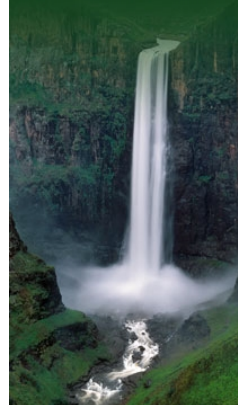


Orange-Senqu River Awareness Kit

Resource Management

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Water Demand in the Basin: Environmental Flows

The aquatic environment should always be considered as a *bona fide* consumer of water, whose requirements must be met alongside basic human requirements, and ahead of any other demand. In the case of water projects involving impoundment, this translates to maintenance of flow in the reaches of the river downstream of the impounding structure, dam, or diversion. Environmental flows are required to:

- Maintain the riverine ecology
- Recharge riverine aquifers
- Maintain the river channel

Excessive abstraction or damming of rivers affects the flow, which in turn affects water chemistry, sediment transport and average temperatures. This has an impact on aquatic biota and the human beings that rely on the water and biota for their livelihoods and well-being.

International laws and regional agreements have been put in place to reduce these impacts, giving countries that share rivers a platform for discussion whenever a development could affect river flow.

Water requirements of freshwater-dependent ecosystems are often referred to as environmental flow requirements (EFR). A river basin is referred to as "closed" when all its river flow is allocated to different uses. The legal framework regarding environmental flow requirements (EFR) varies from country to country.

The South Africa **Ecological Reserve** (South Africa National Water Act, Act 36 of 1998) has been implemented to address the importance of environmental flows (ORASECOM 2007e) and Namibia is currently incorporating environmental flow into its management procedures. In Lesotho, a guideline for assessing instream flow requirements (IFR) was developed as part of the LHWI and this guideline is currently used when assessing IFRs for other projects. The concept of Environmental Flows in Lesotho was first addressed formally in the LHWI Treaty; and as an extension, the Ecological Reserve concept is being incorporated in the Water Resources Law. In Botswana water abstraction is regulated by the Department of Water Affairs.

Instream Flow Requirements (IFR) or Ecological Flow Requirements (EFR) are determined through a detailed study about the flow and ultimately the health of a river that has been modified. This study is a useful tool when determining the environmental trade-offs of developmental measures.

Box: Ecological Reserve

The ecological component of the Reserve refers to that portion of streamflow which needs to remain in the rivers to ensure the sustainable healthy functioning of aquatic ecosystems, while only part of the remainder can practically and economically be harnessed as usable yield. [...] Current provisional assessments indicate that, as a national average, about 20% of the total river flow is required as ecological Reserve which needs to remain in the rivers to maintain a healthy biophysical environment.

Source: DWAF 2003a-e

The table below shows the natural mean annual runoff for areas in South Africa and the estimated ecological reserve. In some cases the 20% rule is adhered to; however in some areas the ecological reserve is quite a bit higher or quite a bit lower.

Table: Natural mean annual runoff and ecological reserve (Mm³/a)

Sub-Areas	Natural mean annual runoff	Ecological reserve
Vaal River basin		
Wilge	868	116
Upstream of Vaal Dam	1 109	126
Downstream of Vaal Dam	446	57
Rhenoster-Vals	295	35
Middle Val	170	29
Sand-Vet	423	45
Harts	138	15
Vaal downstream of Bloemhof	49	5
Upper Orange WMA		
Senqu Lesotho	4 012	933
Caledon Lesotho	753	92
Caledon RSA	650	90
Kraai	956	158
Riet/ Modder	407	45
Vanderkloof	203	31
Molopo	197	29
Lower Orange WMA		
Orange	198	32
Orange Tributaries	280	35
Orange Coastal	24	2

Source: DWAF 2003a-e

Interactive

Basin Map

Explore the sub-basins of the Orange-Senqu River

[enter](#)

Water Management

Explore the water management systems around the basin - including intra-basin transfers and sectoral water requirements

[enter](#)

Dams

Investigate the dams and water infrastructure in the Orange-Senqu basin

[enter](#)

Video Tour

Tour video scenes along the Orange-Senqu River related to Meeting the Water Challenge

[enter](#)

Panel Discussion

Listen to a panel discussion about the history and challenges in the Orange-Senqu basin

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Sunset on the Vaal River.

Source: Fourie 2006

([click to enlarge](#))

Botswana

Rivers in the Molopo River basin in Botswana, part of the Orange-Senqu River basin, are seasonal in flow (ephemeral) and highly dependent on summer rains. Because of this ephemeral character, environmental flows are not necessarily a concern in this basin; any flow that does occur falls under the Botswana Water Act and is considered public water that can only be used with permission from the Water Appointment Board in the Department of Water Affairs.

Lesotho

Environmental flow studies were conducted as part of the Lesotho Highlands Water Project using an interactive flow assessment methodology called DRIFT. This methodology allowed for a series of scenarios to be modelled in six river reaches downstream of the proposed dam projects, showing degradation scales ranging from Minimum Degradation, 60% of the mean annual runoff (MAR) remaining in the river, to Treaty releases (3–5% of the mean annual runoff remaining in the river). The final agreed flows were determined after prolonged negotiation between the governments of Lesotho, South Africa, Namibia and other interested parties (ORASECOM 2007e). The concept of environmental flows is further elaborated in the [Water Act \(2008\)](#) in the clause that states 'The Commissioner shall determine a reserve for all or part of the water resources within the country'.

Namibia

Namibian professionals were observers on the Lower Orange River Management Study and were instrumental in deciding that a Comprehensive Reserve/ Environmental Flow Requirement Determination on the Lower Orange River Water Management Area should be undertaken. Namibia is currently incorporating environmental flow into its water management procedures.

South Africa

Three laws govern environmental flows in South Africa. The Water Law Principles of South Africa (1996) clearly set the direction for the future of water resources management. The requirement for sustainability and equity are put forward by the Principles, the National Water Policy of 1997 and the National Water Act (NWA, Act 36 of 1998).

The National Water Act includes a commitment to not seriously affect the functioning of the natural environment and supports this objective through the Reserve for Water Resources. Department of Water Affairs (DWA) is responsible for ensuring that Reserve flow requirements are met before any other requirement. Only if this objective is met can water use licences be processed and granted.

As part of the RAMSAR designation of the Orange River estuary in 1991, South Africa was assigned responsibility for identifying and protecting areas of environmental importance to waterfowl. Consequently, the environmental requirements for the Orange River Mouth (included in the Lower Orange WMA) have been determined, as well as for the section of the Orange River below the Vanderkloof Dam. The flow requirement at the Orange River mouth is estimated to be approximately 290 Mm/a and in the order of 270 Mm³/a for in-stream flow requirements below Vanderkloof Dam (DWA 2004b; ORASECOM 2007b,e). There is no accurate gauging of the flow reaching the Orange River Mouth, making it extremely difficult to manage these identified environmental flow requirements (ORASECOM 2007e).

[Next: Recreation and Tourism](#) ►