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Water Resource Accounts for South Africa

Jackie Crafford, CIC International
Aneme Malan, National Accounts, Statistics SA

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Agenda

- Acknowledgements
- The water economy in SA
- Water policy in SA
- Adapting the SEEAW principles to WRAs for South Africa
  - Water flow accounts
  - Water asset accounts
- Recommendations

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The Water Economy in SA

- In an advanced stage of development:
  - High demand and competition for water
  - Diminishing low-cost sources of additional supply
  - Water quality problems
  - High social cost of water use
- Resource and supply characteristics
  - Low and erratic rainfall
  - Limited groundwater resources
  - Exhaustive development of available water storage and transfer options

Water Policy in SA

- Transforming legal access and rights to water
- Ensuring provision of water for basic human needs and protection of aquatic ecosystems (Reserve)
- Decentralising water management through more enabling institutions
- Adopting integrated water resources management (IWRM)
- Pricing for financial and environmental sustainability, economic efficiency and social equity
- Refocus on water conservation and demand management
- The National Water Resource Strategy

Adapting and applying the SEEAW to WRAs for SA

- Water management decisions are based upon hydrological data of which DWAF is the custodian
- Statistics SA is the agency that captures official economic data upon which economic decisions are made
- There is a disconnect between the DWAF hydrological data and the Statistics SA economic data
- The SEEAW was applied to link the two data sources
- DWAF data, Statistics SA data and the SEEAW structure and method had to be adapted in to accommodate unique South African requirements for:
    - Water flow accounts
    - Water asset accounts
- Detailed WRA developed fro SA, published as a discussion document

Adapting and applying the SEEAW to WRAs for SA

- **Water flow accounts enhancements: data**
  - **DWAF is the "custodian" of water yield (institutional supply of raw water)**
    - DWAF excludes certain beneficial water uses from its data e.g. dryland use
    - DWAF classifies water use according to broad categories of institutional and policy importance, and not ISIC
    - DWAF planning scale is the Water Management Area (19 in SA) and not National Scale
    - Comprehensive official data currently only available for 2000 and 1995
    - StatsSA
      - Supply and use tables, and limited other water-relevant data
      - No WMA-scale economic data

Adapting and applying the SEEAW to WRAs for SA

- **Water flow accounts enhancements: SEEAW structure**
- SEEAW works well where there is water abundance, but in SA, with its water scarcity and natural supply variation, enhancements were required
- Retained the same convention of partitioning SUTs by their two key components of *within the environment* and *between the environment and economy*, but:
  - Water flows occurring exclusively within the environment were explicitly included, to support IWRM principles e.g.
    - water reserved for ecological purposes to satisfy instream flow requirements
  - Institutional supply analysed in greater detail
    - DWAF (yield regulator) as an institutional supplier
    - Facilitate possible water pricing analyses
  - New family of water users is plantation forestry (at least) added as streamflow reduction activity e.g.
    - SFRA, alien invasive species, rural households

Adopted approach for compiling flow and asset accounts for SA

- An Input-Output (I-O) matrix was developed (using SEEAW as guideline)
  - To describe supply and use in one table especially to the non-economic audience with easier interpretation of water flows
  - To prevent double accounting
  - The framework was developed to be consistent with the definitions of the NWA and NWRS (not consistently defined with the ISIC)
- I-O WRAs were developed for each of the 19 WMAs for the accounting years 1995 and 2000.
  - provided spatial information
- The WMA I-O WRAs were aggregated to produce national WRA I-O matrixes for 1995 and 2000. The framework was then adjusted to improve consistency with ISIC
- The national I-O WRAs were converted to the adjusted UN SUT format described in the SEEAW
- Monetary accounts: integration, augmentation and comparative analysis with economic SUT and other data

	Supply table	Environment					
		Atmosphere and sea	Natural MAR	Surface water Yield	Groundwater	Soil water	Ecological reserve
	Total water returned (D1 + D2)	**105 528**	**49 040**	**9 545**	**0**	**0**	**9 545**
D1	***To water sources***	***105 528***	***49 040***	***9 545***	***0***	***0***	***9 545***
	Atmosphere and sea (evaporation & losses)		29 255				9 545
	Evapotranspiration						
	MAR (including storage)	49 040					
	Groundwater	1 088					
	Surface water (including reserve)		19 785				
	Soil water	55 400					
	Ecological Reserve			9 545			
D2	***To other sources***	***0***	***0***	***0***	***0***	***0***	***0***
	Balance (to atmosphere or lower reserve)	0	0	0	0	0	0

Supply Table				Distribution				
				DWAF (Total Yield)	ROW and other WMA's	Irrigation Boards	Water Boards	Municipalities
			Total water returned	**186**	**0**	**0**	**0**	**0**
		D2	***To other sources***	***186***	***0***	***0***	***0***	***0***
			Balance (to atmosphere or lower reserve)	186				
To economic activities	S2		**Supply of water to other economic units**	**12 613**	**0**	**7 920**	**4 094**	**4 381**
			Of which:					
			Desalinated					
			Reused					
			Waste water to sewage					
			To distribution (bulk yield available)	***12 300***	***0***	***0***	***3 042***	***1 223***
			DWAF (available total yield)		0			1 223
			Irrigation Boards	7 920				
			Water Boards	4 094				
			Municipalities	116			3 041	
			ROW and other WMA's	170				
			To direct use by	***313***	***0***	***7 920***	***1 052***	***3 158***
			Agriculture - Irrigation			7 920		
			Agriculture - Dryland crops (excl forestry)					
			Agriculture - Livestock & Game	313				
			Agriculture - Plantation forestry					
			Mining				388	
			Hydroelectric Power				297	
			Other Bulk: Industrial				367	
			Other Commercial & Industrial					1 199
			Domestic - Urban					1 698
			Domestic - Rural					261

		Production								
		Agriculture			Mining	Electricity	Other Bulk: Industrial	Other Commercial, Industrial, Institutional, Municipal	Domestic - Urban	Domestic - Rural
		Dryland and Irrigation	Livestock and Game	Forestry						
	Total abstraction	**45 000**	**0**	**10 828**	**0**	**0**	**0**	**0**	**0**	**0**
b2	***Abstraction for distribution***									
	From water resources	***45 000***	***0***	***10 828***	***0***	***0***	***0***	***0***	***0***	***0***
a1	Atmosphere and sea (evaporation-losses)									
	MAR (including storage)									
	Groundwater									
	Surface water (including reserve)			428						
	Soil water	45 000		10 400						
	Ecological Reserve									
	Transfers in (ROW)									
	From other sources	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
a2	Direct rain harvesting									
	Abstraction from sea									
	Use of water supplied by other industries	**7 920**	**313**	**0**	**388**	**297**	**367**	**1 199**	**1 697**	**261**
	Supplied by distribution sectors	***7 920***	***313***	***0***	***388***	***297***	***367***	***1 199***	***1 697***	***261***
	DWAF		313							
	Irrigation boards	7 920								
	Water boards				388	297	367			
	Municipalities							1 199	1 697	261
	Supplied by other sectors	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
	Evapotranspiration									
	Losses - evaporation									
	Return flows									
	Effluent									
	Balance (surplus/deficit over current use)									
er use (U1 + U2)		**52 920**	**313**	**10 828**	**388**	**297**	**367**	**1 199**	**1 697**	**261**

Adapting and applying the SEEAW to WRAs for SA

- **Water asset accounts enhancements: SEEAW structure**
  - Volumetric water resource stocks in SA are not managed according to opening stock/closing stock principles but according to the yield requirements from the supply system over a hydrological period
    - 1:50 year assurance of supply
  - Therefore, given the nature of water assets intrinsic in their high spatial and temporal mobility and the typical difficulty with obtaining detailed information on components of the UN SEEAW, this study used a simplified version of asset accounting, following the Australian practice of *pathways analyses*
  - Water quality accounts a complex account to construct and was not attempted

	Annual changes to stock	2000
A.	Changes due to natural processes	
A1.	Precipitation	611,600
A2.	Evapotranspiration and deep seepage	506,072
A3.	Gross annual runoff[a] (A1 – A2)	105,528
A4.	Transpiration from dryland agriculture (including plantations)	55,400
A5.	Replenishment of groundwater	1,088
A6.	***Natural MAR (A3 - A4 - A5)***	***49,040***
	(% of total precipitation)	***8%***
A7.	Base flow[b] and other natural leakages from MAR	29,683
A.8	***Surface water yield (A6 - A7)***	***19,357***
	(% of Natural ? MAR)	***40%***
B.	**The ecological reserve (in stream flow requirements-IFR)**	**9,545**
C.	**Changes due to human activity**	
C.1.	Cultivated forest incremental use	428
C.2	***Available surface water yield (A.8 – B – C.1)***	*9,384*
	(% of Natural MAR)	***20%***
C.3	Available groundwater yield	1,088
C.4	Usable return flows	1,899
C.5	Transfers from ROW (water exports)	170
C.6	Total available yield (C.2 + C.3 + C.4 + C.5)	12,201
C.7	Total abstraction by production activities	*12,015*
D.	**Net annual change in flow water volumes (BALANCE)**	**186**

Recommendations

- **To DWAF**
  - Align water accounting periods and timeframes with StatsSA
  - Align DWAF water sector definitions with the ISIC
  - Explicitly include hydrological data on economically beneficial yield-impacting water uses such as dryland use.
- **To StatsSA**
  - Disaggregate economic data per water management area. This information should assist DWAF in addressing allocation questions.
  - Expand water supply economic data to correspond to institutional supply
  - The water quality account (2005) to be further developed, with emphasis placed on the impact of emissions on water yield. The monetary equivalent of this account should show the cost implications of loss and restoration of water yield due to emissions.
  - Consider options to gather economic data on ecological services.
  - Within the above, many data gaps exist which require attention.
- **To the London Group**
  - Use this as an example of how the SEEAW can be adopted to a water scarce country with unique policy requirements