

## Questionnaire

To review case study basins  
with regard to their water governance regime,  
context and performance

## Olifants River Basin

With focus on the South-African part

Case Study Review Workshop for the WETwin project

Loskopdam, 01.04.2010

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## About this questionnaire

This questionnaire was developed within the scope of the Twin2Go project. It serves to record case study data about a river basin's water governance regime, its context and its performance. An explanation of the indicators, pre-defined scores and potential data sources is provided in the guidance on this questionnaire (Twin2Go, Guidance on the Questionnaire of the Twin2Go Case Study Review Workshops. 13/03/10).

Scores to each of the indicators are assigned according the suggested score scheme proposed in the guidance. In the case of numerical indicators like indices, the numerical values are added in brackets after the score, e.g. "B (0.178)" or "C (12,534)". For a better understanding of the recorded issue, additional information is added in the "comments" column.

If not specified differently, the indicators refer to the national part of the basin of interest, i.e. the South-African part of the Orange basin.

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The questionnaire was sent to the invited experts prior to the Case Study Review Workshop in Loskop Dam, South-Africa (April 2010).

It was completed by the three case study experts who participated in the workshop. Missing scores were added in a subsequent email exchange. The questionnaire was largely filled in parallel with the Orange case study. Many scores are based on national input.

Based on the preliminary synthesis results and discussion during the Twin2Go synthesis workshop (Stockholm, September 1-2 2010) an addendum was made with some additional parameters. These additional scores were filled by the WetWin partners.

The resulting data will be post-processed and added to the Twin2Go database. Should you feel these scores do not reflect the situation of the basin accurately, or want to contest any of the information included, you may contact the project organisers. Contact information as well as additional information regarding the project and the results can be found on [www.twin2go.eu](http://www.twin2go.eu).

Names of participating experts have been removed for confidentiality purposes.

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## A) Water governance regime<sup>1</sup>

No.	Indicator	Score	Comments
<b>I) Characteristics of environmental governance regimes</b>			
<b>a) Water policy, institutional &amp; legal framework (formal and informal)</b>			
1.	<b>Domestic water legislation (laws, by-laws, etc.) in place?</b>	A(-)	Water Services Act, 1997 (water supply, treatment, discharge, waste treatment,...), fairly well implemented
2.	<b>Domestic Water Law: Public character of water and legal status of water use rights</b>	A(--)	National Water Act, 1998 (river basin management), not fully implemented
3.	<b>Domestic Water Law: Explicit recognition of traditional and indigenous water uses</b>	A	the WRCS makes provisions for recognizing any indigenous use, including sacred sites
4.	<b>Domestic Water Law: On flow availability, third party rights and ecological requirements</b>	A(-)	The National Water Resources Strategy has the national water supply versus demand, revised every 5 years, although the first revision due 2009 has not even started. (Ref: Orange River Basin)
5.	<b>Integration of domestic water legislation</b>	A(-)	Two main acts are implemented by a single department, and are fairly well integrated although certain implementation problems persist
6.	<b>Multilevel structure of domestic water legislation and subsidiarity</b>	A	A- from the design perspective, but implementation is lagging behind
7.	<b>Existence of formal domestic administrative structure for water governance</b>	A	Department of Water Affairs is autonomous
8.	<b>National basin organisation or comparable arrangement</b>	C	Currently in the planning phase, in other SA basins, implementation is in progress

<sup>1</sup> Reference is made to the responses in the Orange River Basin questionnaire

No.	Indicator	Score	Comments
9.	<b>Formalised transboundary coordination organisation</b>	A	LIMPCOM
10.	<b>Formal institution (legislation) that prescribes the basin management principle</b>	A/B	Subscribed at both national and supranational level, but not implemented at national level
11.	<b>Water (basin) strategies, programmes and plans</b>	B	
12.	<b>Financing mechanisms: Degree of investment from private sector/ public/ other sources (e.g. international)</b>	A	well balanced. No donors at the national level but predominantly donor-funded at the transboundary level
13.	<b>Economic instruments Is water for irrigation priced?</b>	B	Real consumption not monitored in a volumetric way, pricing corresponds to assumption of complete consumption of allocation, so use efficiency is not promoted > currently a revision is on the way
14.	<b>Economic instruments Is water for households priced in urban areas?</b>	B	Good level of cost recovery from infrastructure perspective, but not environmental costs; system caters for those that are not able to pay (6 kiloliters per household per month are free - cross-subsidising applies)
15.	<b>Economic instruments Is water for industry priced?</b>	B	Price paid by industry is grossly inadequate, especially for mining (reason: amount of revenue generated is not commensurate with what is being paid for water, damage/environmental costs is not reflected in the costs, especially in the absence of the waste discharge charge system)
16.	<b>Tradable permits related to water abstraction/use</b>	B(-)	Although the law allows for it, the administrative system is not in place, putting it in place would mean an additional burden; trading happens in a limited, informal way; this will become a function of the CMAs
17.	<b>Polluter pays principle (related to water)</b>	C	It is allowed for in the legislation; a framework is under development, but implementation/enforcement is still to come
18.	<b>Environmental subsidies (related to water)</b>	C	

No.	Indicator	Score	Comments
19.	Payment for ecosystem services (related to water)	A	It has been investigated and provisions are there; now going into the implementation stage
20.	Tradable permits (related to water quality, maximum, allowable loads etc.)	B(-)	Although the law allows for it, the administrative system is not in place, putting it in place would mean an additional burden; trading happens in a limited, informal way; this will become a function of the CMAs
21.	Environmental tax (related to water)	A	Water resource management charge; from all uses incl. Forestry sector; translates into the amount of mitigating the effects of the use; new charge, only started in 2003 (?); among the main sources of \$ for CMAs
22.	Presence of substituting informal institutions for management of water	A	Exceptions exist, but are not common* additional check; catchment management forums are not considered as subsisting, they are complementary although informal
23.	Presence of complementary informal institutions for water management	B	
23.a	<i>Case-specific indicator(s)...</i>		
<b>b) Formalisation of IWRM principles &amp; Millennium Development Goals</b>			
24.	Formalised IWRM principles	A	
25.	State of implementation of IWRM principles	C(+)	
26.	Capacity to implement IWRM	C	Due to decentralisation which requires more human resources- there are no right people with respect to numbers and skills.
27.	Is universal and non-discriminatory access to safe drinking water and sanitation a goal?	A	Stated in the national constitution as well as national water policy. <a href="http://www.dwa.gov.za">www.dwa.gov.za</a>
28.	Integration of wetlands in IWRM and IRBM*	A	

No.	Indicator	Score	Comments
<i>28.a</i>	<i>Case-specific indicator(s)...</i>		
<b>c) Decision making regarding uncertainties</b>			
29.	<b>General practices for dealing with uncertainties</b>	B	Water planners often operate on worst case scenarios and use of climate projections has potential to refine their plans. However most of the uncertainties are ignored and only very limited and mostly risk based parameters are used. Data in 2006 suggests that climate projections do not play a significant role in decision making.
30.	<b>Dealing with uncertainties: Reversible and flexible options</b>	B	From the policy/planning side it is a target (good review loop), but in practice more difficult; in case of crises response however can be quite quick. So it's somewhere in between. scenarios are used in the context of the National Water Resources Strategy which has - as alluded to under 4 - not been updated yet.
31.	<b>Dealing with uncertainties: Safety margins</b>	A	
32.	<b>Are scenarios used for decision making?</b>	B	National scenarios (not water) exist, but do not result in strong concrete action on the ground
33.	<b>Climate risks: Climate variability and change</b>	B	Current focus on climate variability, slow shift to incorporate climate change
<i>33.a</i>	<i>Case-specific indicator(s)...</i>		
<b>II) Actor networks with emphasis on the role and interactions of state and non-state actors and power relationships</b>			
<b>a) Cooperation and coordination structures</b>			
34.	<b>Vertical coordination (governmental)</b>	D	Coordination between regional and head offices frequently lacking
35.	<b>Horizontal coordination (governmental)</b>	C(-)	Tasks fairly well defined, limited degree of overlap, certain lack of coordination, a policy of cooperative governance exists (is in the constitution).
36.	<b>Role of local governments</b>	A	Strong
<i>36.a</i>	<i>Case-specific indicator(s)...</i>		

No.	Indicator	Score	Comments
<b>b) Information sharing via formal rules, dependency relationships etc.</b>			
37.	<b>Kinds of knowledge included =&gt; Role of experts/ science, local/traditional knowledge</b>	B	Mostly the technical information is taken into account excluding much of the traditional knowledge.
38.	<b>Access to information =&gt; about expert knowledge and management plans</b>	A(-)	Open to everyone free of cost although access is difficult in some instances, there is no active dissemination of information and in instances where there is no access to the internet then it is also difficult to obtain this information. E.g <a href="http://www.dwa.gov.za">www.dwa.gov.za</a> has a lot of information on management plans.
<i>38.a</i>	<i>Case-specific indicator(s)...</i>		
<b>III) Multi-level interactions across administrative boundaries and vertical integration across levels and horizontal integration across sectors</b>			
<b>a) Centralisation</b>			
39.	<b>One level one actor?</b>	A	In terms of water resources DWA is a dominant actor, in the SA setup there are disparities and very strong invested interests
40.	<b>Degree of centralisation</b>	B	The example of the Catchment Management agencies creation and implementation process which has taken too long shows a strong tendency towards centralisation.
41.	<b>Technical capacity and economies of scale</b>	A	Serious consideration has been given to this; this could explain why there is slow development at lower levels (because of lack of available technical human capacity)
42.	<b>Legal obligations and responsibility</b>	A(-)	Well defined in law, but not well implemented (yet)
<i>42.a</i>	<i>Case-specific indicator(s)...</i>		



## B) Context<sup>2</sup>

No.	Indicator	Score	Comments
<b>I) Societal dimension</b>			
43.	<b>Proportion of the population living in rural areas</b>	<b>ZA: 43.7%</b> LS: 76.7% NAM: 64.9% RB: 42.7%	Source: United Nations Population Division (2008): World Urbanization Prospects: The 2007 Revision Population Database, <a href="http://esa.un.org/unup/">http://esa.un.org/unup/</a> Values for 2005
44.	<b>State of societal development</b>	<b>ZA: C (0.683)</b> LS: C (0.514) NAM: C (0.686) RB: C (0.694)	Human Development Index Source: UNDP: Human Development Report, online at <a href="http://hdr.undp.org/en/statistics/">http://hdr.undp.org/en/statistics/</a> Values for 2007
45.	<b>Social sustainability (Gini Index)</b>	<b>ZA: D (57.8)</b> LS: D (52.5) NAM: E (74.3) RB: E (61.0)	Gini Index Source: UNDP: Human Development Report 2009, <a href="http://hdr.undp.org/en/media/HDR_2009_EN_Complete.pdf">http://hdr.undp.org/en/media/HDR_2009_EN_Complete.pdf</a> - Values were calculated based on data by World Bank (2009d)

<sup>2</sup> Reference is made to the responses in the Orange River Basin questionnaire

No.	Indicator	Score	Comments
46.	<b>Economic sustainability (e.g. GDP)</b>	<b>ZA: C (8,477 \$)</b> LS: D (1,415 \$) NAM: D (4,547 \$) RB: C (12,057 \$)	GDP per capita (US-\$, PPP-corrected) Source: World Bank, <a href="http://siteresources.worldbank.org/ICPINT/Resources/icp-final-tables.pdf">http://siteresources.worldbank.org/ICPINT/Resources/icp-final-tables.pdf</a> Values for 2005
47.	<b>Effectiveness of formal institutions</b>	<b>ZA: C (4.7)</b> LS: D (3.3) NAM: C (4.5) RB: C (5.6)	Corruption Perception Index Source: Transparency International, <a href="http://www.transparency.org/policy_research/surveys_indices/cpi/2009/cpi_2009_table">http://www.transparency.org/policy_research/surveys_indices/cpi/2009/cpi_2009_table</a> Values for 2009
48.	<b>Trustworthiness of economic institutional setting - degree of risk for foreign direct investment</b>	<b>ZA: B (A- to AA+)</b> LS: n/a NAM: n/a RB: B (A- to AA+)	Rating by the rating agency "Standards & Poor" Source: The Guardian (article from 22.05.2009), <a href="http://www.guardian.co.uk/business/2009/may/22/recession-government-borrowing#zoomed-picture">http://www.guardian.co.uk/business/2009/may/22/recession-government-borrowing#zoomed-picture</a>

No.	Indicator	Score	Comments
49.	Presence of avenues of dissent – press freedom, freedom of speech	<b>ZA: A (8.50)</b> LS: C (27.50) NAM: A (9.00) RB: C (15.50)	Press Freedom Index Source: Reporters without Borders, <a href="http://www.rsf.org/en-classement1003-2009.html">http://www.rsf.org/en-classement1003-2009.html</a> Values for 2009
49.a	<i>Case-specific indicator(s)...</i>		
<b>II) Good Governance Principles at the national level – legal basis at the national level</b>			
50.	Participatory regarding decision making in the water sector	A(-)	Laws are in place and numerous guidelines on how to do it but the implementation is not institutionalised. The National Water Resources Strategy was the best consulted document where stakeholders' inputs were dealt with in a transparent way. Other initiatives exist which were also very good. It is not yet a norm.
51.	Transparency regarding water allocation	A	There is a law on Access to Information law. Water Allocation is a highly political issue is still quite centralised. Even regional offices do not allocate water leave alone any other institution.
52.	Effectiveness and efficiency regarding decision making in the water sector	B(-)	All regulations, controls and supporting laws are in place. They are just not enforced
53.	Equitable and inclusive	B	Equity is not defined only through water pricing and the rights of access. The score is because we have the Pricing strategy and the guaranteed access and very good policies but part implementation on gender equity.
54.	Predictability – with regard to IWRM and climate change	B	Maybe more implicit rather than explicit
54.a	<i>Case-specific indicator(s)...</i>		

No.	Indicator	Score	Comments
<b>III) Environmental dimension</b>			
55.	Köppen-Geiger climate classification (river basin)		
56.	Climate Moisture Index	SA, semi-arid (upstream) A, arid (mid- & downstream)	Source: GWSP Digital Water Atlas (2008), GWSP Digital Water Atlas (2008), <a href="http://atlas.gwsp.org/index.php?option=com_wrapper&amp;Itemid=53&amp;id_desc=98&amp;itemId_desc=63&amp;id_ds=146&amp;itemId_ds=52&amp;header=Climate%20Moisture%20Index&amp;site=b1_cmi_anWSAG1_0">http://atlas.gwsp.org/index.php?option=com_wrapper&amp;Itemid=53&amp;id_desc=98&amp;itemId_desc=63&amp;id_ds=146&amp;itemId_ds=52&amp;header=Climate%20Moisture%20Index&amp;site=b1_cmi_anWSAG1_0</a> Reported are the dominant values in the Orange-Senqu basin
57.	Climate Moisture Index Coefficient of Variation	B, moderate (upstream) A, low (mid- & downstream)	Source: GWSP atlas (2008), <a href="http://atlas.gwsp.org/index.php?option=com_wrapper&amp;Itemid=53&amp;id_desc=126&amp;itemId_desc=63&amp;id_ds=171&amp;itemId_ds=52&amp;header=Coefficient%20of%20Variation%20for%20Climate%20Moisture%20Index&amp;site=b2_cmi_annual_cv">http://atlas.gwsp.org/index.php?option=com_wrapper&amp;Itemid=53&amp;id_desc=126&amp;itemId_desc=63&amp;id_ds=171&amp;itemId_ds=52&amp;header=Coefficient%20of%20Variation%20for%20Climate%20Moisture%20Index&amp;site=b2_cmi_annual_cv</a> Reported are the dominant values in the Orange-Senqu basin
58.	Per Capita Equivalent of TARWA	<b>ZA: D (1,110 m<sup>3</sup>/yr)</b> LS: D (1,680 m <sup>3</sup> /yr) NAM: C (8,810 m <sup>3</sup> /yr) RB: C (6,820 m <sup>3</sup> /yr)	Source: UNESCO, UN World Water Development Report, <a href="http://www.greenfacts.org/en/water-resources/figtableboxes/3.htm">http://www.greenfacts.org/en/water-resources/figtableboxes/3.htm</a> Values for 2005

No.	Indicator	Score	Comments
59.	Average water availability at the river basin level (1995)	E (1-5 mm/yr) D (5-10 mm/yr)	Source: University of Kassel, WaterGAP 2.0, <a href="http://www.env-&lt;br/&gt;edu.gr/Documents/World%20Water%20in%202025.pdf">http://www.env- edu.gr/Documents/World%20Water%20in%202025.pdf</a> The source excludes the Kalahari catchment (D, 5-10 mm/yr) from the rest of the Orange-Senqu basin (E, 1-5 mm/yr)
60.	Annual renewable water supply per person by river basin (1995)	C (1,000-1,700 m <sup>3</sup> /yr)	Source: World Resources Institute, EarthTrends 2001, <a href="http://earthtrends.wri.org/pdf_library/maps/2-4_m_WaterSupply1995.pdf">http://earthtrends.wri.org/pdf_library/maps/2-4_m_WaterSupply1995.pdf</a>
61.	Projected annual renewable water supply per person by river basin (2025)	D (500-1,000 m <sup>3</sup> /yr)	Source: World Resources Institute, EarthTrends 2001, <a href="http://earthtrends.wri.org/pdf_library/maps/2-4_m_WaterSupply2025.pdf">http://earthtrends.wri.org/pdf_library/maps/2-4_m_WaterSupply2025.pdf</a>
62.	Relative Water Stress Index	B, (low, upstream) E (very high, midstream) C (medium, downstream)	Source: UNESCO, World Water Development Report II, <a href="http://wwdrii.sr.unh.edu/download.html">http://wwdrii.sr.unh.edu/download.html</a> Downstream is average value <i>The illustration (I4) has bad quality. Please check if the judgement is appropriate, especially with regard to the downstream score.</i>

No.	Indicator	Score	Comments
63.	Climate Vulnerability Index	<b>ZA: D</b> (medium-high) LS: D (medium-high) NAM: D (medium-high) RB: D (medium-high)	Source: Oxford Centre for Water Research (OCWR), 2008-2010, <a href="http://ocwr.ouce.ox.ac.uk/research/wmpg/cvi/">http://ocwr.ouce.ox.ac.uk/research/wmpg/cvi/</a>
64.	Degree to which water quality status restricts usability of users' types	<b>B</b> (Medium: water quality restrict water uses to a certain extent)	The Upper Olifants has very significant water quality problems associated with mining; and there have also been major algal blooms in Loskop and other dams, and fish and crocodile kills. However, water quality does not restrict use in most of the basin. (this might explain the conflicting answers you have on water quality)
65.	Extent of flow and channel modification	<b>C</b> (Heavily modified)	There are 37 major dams (i.e., reservoir capacity greater than 2 Mm <sup>3</sup> ) and approximately 300 minor dams (i.e., reservoir capacity 0.1 to 2 Mm <sup>3</sup> ). In addition, it is estimated that there are between 3,000 and 4,000 small dams (i.e., reservoir capacity less than 0.1 Mm <sup>3</sup> ), most of which were constructed for livestock watering and irrigation. Currently, the cumulative storage of dams in the catchment is estimated to be approximately 1,480 Mm <sup>3</sup> (i.e., 73% of the mean annual runoff - From McCartney, M. P.; Arranz, R. 2007. Evaluation of historic, current and future water demand in the Olifants River Catchment, South Africa. Colombo, Sri Lanka: International Water Management Institute. 48p. (IWMI Research Report 118)

No.	Indicator	Score	Comments
66.	<b>Impact of land-use changes on hydrological processes</b>	<b>C</b> (Heavily modified with clear negative impact on ecosystem services)	The basin's water resources are overallocated, and deficits occur in most years (RR118, above). Present ecological status of the rivers has been assessed as part of the Comprehensive Reserve Determination, and much of the basin is classed as C to E on a scale from A to F (I have maps if you need them).
67.	<b>Uncertainty associated to climate change predictions regarding precipitation for the basin</b>	D (0.2-0.4)	Source: Illustration from MAGICC-SCENGEN tool at the end of the guidance document
<i>67.a</i>	<i>Case-specific indicator(s)...</i>		

### C) Performance<sup>3</sup>

No.	Indicator	Score	Comments
<b>I) Progress towards stated Goals</b>			
68.	<b>Progress towards sustainable access to safe drinking water (MDG drinking water target)</b>	<b>ZA: A</b> LS: B NAM: A RB: A	Source: WHO & UNICEF (2008), Progress on Drinking Water and Sanitation: Special Focus on Sanitation, <a href="http://www.wssinfo.org/en/40_MDG2008.html">http://www.wssinfo.org/en/40_MDG2008.html</a> Values for 2006
69.	<b>Proportion of population with access to improved drinking water</b>	<b>ZA: B (93%)</b> LS: C (78%) NAM: B (93%) RB: B (96%)	Source: UN statistics of MDG progress, <a href="http://mdgs.un.org/unsd/mdg/Data.aspx">http://mdgs.un.org/unsd/mdg/Data.aspx</a> Values for 2006
70.	<b>Proportion of rural population with access to improved drinking water</b>	<b>ZA: C (82%)</b> LS: D (74%) NAM: C (90%) RB: C (90%)	Source: UN statistics of MDG progress, <a href="http://mdgs.un.org/unsd/mdg/Data.aspx">http://mdgs.un.org/unsd/mdg/Data.aspx</a> Values for 2006
71.	<b>Progress towards sustainable access to basic sanitation (MDG sanitation target)</b>	<b>ZA: C</b> LS: C NAM: C RB: C	Source: WHO & UNICEF (2008), Progress on Drinking Water and Sanitation: Special Focus on Sanitation, <a href="http://www.wssinfo.org/en/40_MDG2008.html">http://www.wssinfo.org/en/40_MDG2008.html</a> Values for 2006

<sup>3</sup> Reference is made to the responses in the Orange River Basin questionnaire



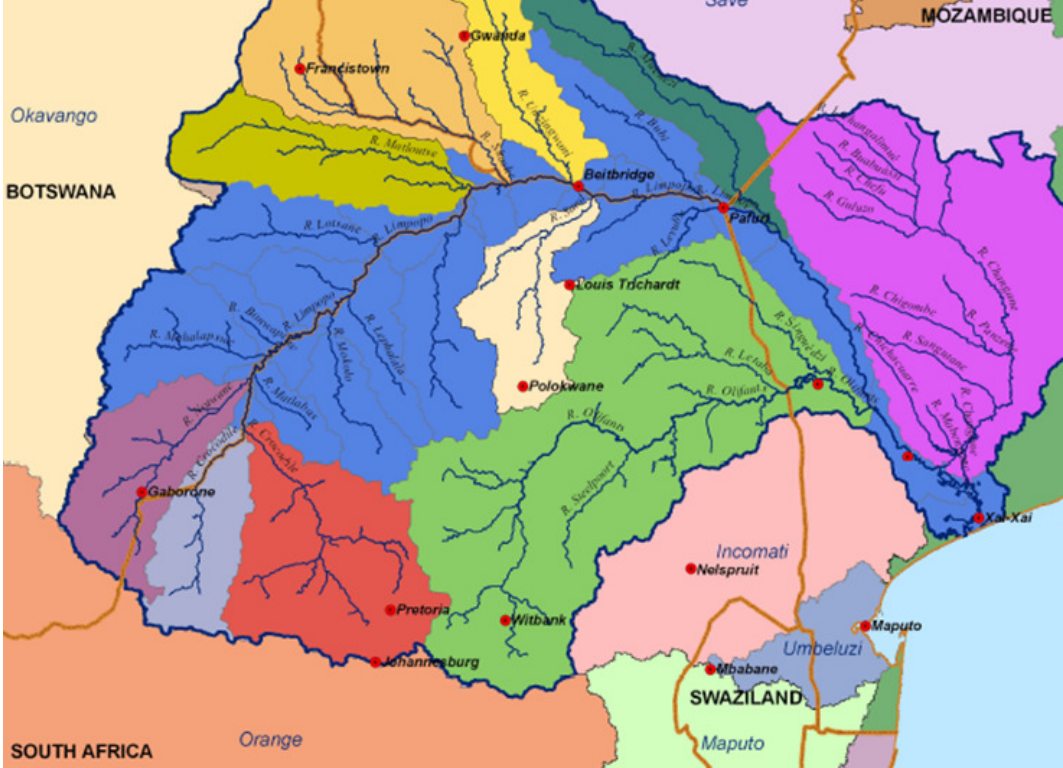
No.	Indicator	Score	Comments
72.	Proportion of population with access to improved sanitation facilities	<b>ZA: D (59%)</b> LS: E (36%) NAM: E (35%) RB: E (47%)	Source: UN statistics of MDG progress, <a href="http://mdgs.un.org/unsd/mdg/Data.aspx">http://mdgs.un.org/unsd/mdg/Data.aspx</a> Values for 2006
73.	Proportion of rural population with access to improved sanitation facilities	<b>ZA: E (49%)</b> LS: E (34%) NAM: E (18%) RB: E (30%)	Source: UN statistics of MDG progress, <a href="http://mdgs.un.org/unsd/mdg/Data.aspx">http://mdgs.un.org/unsd/mdg/Data.aspx</a> Values for 2006
73.a	<i>Case-specific indicator(s)...</i>		
<b>II) Good governance principles as indicators for the process dimension</b>			
74.	Participatory regarding decision making in the water sector	B(-)	At least in the water sector.
75.	Transparency regarding water allocation	B	
76.	Effectiveness and efficiency regarding decision making in the water sector	C	
77.	Equitable and inclusive	B	considerable progress has been made

No.	Indicator	Score	Comments
78.	<b>Predictability – with regard to IWRM and climate change</b>	B	The Legislation that informs water governance is anchored on IWRM principles, but degree to which effect is given to governance due to poor coordination is a challenge. Climate change is taken note of but still needs to be mainstreamed into planning and management.
<i>78.a</i>	<i>Case-specific indicator(s)...</i>		
<b>III) Stakeholder participation</b>			
79.	<b>Deliberative engagement opportunities</b>	B+	Discussions are common, not necessarily leading to changing decisions in a direct predictable way
80.	<b>Inclusiveness of stakeholder participation</b>	B	Few vested interests and majority who are not aware of the processes in the water sector. The introduction of Catchment Management Agencies should improve this situation.
<i>80.a</i>	<i>Case-specific indicator(s)...</i>		
<b>IV) Response to climate change</b>			
81.	<b>Strategy for adaptation to climate change in the water sector</b>	B(-)	draft strategy is there ("zero version"), but not approved yet; the water-specific one is still in development
82.	<b>Availability of specific knowledge enabling adaptation</b>	B(-)	It was done nationally, for each basin in the country (all quaternally and quenerie) Although it is not clear to some.
83.	<b>Awareness of water managers regarding adaptation to climate change</b>	B	There has been fair degree of awareness raising lately among water managers
84.	<b>Coordinated implementation process regarding adaptation to climate change: Program / Plan of activities and measures</b>	C	The draft water related climate change response strategy is in place but needs to be finalized and then implemented
85.	<b>Operational activities (measures)</b>	C	

No.	Indicator	Score	Comments
86.	Ways to deal with climate variability (floods and droughts)	A	Implementation of both flood and drought management is very good. The National Disaster Management Centre and Hydrology section at the Dept of Water Affairs ensures this.
86.a	<i>Case-specific indicator(s)...</i>		

## Addendum - Context

No.	Indicator	Score	Comments
<b>I) Basin Characteristics</b>			
67a	Sub-Basin Size	54 570 km <sup>2</sup>	<p>The source of this data is the State of the Rivers Report prepared within the frame of the South African River Health programme:  <a href="http://www.csir.co.za/rhp/state_of_rivers/state_of_crocsabieolif_01/olif_eco.html">http://www.csir.co.za/rhp/state_of_rivers/state_of_crocsabieolif_01/olif_eco.html</a></p> <p>This basin area corresponds to the South-African Olifants River Basin:</p> <div data-bbox="1028 624 1742 1189" data-label="Figure"> </div> <p>(source of the figure:  <a href="http://www.iwmi.cgiar.org/Assessment/files_new/research_projects/River_Basin_Development_and_Management/MainRivers_Olifant.pdf">www.iwmi.cgiar.org/Assessment/files_new/research_projects/River_Basin_Development_and_Management/MainRivers_Olifant.pdf</a>)</p> <p>This sub-basin doesn't include the following areas:</p> <ul style="list-style-type: none"> <li>• Those areas of the basin that can be found in Mozambique</li> <li>• The sub-basins of those tributaries that springs from S-Africa but flows into the Olifants in Mozambique or at the border of S-Africa and Mozambique (Letaha and Singuedzi rivers)</li> </ul>

No.	Indicator	Score	Comments
67b	Transboundary	Yes	<p>The largest part of the whole Olifants basin is in S-Africa. Only about 10% falls into Mozambique:</p>  <p>(source: M. Masiyandima. 2008. <i>Wetlands and the Olifants River basin: an overview</i>. presentation at the WETwin kick-off meeting)</p>

## Addendum - Performance

No.	Indicator	Score	Comments
<b>I) Environmental sustainability</b>			
<b>a) State of the water resources and the environment</b>			
87	<b>Aquatic biodiversity</b>	A	<p>Olifants River fish assemblages are dominated by fish of the Zambebian and endemic South-African fauna. They can be considered as 'original native fish species still present in basin'. The species diversity is quite high: the number of abundant fish species is 29, all of which are native. Non-native species, such as the mosquitofish, smallmouth and largemouth bass, carp, and rainbow trout, are very rare in the Olifants catchment.</p> <p>Source of info:            B. Rashleigh, D. Hardwick, D. Roux (2009): Fish assemblage patterns as a tool to aid conservation in the Olifants River catchment (East), South Africa, <a href="http://www.watercentre.org/resources/publications/journal-articles/Rashleigh%20et%20al_2009_%20Fish%20assemblage%20and%20conservation%20in%20Olifants%20River.pdf">http://www.watercentre.org/resources/publications/journal-articles/Rashleigh%20et%20al_2009_%20Fish%20assemblage%20and%20conservation%20in%20Olifants%20River.pdf</a></p>
88	<b>Invasive exotic species</b>	D	<p><i>"The Olifants Catchment experiences extreme demand for natural resources, and associated land modification and pollution. Thus <b>river ecosystems in this area are generally in a fair to poor condition</b>. Exceptions are the Tongwane, upper Mohlapiitse, and most of the Blyde Rivers, where a natural state prevails, and the lower reaches of the Olifants River, which is protected by conservation activities. In the upper parts of the catchment mining-related disturbances are the main causes of impairment of river health. <b>There is also an extensive invasion by alien vegetation, and to a lesser extent alien fauna. Alien plants such as wattles and seringa (Melia azedarach) occur within the riparian zone, competing with indigenous vegetation and reducing available water in the riparian zone.</b>"</i></p> <p>Source: State of the Rivers Report prepared within the frame of the South African River Health programme:  <a href="http://www.csir.co.za/rhp/state_of_rivers/state_of_crocsabieolif_01/summary.html">http://www.csir.co.za/rhp/state_of_rivers/state_of_crocsabieolif_01/summary.html</a></p>

No.	Indicator	Score	Comments
89	Surface and groundwater quality	C	<p>See WRC Report TT 452/10 Heath, R. et al (2010) Water quality overview and literature review of the ecology of the Olifants River. Water Research Commission. Pretoria, South Africa.</p> <p>There is however some uncertainty in this answer, which is also reflected in the following statements.</p> <p><b>“Surface water quality is generally high. But this is adversely impacted in some areas, especially in the upper Olifants, by mining activities and discharge of mine effluent.”</b></p> <p><b>“Groundwater quality is also generally acceptable although some small areas show high nitrate concentrations. Furthermore, low pH (3 to 5) and high sulphate concentrations are observed in mining areas.”</b></p> <p>Source: UNESCO HELP project (2007)  <a href="http://portal.unesco.org/science/fr/ev.php-URL_ID=3752&amp;URL_DO=DO_PRINTPAGE&amp;URL_SECTION=201.html">http://portal.unesco.org/science/fr/ev.php-URL_ID=3752&amp;URL_DO=DO_PRINTPAGE&amp;URL_SECTION=201.html</a></p> <p>On the other hand:</p> <p><b>“The Olifants River is highly contaminated, researchers said. Microbiologist at the Council for Scientific and Industrial Research (CSIR), Martella du Preez, said all the sites along the river showed mild to heavy microbial contamination most likely due to untreated, or poorly-treated, sewage flowing into it. “People using untreated water from these contaminated sites face a high risk of contracting disease”</b></p> <p><b>“The Olifants River Forum commissioned the CSIR in 2009 to conduct a study on the progressive eutrophication – when water receives excessive nutrients that stimulate excessive plant growth – and chemical pollution of the river and the implications for aquatic ecosystem health and human health.”</b></p> <p><b>“Researchers said they had found pansteatitis, a disease caused by the depletion of anti-oxidants, in Largescale yellowfish caught in the upper catchment of the river.”</b></p> <p><b>“The problem is that the Olifants runs through the Kruger National Park and many animals rely on this river, and sadly there is no alternative for them. Over the last 2 years there was a spate of mysterious crocodile deaths in the Olifants, and it was at the time thought that contamination was the cause of the sudden deaths. South Africa is a water scarce country and we simply cannot afford to continue to allow untreated sewerage, pollutants and toxins from mines and other industry to flow untreated into our river systems. This will undoubtedly lead to a serious water crisis and fatalities of both human and wildlife alike will be the result.”</b></p> <p>Source: Report of the Water Rhapsody Conservation Systems (2010)  <a href="http://www.watersense.co.za/2010/04/24/olifants-river-highly-contaminated/">http://www.watersense.co.za/2010/04/24/olifants-river-highly-contaminated/</a></p> <p>The above contradiction is probably due to variation across the catchment.</p>

No.	Indicator	Score	Comments
90	Groundwater use	B	<p>“Groundwater is an important source of water for domestic water supply in many small towns as well as for small-scale irrigation. The mines also increasingly use groundwater.”</p> <p><b>“Annual water use is approximately 1,000 Mm<sup>3</sup> of which 900 Mm<sup>3</sup> is surface water and 100 Mm<sup>3</sup> is groundwater.”</b></p> <p>“The amounts of water that can be economically and practically harnessed as usable yield, after allowing for an ecological Reserve, is 611 Mm<sup>3</sup>/y. <b>99 Mm<sup>3</sup>/y of this total usable yield is the groundwater yield.</b>” (data from year 2000)</p> <p>Source: UNESCO HELP project (2007)</p> <p><a href="http://portal.unesco.org/science/fr/ev.php-URL_ID=3752&amp;URL_DO=DO_PRINTPAGE&amp;URL_SECTION=201.html">http://portal.unesco.org/science/fr/ev.php-URL_ID=3752&amp;URL_DO=DO_PRINTPAGE&amp;URL_SECTION=201.html</a></p> <p>“The developed yield from groundwater in 1995 is 100. 6 million m<sup>3</sup>/a. The potential ground water yield is estimated at 287 million m<sup>3</sup>/a. This leaves an exploitable yield of about 180 million m<sup>3</sup>/a. ....The Steelpoort River catchment’s exploitable groundwater yield are nearly fully developed. The Blyde River catchment’s exploitable groundwater yield are over developed” (DWA Olifants WMA Water Resources Situation Assessment 2003)</p> <p>Nevertheless:</p> <p><b>“At present, there is not only uncertainty about the magnitude of the groundwater resource but also the extent to which it is used. Best estimates are that about 250 Mm<sup>3</sup> are accessible of which about 100 Mm<sup>3</sup> are presently used”</b></p> <p>Source: UNESCO HELP project (2007)</p> <p><a href="http://portal.unesco.org/science/fr/ev.php-URL_ID=3752&amp;URL_DO=DO_PRINTPAGE&amp;URL_SECTION=201.html">http://portal.unesco.org/science/fr/ev.php-URL_ID=3752&amp;URL_DO=DO_PRINTPAGE&amp;URL_SECTION=201.html</a></p>
91	Water Exploitation Index (WEI)	C (33%)	<p>Score at basin level (national part)calculated on the basis of data from:</p> <p><a href="http://www.dwa.gov.za/ORWRDP/documents/Strategic%20Perspective%20FINAL.pdf">http://www.dwa.gov.za/ORWRDP/documents/Strategic%20Perspective%20FINAL.pdf</a> (2005)</p> <p>Corresponds with calculations from WEAP modelling (McCartney and Arrantz 2007) which give “naturalised” flows as 2040 MCM, total demand as 744 MCM, and potential utilizable groundwater resource as 250 MCM. Note that there are also interbasin transfers of ~196 MCM.</p>
<b>b) Management practices</b>			



No.	Indicator	Score	Comments
92	Water allocated for aquatic ecosystem	B	<p><i>Ecological reserve is legislated, but not fully enforced in practice in the Olifants. The ecological Reserve is estimated to be 460 Mm<sup>3</sup>. At the present time, most of the ecological Reserve is being used in human consumption. . "To safeguard rural and urban supplies, the DWAF is not currently fully implementing the Reserve" (McCartney and Arranz 2007).</i></p> <p><b><i>"Ecologically insensitive releases of water and sediment from storage dams are another major cause of environmental degradation downstream, which is particularly relevant in the middle and lower parts of the catchment"</i></b>  Example: <i>"Sediment, from upstream activities including overgrazing and industrial and mining activities, accumulates in the Phalaborwa Barrage. When the barrage is flushed out from time to time, large quantities of sediment are released. This causes severe damage to in-stream habitats and biota in the downstream part of the Olifants River. Fish die from oxygen depletion or are smothered by silt clogging their gills."</i>  Source: State of the Rivers Report prepared within the frame of the South African River Health programme:  <a href="http://www.csir.co.za/rhp/state_of_rivers/state_of_crocsabielif_01/summary.html">http://www.csir.co.za/rhp/state_of_rivers/state_of_crocsabielif_01/summary.html</a></p> <p>On the other hand:  <b><i>"Remedial measures to contain mine wash-off and leachate, and for controlled release of polluted water into natural streams at times of high flows are being implemented."</i></b>  <b><i>"The National Water Act of South Africa provides for a compulsory 'Reserve' to meet basic human needs and to maintain aquatic ecosystems. This is expected to be taken into account when determining the amount of water available for abstraction."</i></b>  <i>"Mounting environmental awareness has led to an increased emphasis on ensuring that flows are maintained to preserve the natural ecology of the river. This is particularly important in the lower part of the basin where the river flows through the renowned Kruger National Park. The question of satisfying the 'Reserve' without adversely affecting all other water uses in the basin raises fundamental integrated water resources development and management issues on the water and environment front."</i>  Source: UNESCO HELP project (2007)  <a href="http://portal.unesco.org/science/fr/ev.php-URL_ID=3752&amp;URL_DO=DO_PRINTPAGE&amp;URL_SECTION=201.html">http://portal.unesco.org/science/fr/ev.php-URL_ID=3752&amp;URL_DO=DO_PRINTPAGE&amp;URL_SECTION=201.html</a></p>
93	Water pollution incidents	B	<p><b><i>"Remedial measures to contain mine wash-off and leachate, and for controlled release of polluted water into natural streams at times of high flows are being implemented."</i></b> - Source: UNESCO HELP project (2007)</p> <p><i>...there was a <b>spate of mysterious crocodile deaths</b> in the Olifants, and it was at the time thought that contamination was the cause of the sudden deaths.</i></p>

No.	Indicator	Score	Comments
94	Water quality monitoring	B	442 monitoring points registered in the Olifants WMA, measuring a range of variable. However, “ there is little historical data available regarding heavy metal and pesticide inputs to the Olifants River. ... Many of the variables of concern are not covered in any current monitoring programme” (WRC TT452/10)
95	Hydrometeorological monitoring – levels	A	Monitoring program administered by DWA. IN Olifants Basin, over 160 flow monitoring stations with data back as far as 1904; plus 44 met stations. <a href="http://www.dwa.gov.za/Hydrology/CGI-BIN/HIS/CGIHis.exe/Station">http://www.dwa.gov.za/Hydrology/CGI-BIN/HIS/CGIHis.exe/Station</a>
96	Level of understanding of groundwater resources	B	DWA WSAM database has estimates of groundwater harvest potential and recharge for each quaternary catchment (McCartney and Arranz 2007); but <b>“At present, there is not only uncertainty about the magnitude of the groundwater resource but also the extent to which it is used.</b> Source: UNESCO HELP project (2007)

