

# Sustainable, equitable and productive use of water through water accounting



The Government of Botswana has developed water accounts for 2010/11 and 2011/12 that show what is happening with water stocks and flows in the country. They build on water accounts constructed for 1993–2003. This information has the potential to improve the productive and equitable use of water across Botswana now and in the future.

The main messages that emerge are:

**Water use efficiency — make sure population and economic growth are not tightly linked to growth in water abstraction**

- The policy emphasis on water supply — ‘keep water flowing’ — now needs to be complemented by demand management and integrated water resource management
- There is an urgent need for wastewater strategies to improve reuse and recycling within sectors
- Rethink possibly unsustainable levels of water subsidy.

**Water allocation — provide water to sectors and users that add most value through, for example:**

- Economic development — support economic growth and diversification
- Social protection — secure basic water needs and keep water bills affordable
- Environmental protection — secure ecological water requirements.

There is an opportunity to integrate these policy imperatives into the 11th National Development Plan and the new national sustainable development strategy if we act now, collaborate and raise the profile of the added value that water accounts provide.

This brief is based on work undertaken by the Department of Water Affairs (DWA) and Centre for Applied Research (CAR) under the World Bank's Wealth Accounting and Valuation of Ecosystem Services (WAVES) programme. The full report is available from the DWA and WAVES programme.

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## Water resources management: the situation so far

'Keep the water flowing!' to provide the population with enough piped water and to sustain economic growth has been the political idea driving water policy in Botswana. But water provision must also be sustainable and affordable and so, as the 2006 review of the Botswana National Water Master Plan concluded, this means a shift to managing demand. Water must flow to where it can meet the needs of society.

The water sector reform programme sets out how this can be achieved, underpinned by an enabling policy framework that commits the country to implement more than 50 activities in ten strategic areas (through the 2013 Botswana Integrated Water Resources Management Plan).

## What water accounting in Botswana includes

The purpose of water accounting in a water-scarce country like Botswana is to inform better management by understanding the quantity of water stocks in groundwater, reservoirs and rivers; what flows come from these stocks; how water is supplied and used in the economy and environment and with what result.

The water accounts adopt the framework of the United Nations' System of Environmental Economic Accounting for Water (SEEA-Water), which is now an international statistical standard. It is designed as a satellite system to the existing UN System of National Accounts linking water data to economic data using the standard classification of economic sectors, bringing natural capital into the national economic accounts. SEEA-Water covers stocks and flows of water in physical and monetary terms and also addresses water quality issues through pollution emission accounts.

The following water accounts have been developed in Botswana:

- Physical use and supply accounts indicating:
  - Water abstraction by sector and by natural source
  - Water imports and exports
  - Water use and consumption by sector
  - Water abstraction at the sub-national level by Water Utilities Corporation
- Physical stock accounts for reservoirs.

Wastewater physical accounts and, importantly, water monetary accounts will be developed later.

**Water needed  
to sustain human life  
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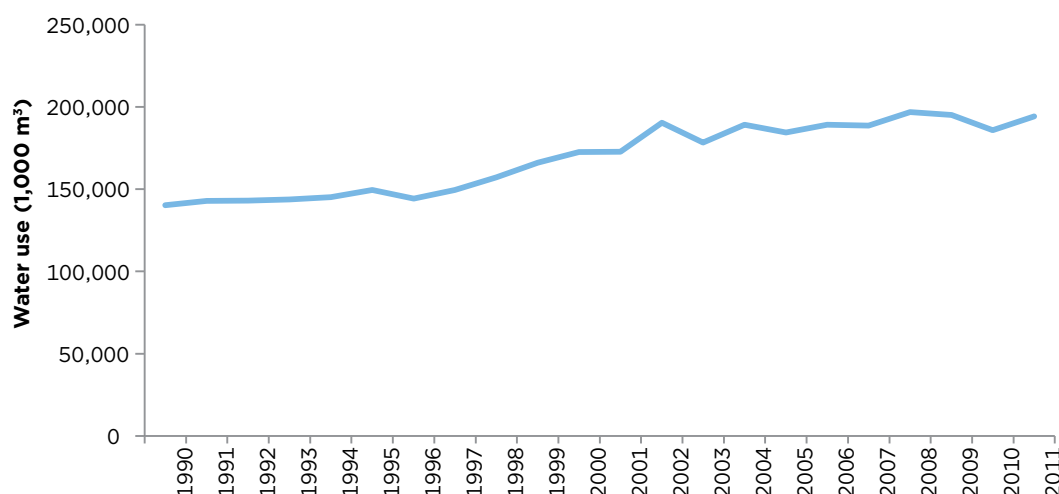
## What the water accounts mean for policy

The findings of the water accounts have significant policy implications for the water sector and overall economic development.

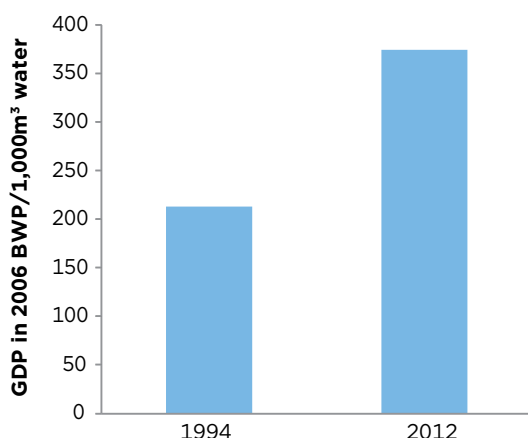
### Allocate water efficiently

Water use has grown by about one third from 1990 to 2011 (Figure 1), and water productivity, measured as GDP per 1000m<sup>3</sup>, has nearly doubled, from about 200 pula (BWP)/m<sup>3</sup> in 1994 to over BWP 370/m<sup>3</sup> in 2012 (Figure 2). Per capita water use has declined nearly 12 per cent over the same period due to increased efficiency and structural changes in the economy (Figure 3). These are important achievements for a water-scarce country. But greater efficiency in water use will be needed as water scarcity grows and climate change increases variability and risk.

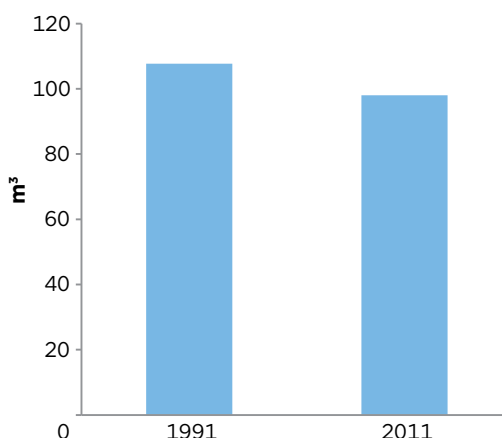
**Figure 1. Long-term trend in water use in Botswana, 1990 to 2012**



**Figure 2. Water productivity in 1994 and 2011**



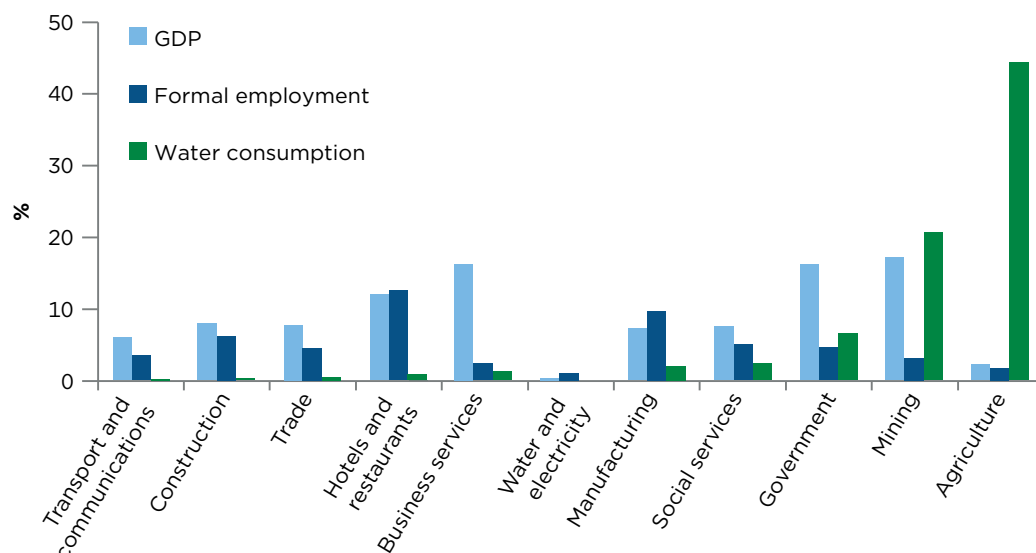
**Figure 3. Water use per capita in Botswana, 1991 and 2011**



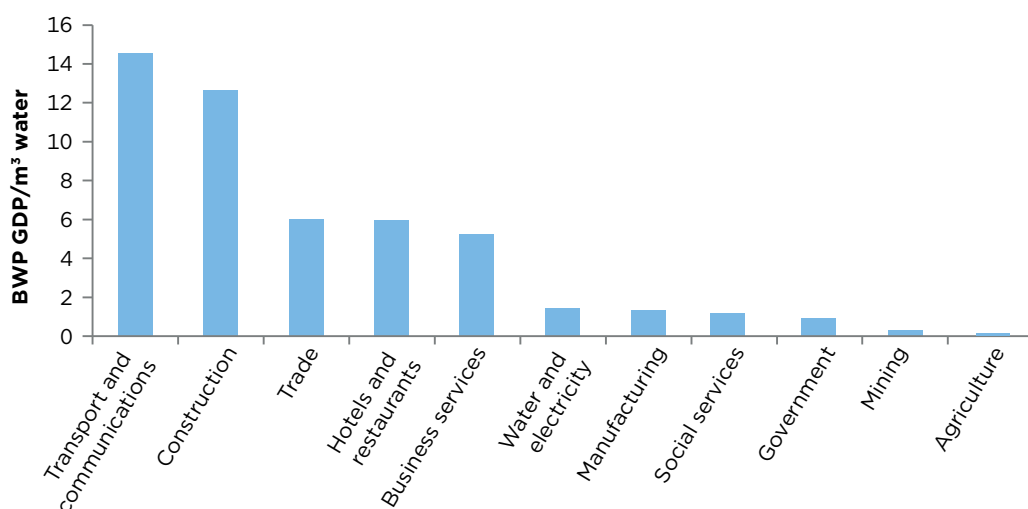
Competition for water resources is growing and it is likely that in the future not every sector's demands can be met. Managing this situation will require careful and informed allocation strategies that prioritise the sectors that best balance economic, strategic and livelihood benefits including employment. The National Integrated Water Resource Management Plan recommends developing water allocation efficiency guidelines for the Department of Water Affairs and the Water Resources Board to use.

The economic contribution from use of water varies a great deal by economic sector (Figure 4). Service sectors use the least water and contribute most to GDP and employment. Therefore they are attractive sectors for economic growth from an integrated water resource management perspective. By contrast, the agricultural sector — livestock and irrigation — is the highest water user (44 per cent) but contributes least to GDP and formal employment (the picture only changes marginally if informal employment is included) (Figure 5). This poses a water management challenge in places where agriculture competes with other sectors for water — in much of the irrigated sector, for example. This is generally not the case for the livestock sector, which mainly uses boreholes scattered over the country where there are few competing uses.

**Figure 4. Shares of water consumption, GDP and employment by sector in 2011/12**



**Figure 5. Water productivity by sector in 2011/12**



Clearly, sectors' comparative advantages and disadvantages for using water resources need to be factored not only into water resources management but into broader strategic development thinking about economic diversification, job creation and trade policies.

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### **Increase water efficiency through water demand management**

A shift is needed towards water demand management to avoid future water shortages and keeps water affordable.

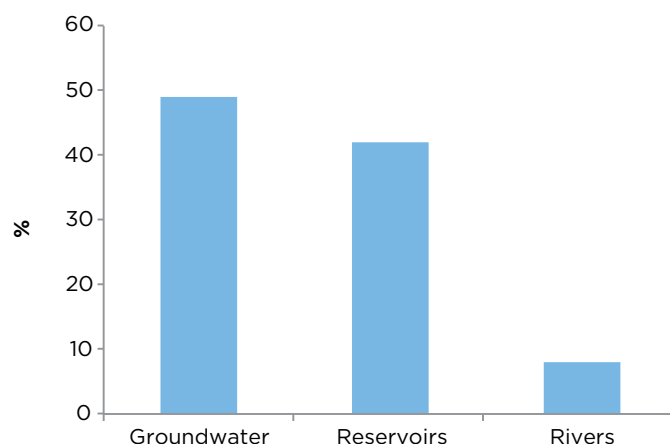
- One quarter of all water supply in Botswana is lost through the Water Utilities Corporation (WUC) distribution system — this needs to be reduced to at least the 15 per cent target level set by the WUC. This would save 6.3 Mm<sup>3</sup> water or about 5 per cent of total water use in the country. Additional losses by self-providers, such as mines and irrigators, are unknown and should be included in their annual reports to government.
- Treated wastewater amounts to an estimated 20 to 30 Mm<sup>3</sup> per annum but only 10 per cent is currently reused. This figure must be increased through greater reuse and recycling, particularly in agriculture and mining. The government is investing in irrigation schemes that utilise treated wastewater — the Glen Valley Irrigation Scheme in Gaborone, for example — but the productivity of these schemes and their water use efficiency need to improve.
- Planning for recycling requires good information about wastewater flows, which is currently not available. This problem would be resolved if the Water Utilities Corporation were to encourage wastewater treatment plants and self-providers to monitor these flows.

### **Safeguard basic water resources for the future**

The country's water resources are limited and heavily used. Moreover, opportunities for constructing more large water reservoirs are limited, making Botswana's water system vulnerable and potentially close to unsustainable.

Water abstraction is highest from groundwater (103 Mm<sup>3</sup> in 2011/12), followed by reservoirs (76 Mm<sup>3</sup>) and rivers at 15 Mm<sup>3</sup> (see Figure 6). Water abstracted for self-providers' own use is 103 Mm<sup>3</sup> and for distribution, 91 Mm<sup>3</sup>.

**Figure 6. Water abstraction by source 2011/12**





Groundwater abstraction from existing well fields is unsustainable in some places and recharge is low; thus new well fields need to be developed. Reservoir water abstraction is almost up to the safe yields of reservoirs — the maximum rate (or amount) of water that can be withdrawn over the duration of a drought. Current water storage capacity in reservoirs is 422 Mm<sup>3</sup> with safe yields of 73.5 Mm<sup>3</sup>. Consequently additional reservoirs are critical to ensuring water availability for the country's development and environmental integrity; Dikgatlong dam is a beginning.

**The Department for Water Affairs needs to commission feasibility studies for increasing both conventional and non-conventional water resources**

The Department for Water Affairs needs to commission feasibility studies for increasing both conventional and non-conventional water resources: for desalination plants capturing and utilising run-off, and for wastewater and return flows, for example.

### **Keep water affordable**

Water has an economic value that must be reflected in its cost to users. Otherwise it could be inefficiently used or misused; at the same time, water is needed to sustain human life and health and must be affordable. This cost-revenue dilemma is currently addressed by a low water charge for the lowest use band (up to 5 m<sup>3</sup> per month) but initial water accounting work shows that the cost/revenue balance has deteriorated as the water sector reforms take hold.

Additionally, future supply costs are likely to rise, making water demand management measures, cost reduction and cost-sharing mechanisms and efficient Water Utilities Corporation operations essential to keep water affordable.

For example, costs savings could be achieved if untreated fresh water is supplied to the construction, mining and agriculture sectors that do not need potable fresh water. Full reuse and recycling of treated wastewater is also likely to reduce the costs of water provision. Cost-sharing mechanisms (especially with the private sector) could also attract investment to the sector and reduce the costs of water supply borne by the tax payer.

### **Collect and analyse data**

Water accounts form a suitable framework not only for assembly and analysis of existing data, improving its usability, but also for identifying data gaps that impede proper planning and development in the water sector.

For example, the water accounts reveal that small settlements need to be metered and information about water use by self-providers needs to be improved. It is unclear when data currently available for self-providers denotes either water abstraction or water use. More accurate data for the agricultural sector are also needed, covering irrigation water abstraction, use and productivity, as well as livestock water use.

Government has set an ambitious target of 96 per cent reuse of wastewater outflows by 2030. However it does not have inflow and outflow data. The Water Utilisation Corporation needs to prioritise collecting these data from wastewater treatment plants.

Water accounting, planning and allocation would be even more effective with proper sector classification of different Water Utilisation Corporation customers. The current classification only distinguishes between businesses/commercial, domestic and government. This is not in

line with the national accounting system or the System of Environmental Economic Accounting for Water (SEEA) requirements. Reporting in the SEEA water format would provide the Water Utilisation Corporation and Department of Water Affairs with a better understanding of the water provision market and could generate information on where water is used most, helping to target water demand management measures.

A shared plan between the Water Utilisation Corporation, Statistics Botswana and the Department for Water Affairs could therefore fast track the development planning and policy process. The Department for Water Affairs has already committed to establish a water accounting unit.

There are of course limits to the interpretation of data: there are caveats as to how national-level accounts should be interpreted locally in the absence of a system that separates different levels of data. While agriculture, for example, looks to be an inefficient user of water at the national level, it is often the most efficient within given localities.

## Conclusion

Seventy countries around the world and 90 companies currently support national capital accounting, and the numbers are growing, with Botswana leading this approach in the 2012 Gaborone Declaration on Sustainability in Africa. Natural capital accounting offers a framework for measuring our natural assets: without being able to measure them, we cannot manage and conserve those assets. The system works for economists, resource managers, statisticians, accountants, scientists and policymakers and, importantly, it makes the use and the value of these assets more transparent to the public.

Natural capital accounting gives a truer picture of the value of a country's natural resources and so has the potential to assist planning and monitoring of sustainable development strategies, providing a complement to GDP as a measure of progress. These water accounts are the first step in the process and represent a lively and productive collaboration between many sectors and organisations with a stake in natural resource management.