Environmental Economic Accounting
Water Resource Accounting
for South Africa

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Application of National Accounts
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Contents

1. Introduction & background
2. Data
3. Statistics South Africa's involvement
4. Water resource accounting
5. Internal data audit/mining
6. Discussion document/results
7. Future initiatives & requirements

1. Environmental Economic Accounting

Environmental & Economic Information

Environmental Information

Economic Information

Contribution of environment to economy

Impact of economy on environment

1. Applications of EEA

- Regular monitoring of resource supply and demand at a national and regional levels
- Data provision in support of natural resource management
- Terminology standardisation
- Development still required
  - Technical
  - Institutional

2. Data requirements for EEA

- Developing EEA requires two types of data:
  - Physical data on stocks and flows of natural resources
  - Monetary data on the production, price and costs of natural resources

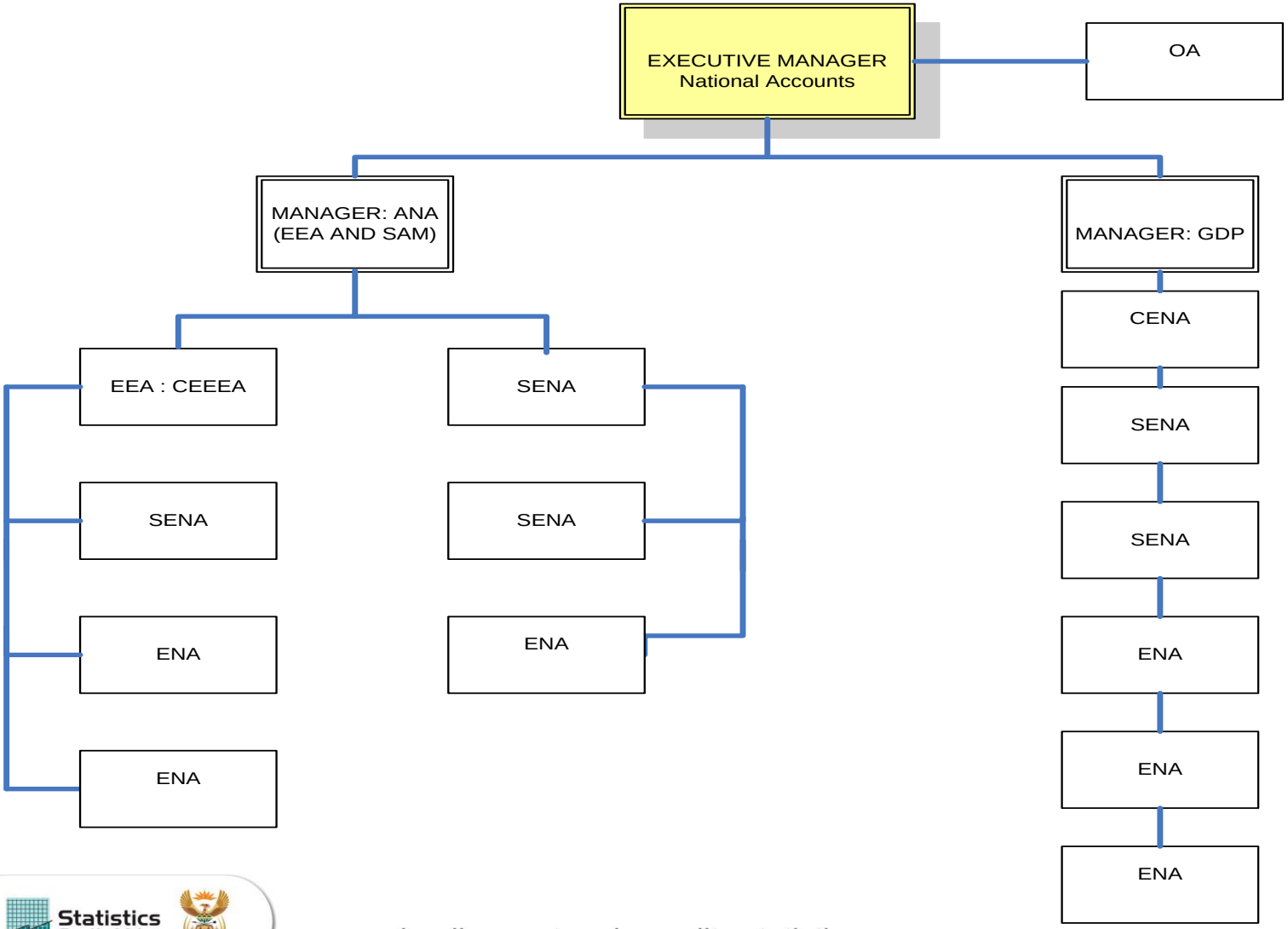
2. Data requirements for EEA

- Physical data are collected by:
  - Department of Mineral Resources (DMR)
  - Department of Water Affairs (DWA)
  - Department of Energy (DoE)
  - Department of Environmental Affairs (DEA)
- Monetary data are collected by:
  - Stats SA (custodian of economic data)
  - Monetary data used to a limited extent in EEA

2. Data requirements for EEA

- Stats SA has mandatory leadership in terms of the alignment, use and production of statistics
- Stats SA defines quality data according to South African Statistical Quality Assessment Framework (SASQAF)
- SASQAF draws a distinction between 'official' and 'national' statistics

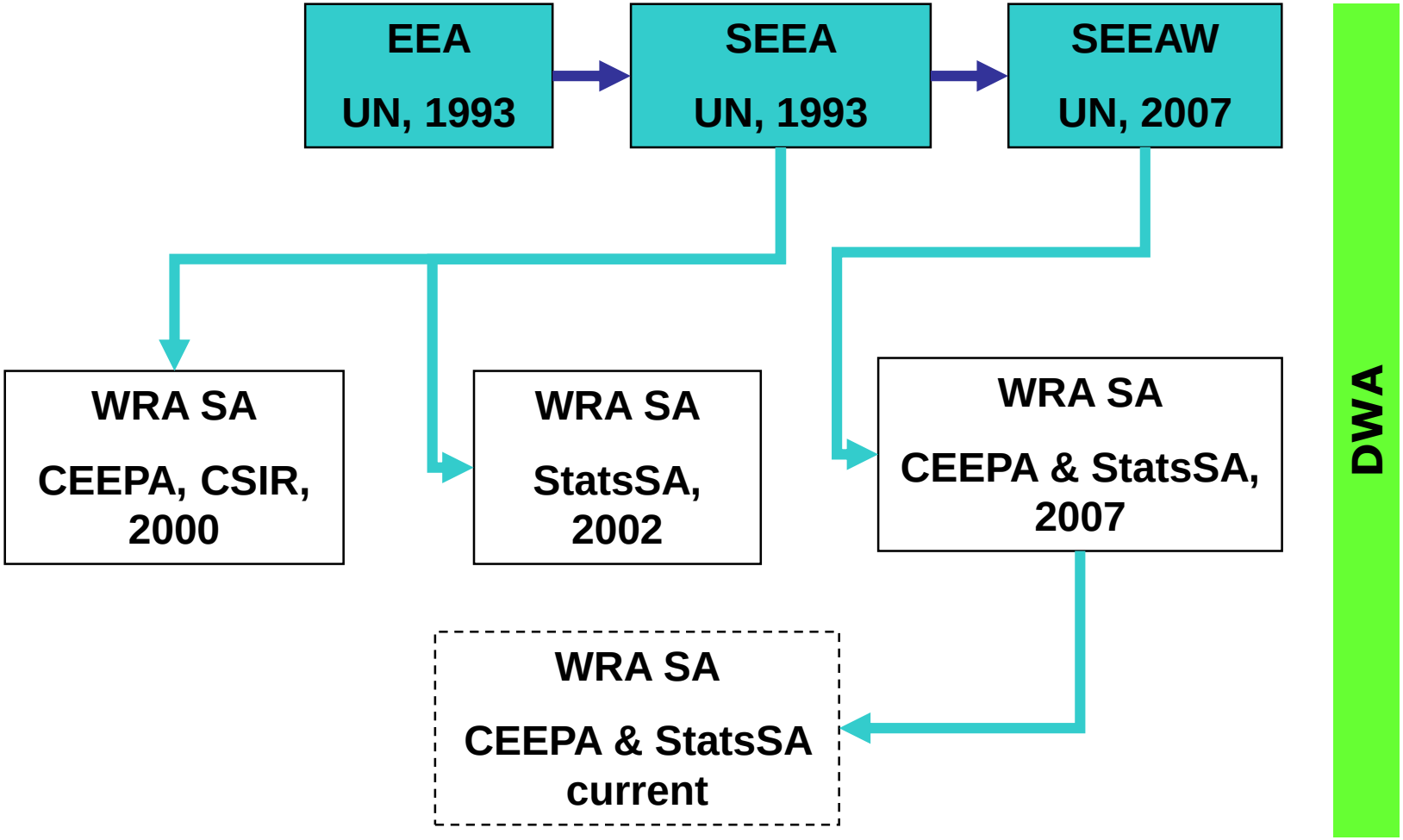
3. Stats SA involvement



3. Stats SA initiatives

- StatsSA – National Accounts
- 2009: 4 staff appointments in EEA
- 9-year partnership with CEEPA network
- 14 EEA Documents published
  - Water (5)
  - Mineral (5)
  - Energy (2)
  - Land (1)
  - Fishery (1)
- Host of London Group (UN) in 2007
- Core Member of London Group and Oslo Group (UN)
- UNCEEA

3. History of WRA in South Africa



4. What does WRA provide for?

Physical Accounting

Environmental stats & Economic classification

Hybrid Accounting

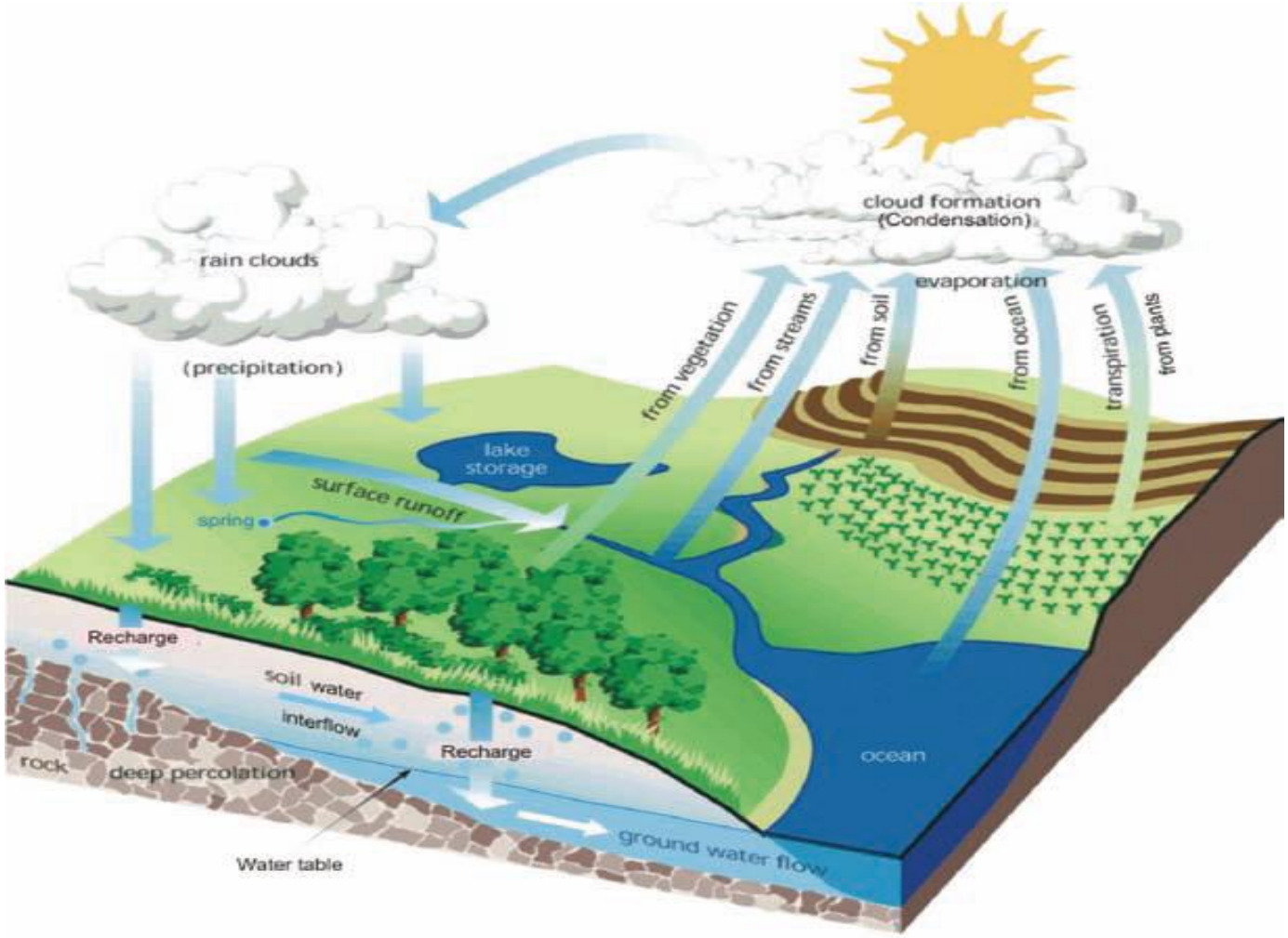
According to SNA

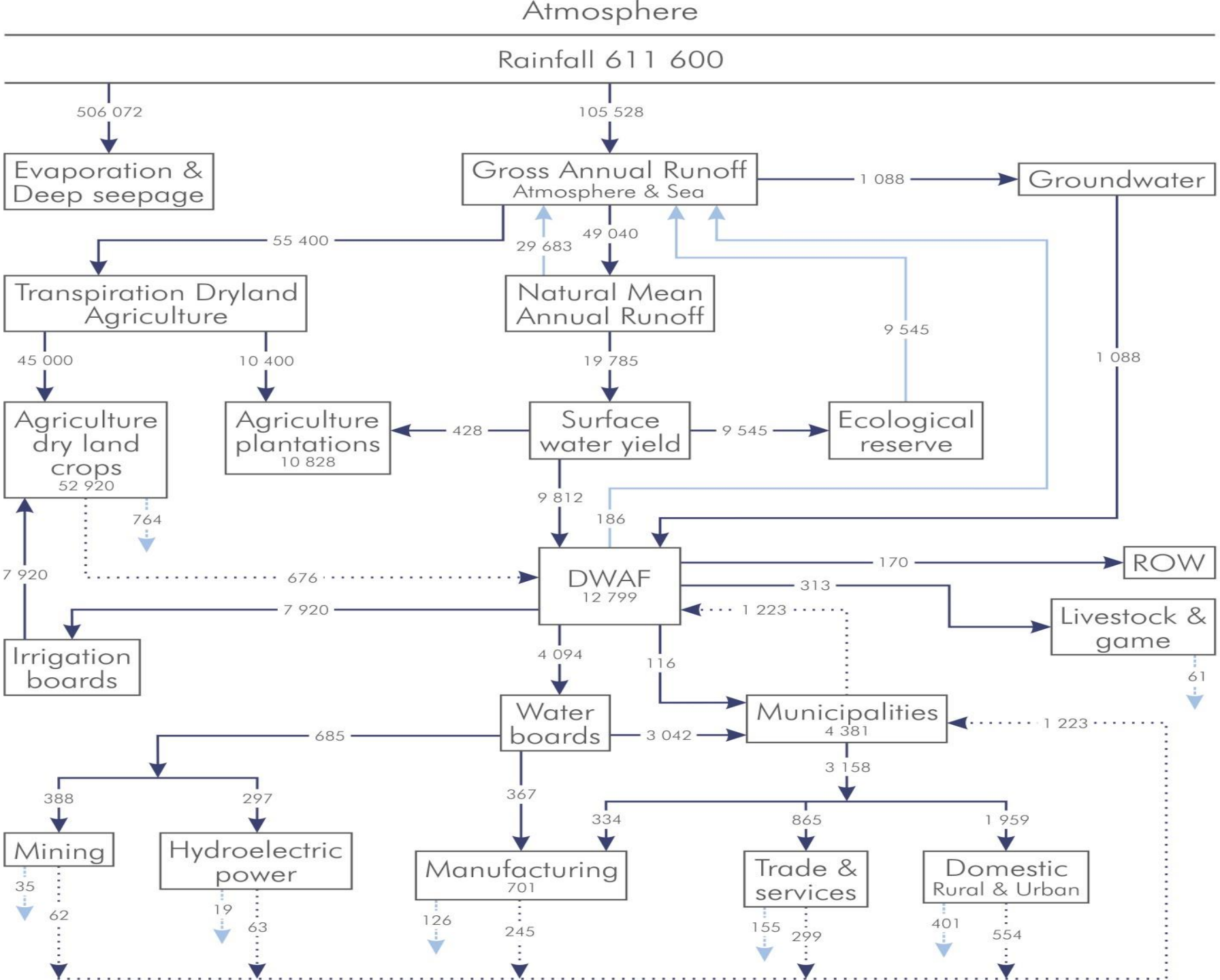
Monetary Accounting

More detail than SNA data

Allow variations in SNA accounting rules

4. Hydrological cycle




Atmosphere
Rainfall 611 600
506 072
105 528
Evaporation & Deep seepage
Gross Annual Runoff
Atmosphere & Sea
1 088
Groundwater
55 400
29 683
49 040
Transpiration Dryland Agriculture
Natural Mean Annual Runoff
9 545
1 088
45 000
10 400
19 785
Agriculture dry land crops
52 920
Agriculture plantations
10 828
428
Surface water yield
9 545
Ecological reserve
764
9 812
186
7 920
676
DWAF
12 799
170
ROW
313
7 920
1 223
Livestock & game
Irrigation boards
4 094
116
61
Water boards
685
3 042
Municipalities
4 381
1 223
3 158
388
297
367
334
865
1 959
Mining
Hydroelectric power
Manufacturing
701
Trade & services
Domestic
Rural & Urban
35
62
19
63
126
245
155
299
401
554

4. Physical supply & use tables (SUT)

Standard Physical water supply table.

Supply table				Environment					
				Atmosphere and sea	Natural MAR	Surface water yield	Groundwater	Soil water	Ecological reserve
To the environment	S1	D1	**Total water returned (D1 + D2)**	**105 528**	**49 040**	**9 545**	**0**	**0**	**9 545**
			To water sources	***105 528***	***49 040***	***9 545***	***0***	***0***	***9 545***
			Atmosphere and sea (evaporation and losses)		29 683				9 545
			Evapotranspiration						
			MAR (including storage)	49 040					
			Groundwater	1 088					
			Surface water (including reserve)		19 357				
			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

4. Physical supply & use tables (SUT)

Standard Physical water use table.

			Use table	Environment					
				Atmosphere and sea	Natural MAR	Surface water yield	Groundwater	Soil water	Ecological reserve
From the environment	U1	B1	**Total abstraction**	**39 398**	**49 040**	**19 785**	**1 088**	**55 400**	**9 545**
			Abstraction for own use						
			Hydroelectric power						
			Mine water						
			Urban runoff						
			Other						
		A1 B2	***Abstraction for distribution***						
			From water resources	***39 398***	***49 040***	***19 785***	***1 088***	***55 400***	***9 545***
			Atmosphere and sea (evaporation – losses)		49 040		1 088	55 400	
			MAR (including storage)	29 683		19 785			
			Groundwater						
			Surface water (including reserve)						9 545
			Soil water						
			Ecological reserve	9 545					
			Transfers in (ROW)	170					
		A2	***From other sources***	***0***	***0***	***0***	***0***	***0***	***0***
			Direct rain harvesting						
			Abstraction from sea						

4. Water supply and use in SA

Supply

Environment

- Atmosphere and sea
- Natural MAR
- Surface water yield
- Ground water
- Soil water
- Ecological reserve

Distributors

- DWA (total yield)
- Irrigation boards
- Water boards
- Municipalities
- ROW and other WMAs

Demand

Production (SIC)

- Agriculture
  - Dry land & irrigation
  - Livestock
  - Plantation
- Mining
- Electricity
- Manufacturing
- Trade & Services
- Domestic
  - Urban & Rural

5. Internal data audit/mining

- Constraints to development of EEA
  - Reliance on other government department & statutory bodies

- Limited Development of EEA
  - Source data not official statistics
  - Standard industrial classification of all economic activities (SIC)

5. Internal Data audit/mining

- Goals and objectives:
  - Identify EEA data within Stats SA.
  - Make improvements on identified data source.

- Methodologies:
  - Collect all Stats SA questionnaires.
  - Consultation with relevant survey areas.
  - Identified questionnaires, included in paper.

5. Internal data audit/mining

- Findings:
  - 21 questionnaires have EEA related questions.
    - Agriculture
    - General Household Survey
    - Non-Financial Census of municipalities
  - Most questions in monetary terms.
  - Questions not detailed enough.
  - Data at municipal district & WMA levels

6. Purpose of discussion document

- Assessment of potential for:
  - Extracting existing environmental data within Stats SA
  - Adapt Stats SA census and survey questionnaires
  - Propose framework for regular EEA reports

- Key Data points (46)
  - 33 data point from Stats SA
  - 13 data points from DWA

6. Extent of data contribution

Water Flow Account: Input-output tables for South Africa, 2000

		Environment						Distribution				
		Atmosphere and sea	Natural MAR	Surface water yield	Ground-water	Soil water	Ecological reserve	DWAF (Total yield)	Irrigation Boards	Water Boards	Municipalities	ROW and other WMA
Environment	Atmosphere and sea		49 040		1 088	55 400						
	Natural MAR (including storage)	29 683		19 357								
	Surface water (including reserve)						9 545	9 812				
	Groundwater							1 088				
	Soil water											
	Ecological reserve	9 545										
Distribution	DWAF (available total yield)	186							7 921	4 094	116	170
	Irrigation Boards											
	Water Boards										3041	
	Municipalities							1 223				
	ROW and other WMAs	170										
Production	Agriculture	62 957		428				676				
	Dryland and irrigation	52 244						676				
	Livestock and game	313										
	Plantation forestry	10 400		428								
	Mining	326									62	
	Electricity	234									63	
	Other bulk (industrial)	238									129	
	Other commercial and industrial	784									415	
	Total domestic	1 405									554	
	Domestic – urban	1 144									554	
	Domestic – rural	261										
Theoretical ecological reserve							9 545					
Water balance							186					

Physical data source from Department of Water Affairs (DWA)

Physical data source from Statistics South Africa

6. Extent of data contribution

Water Flow Account: Input-output tables for South Africa, 2000

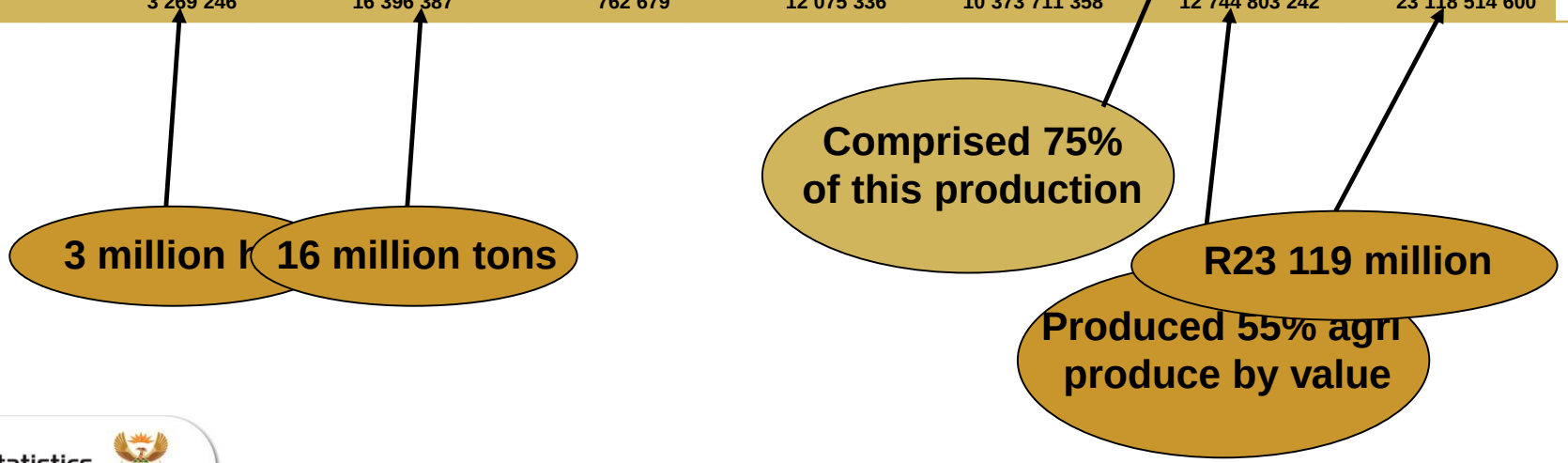
		Production											
		Agriculture											
		Dryland and irrigation	Livestock and game	Plantation forestry	Total	Mining	Electricity	Other bulk (industrial)	Other commercial and industrial	Domestic – urban	Domestic – rural	Domestic – total	Total
Environment	Atmosphere and sea												105 528
	Natural MAR (including storage)												49 040
	Surface water (including reserve)			428	428								19 785
	Groundwater												1 088
	Soil water	45 000		10 400	55 400								55 400
	Ecological reserve												9 545
Distribution	DWAF (available total yield)		313		313								12 799
	Irrigation Boards	7 921			7 920								7 920
	Water Boards					388	297	367					4 094
	Municipalities								1 199	1 698	261	1 959	4 381
	ROW and other WMA												170
Production	Agriculture												64 061
	Dryland and irrigation												52 920
	Livestock and game												313
	Plantation forestry												10 828
	Mining												388
	Electricity												297
	Other bulk (industrial)												367
	Other commercial and industrial												1 199
	Total domestic												1 959
	Domestic – urban												1 698
	Domestic – rural												261
Theoretical ecological reserve													9 545
Water balance													186

Physical data source from Department of Water Affairs (DWA)

Physical data source from Statistics South Africa

6. Summary of Agriculture products, 2002

Crops	Dryland area (ha)	Dryland production (tons)	Irrigated area (ha)	Irrigated production (tons)	Dryland production (R)	Irrigated production (R)	Total production (R)
Field crops	3 159 670	14 995 096	471 262	6 050 873	8 803 400 205	3 136 438 795	11 939 839 000
Horticultural crops	109 576	1 401 291	291 417	6 024 464	1 570 311 153	9 608 364 447	11 178 675 600
Total	3 269 246	16 396 387	762 679	12 075 336	10 373 711 358	12 744 803 242	23 118 514 600



6. Municipal water distribution, 2006

Water Management Area	Water lost	Water sold	Free basic water supplied	Water for own use	Total
Limpopo	7 734 991	35 474 535	11 509 527	1 086 835	55 805 888
Luvuvhu to Letaba	3 203 728	14 693 069	4 767 089	450 152	23 114 038
Crocodile West Marico	112 968 291	287 330 515	51 740 622	1 032 333	453 071 761
Olifants	60 437 111	149 969 594	32 156 042	1 049 740	243 612 487
Inkomati	10 464 287	25 338 514	7 741 002	508 117	44 051 921
Usutu to Mhlatuze	70 489 284	121 195 834	18 762 523	434 838	210 882 480
Thukela	53 736 005	90 657 902	13 080 574	225 551	157 700 032
Upper Vaal	157 369 290	377 187 254	68 188 262	2 658 536	605 403 342
Middle Vaal	14 489 542	44 424 974	5 774 727	3 028 689	67 717 932
Lower Vaal	19 435 094	85 081 853	14 248 049	2 140 968	120 905 964
Mvoti to Umzimkulu	45 534 712	77 954 910	11 617 250	248 441	135 355 313
Mzimvubu to Keiskamma	23 692 131	63 096 775	16 925 618	1 307 664	105 022 188
Upper Orange	22 581 484	61 781 298	11 081 901	4 428 550	99 873 233
Lower Orange	13 280 720	41 351 049	12 723 192	2 026 197	69 381 158
Fish to Tsitsikamma	29 289 929	97 206 939	24 425 872	2 990 178	153 912 917
Gouritz	30 297 264	119 348 879	18 156 591	5 071 966	172 874 700
Olifants/Doorn	19 689 276	76 822 936	12 186 466	3 299 605	111 998 283
Breede	11 820 715	46 750 441	7 011 650	1 996 803	67 579 609
Berg	7 998 579	31 634 052	4 744 488	1 351 153	45 728 271
Total	714 512 435	1 847 301 323	346 841 443	35 336 316	2 943 991 517

715 million m³ 847 million m 347 million m 35 million m³

6. Mining sector, 2004

Mining Sector	Water use R' million	Estimated price Cents/m^3	Water use (million m^3)
Gold and uranium	185,451	8,8	211,51
Chrome, manganese and other metal ores	52,990	8,8	60,43
Platinum Group Metals	43,720	8,8	49,86
Iron ore	24,572	8,8	28,02
Coal	23,512	8,8	26,82
Stone quarrying, clay and sandpits	2,894	8,8	3,30
Diamonds	1,398	8,8	1,59
Phosphate and other chemicals	1,191	8,8	1,36
Limestone	0,864	8,8	0,99
Dimension stone	0,422	8,8	0,48
Other mining	3,189	8,8	3,64
Total	340,204		388

R340 million

8,8cents per m^3

6. Other sectors

Sector	Year	Water use (R' million)	Water price (R/m³)	Water volume (million m³)
Business	2006	322,818	5,29	61,024
Construction	2004	21,072	5,29	3,983
Personal Service	2004	144,241	5,29	27,267
Accommodation	2004	5,813	5,29	1,099

R323 million

61 million m³

R6 million

1 million m³

6. Time spent for collection of water

Water Management Area	Total days spent collecting water 2005	2006	Opportunity cost of labour (R' million) 2005	2006	Change (%)
Berg	585 322	708 760	23,41	28,35	21%
Breede	123 089	151 092	4,92	6,04	23%
Crocodile (West) and Marico	4 737 004	7 096 756	189,48	283,87	50%
Fish to Tsitsikamma	4 438 859	5 563 450	177,55	222,54	25%
Gouritz	274 374	353 898	10,97	14,16	29%
Inkomati	2 013 454	3 284 174	80,54	131,37	63%
Limpopo	6 748 710	5 646 530	269,95	225,86	-16%
Lower Orange	159 718	288 976	6,39	11,56	81%
Lower Vaal	2 496 007	4 002 440	99,84	160,10	60%
Luvuvhu and Letaba	5 120 260	4 240 943	204,81	169,64	-17%
Middle Vaal	756 214	857 432	30,25	34,30	13%
Mvoti to Umzimkulu	19 192 381	20 252 236	767,70	810,09	6%
Mzimvubu to Keiskamma	37 524 061	40 943 501	1 500,96	1 637,74	9%
Olifants	8 209 876	8 781 256	328,40	351,25	7%
Olifants/Doorn	132 6		5,31		1%
Thukela	10 459 309	11 547 937	418,37	461,92	10%
Upper Orange	2 795 096	3 330 762	111,80	133,23	19%
Upper Vaal	4 548 055	6 164 977	181,92	246,60	36%
Usutu to Mhlathuze	17 141 191	24 149 604	685,65	965,98	41%
Total	127 455 625	147 498 527	5 098	5 900	16%

127 million p/d

148 million p/d

R5 900 million

6. Salient features

- Salient features of updated Water Accounts for Agriculture
  - Actual irrigation water use & irrigation area
  - Improved estimate of soil water use by dryland crops
  - Analysis of agricultural water use by major crop type
  - Summary of irrigation water price

6. Salient features

- Salient features of updated Water Accounts for municipal water supply
  - Breakdown of municipal water source
  - Breakdown of where municipality supply water
  - Breakdown of municipal water cost & selling price

7. Future initiatives

- Future approach for EEA
  - Policy link as well as link between various accounts
  - Monetary accounts
  - Continuation of the EEA advisory committee
  - UNSD training on water accounts

7. Future WRA requirements

- Current WRA have been developed based on DWA hydrological models:
  - On a national basis
  - Per Water management Area
  - Limited to physical data (no monetary data)
  - No regular data updates possible
  - Little appropriate water quality information
- Future usage of EEA:
  - Increase data intensity
  - Increase frequency of the publications
  - Increase range of products to support water management / allocation

7. Future requirements

- Data requirements
  - Volume data for environment, distribution & production
  - Monetary data for environment, distribution & production
  - Water quality

7. Future requirements

- Line ministries data through SASQAF
  - Process to making EEA document official statistics
  - DoE is already following process
  - DEA is looking at the process

THANK YOU

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