------------------------|------------|---------------|--|--|--------------|----------------------------|--------------------------------------|-------------------|---------------------|--------------|--------------|-------------------|----------------------------|
| | | Agriculture, Forestry & Fishing | Mining | Manufacturing | Electricity, Gas, Steam and Hot water supply | Collection, purification and distribution of Water - Local | Construction | Wholesale and retail trade | Transport, storage and communication | Business Services | Government Services | | | | |
| (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 | 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 |
| | 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 |
| (II) Abstracted water | 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 |
| (III) Wastewater and reused water | Total Use of Abstracted Water | 6,927 | 600 | 514 | 339 | 2,006 | 13 | 301 | 54 | 217 | 103 | 3,583 | - | 17 | 14,675 |
| | Distributed water | - | 486 | 127 | 3 | 2,006 | 13 | 301 | 54 | 217 | 103 | 3,583 | n/a | - | 6,895 |
| (IV) Return flows of water | Own use | 6,927 | 114 | 387 | 335 | - | - | - | - | - | - | - | - | n/a | 7,780 |
| | Total | 6,927 | 600 | 514 | 339 | 2,006 | 13 | 301 | 54 | 217 | 103 | 3,583 | - | 17 | 14,675 |
| (V) Other | 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 | | | | | | | | | | | | | | |
| (VI) Return flows of 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 | 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 | - |
| (VII) Return flows of water | Return flows of water to the environment | | | | | | | | | | | | | | |
| | 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 |
| (VIII) Return flows of water | Total returns flows | 691 | 332 | 65 | 67 | 2,006 | 7 | 154 | 28 | 111 | 53 | 1,273 | - | - | 4,786 |
| | 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 |
| (IX) Other | 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) | Industry | Households | Environment | | | | | | | | | | | | | | | | | | | | | |
|---|-----------|------------|-------------|-------|-----------|------|-------|--------|-----------|-------|-------|-------|-----------|-------|-------|-------|-----------|-------|-----|-----|-----------|-----|-----|-----|
| | | | 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 | 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 | | | | | | |

| Water Management Area | Environment | | | | | | | | | | | | | | | | | | | | | | | |
|---|-------------|--------|-------|-------|-----------|-------|-------|-------|-----------|--------|--------|-------|-----------|--------|-------|-----|-----------|-----|-----|-----|-----|--|--|--|
| | 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 | 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.





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/m³ for irrigation to more than R16.00/m³ 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.



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.

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

