Stephen W Hussey, Water from Sand Rivers: Guidelines for Abstraction.

Loughborough, UK: Loughborough University, 2007, Softcover, 194 pages. ISBN 978-1-84380-126-9.

Botswana is interlaced with sand rivers. Many of them are dry most of the time. Some sand rivers run every rainy season; how much depends on the amount of rain and the catchment area. One famous sand river in Botswana (coming from Namibia) is the Nossob in the Kgalagadi Trans-Frontier Park. Its major flood was over 90 years ago. One of many other ancient sand rivers is the Okwa that dissects Botswana from Namibia (known there as Chapman's) into the Central Kalahari Game Reserve (CKGR) towards the Boteti River.

Mike Main in his Kalahari: Life's Variety in Dune and Delta (2000) mentions the Okwa as one of the most impressive of Botswana's fossil rivers, 'which have distinct valleys, over 1.5 km in width and sometimes as much as 40 metres below the surface of the surrounding plain'. Later he explains in relating a G/wi origin tale about why the Okwa doesn't reach the Boteti River—it was created by G// awama after he was bitten by a python in the great west and went dragging east 400 km to find water at the Boteti, but he never got there because he made the Okwa as he traversed the Kalahari (p.183).

Many are the natural basins where water flows, often seasonally, that have been called a Sand River. There are four each in Canada and the USA and two in South Africa. They are recognised throughout Africa as a source of water during droughts. Peter Matthiessen's famous book, Sand Rivers (1981), amply and beautifully supplemented by Hugo van Lawick's sterling photographs, is actually the story of a safari that creates a comprehensive portrait of the 22,000 square mile Selous Game Reserve (SGR), which begins only 200 km from Dar es Salaam. It is four times the size of Tanzania's Serengeti National Park, but less well known. It is dominated by the grandeur of the Rufiji River and dozens of its tributaries that dominate the SGR. Created over one hundred years ago it is seen as a throwback to the old Africa before development. The famous tourist lodge on the banks of the Rufiji is called Sand Rivers Selous.

Another type of river that in many places can also dry up, is the braided river. Some sand rivers are also braided rivers, but they are often made of stones. In Karamoja, Uganda braided sand rivers when in flood can change course, ignoring any manmade channels under bridges and making man's crossovers obsolete. A vehicle stuck in such a river in flood can slowly be lowered to the point it vanishes under the sand. Braided stony rivers, like in Alaska and New Zealand, can also devour vehicles. Such rivers when fed by glaciers and seasonal melting fluctuate greatly. When dry they are a source of water. But it is easier to extract water from sand rivers. During drought people knew how to dig down in the sand until they found water. Elephants have always known where to dig to find water in sand rivers.

A number of books are concerned about how the abstraction of water from sand rivers can be made easier through simple and sustainable appropriate technology for small rural communities. In Zimbabwe for over twenty years the Dabane Trust, a non-governmental organisation, has helped to install hundreds of 'abstraction systems to provide clean water for household use and for small-scale irrigation and livestock water schemes'. What has been accomplished in Zimbabwe should be of interest to many different people in Botswana.

Stephen W. Hussey in Water from Sand Rivers: Guidelines for Abstraction explains simply, 'sand rivers are literally rivers that are full of sand'. This has been caused by erosion and dispersal over generations. Most of these rivers in Southern Africa are not braided. The size of grains moved over time are dependent on the amount of rain and its force, which can vary from particles of less than 0.002 mm to fragments and pieces of rock, even boulders over 2000 mm. The distance and gradient of the riverbed will also influence the depth and rate of flow and where and when particles are deposited. A common feature afterwards is that some water ends up being stored in the river alluvium, 'in the pore

space between the particles of sediment'. It is this water that can be beneficially abstracted. It is wind blown sand, or Aeolian sand that is very fine, that has reduced water storage potential.

Sand rivers, where water can be extracted from below the surface, are found in arid areas worldwide in Australia, North and South America, Asia and North and East Africa and areas with Kalahari and Namib sands. In all these places the beauty of sand river abstraction is that it benefits from a process of natural filtering; water purification has occurred as 'contaminated water passes through the sediment bed'.

It is not hard to understand now why the mining of sand from arid-area rivers for construction, road works or other industrial purposes serves to destroy a sand river. Sand mining removes the natural filtering layers, the water-saturated sand, and exposes the naturally stored water to elimination, pollution and rapid evaporation. Sand mining and sand river water abstraction are contradictory objectives. If sand rivers are to be preserved in perpetuity they must be protected. Alternative sites for obtaining sand exist; it should not be taken from rivers. Already illegal sand mining is destroying a number of sand rivers outside Gaborone.

It is more than a pipe dream. There are a variety of approaches and methods used to abstract water from sand rivers. In Zimbabwe the Dabane Trust has been promoting various ways of abstracting water and its use in small-scale nutrition gardens to supply fresh vegetables and an income for thousands of people. They believe their efforts now reach over one hundred thousand people in Zimbabwe. Their target has been to develop at least forty low-cost extraction points each year. They also have helped develop dams in sand rivers to make them more sustainable—these are different from the weirs that have placed across the Limpopo River.

Stephen Hussey's book is also a practical 'how-to' manual. He covers: the complicated process of site identification and selection; the various methods of abstraction; the choice of method and then how to install the technology; social and community aspects that make a project sustainable; and he ends with case studies of four projects and how they were evaluated. My bias has always been for minimum-maintenance, gravity-feed-continuous-flow water projects, but this is not possible with sand rivers.

Another source that may be of interest is a short book (57 pages) that focusses on Kenya: Water from Sand Rivers: a Manual on Site Survey, Design, Construction, and Maintenance of Seven Types of Water Structures in Riverbeds by Erik Nissen-Peterson (RLME Number 23, 2000). Those who are interested and new to this topic could start with a four-page .pdf by Rudolph Cleveringa on water retention and harvesting released by the International Fund for Agricultural Development (IFAD) in Rome, Italy. See: www.ifad.org/english/water/innowat. While other countries and agencies promote appropriate and integrated development approaches for small communities, Botswana seems to put all its eggs in one basket—usually large, costly, major schemes that ignore local human and natural resources.

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