Southern
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SADC CONCEPT PAPER ON BENEFIT SHARING AND TRANSBOUNDARY WATER MANAGEMENT AND DEVELOPMENT




SADC CONCEPT PAPER ON BENEFIT SHARING IN THE CONTEXT OF TRANSBOUNDARY WATER RESOURCES MANAGEMENT AND DEVELOPMENT

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I. INTRODUCTION

This document presents some of the concepts that will be discussed at 4th RBO Workshop on benefit sharing in the context of transboundary water resources management and development.

Following international water law, transboundary watercourses are taken here to be surface water and/or groundwater bodies that are shared by more than one State. Benefit sharing in such systems was proposed initially by Sadoff and Grey (2002) as an alternative to the volumetric allocation of water, potentially offering greater scope for underpinning equitable agreements between riparians. Phillips and Woodhouse (in press) have suggested a definition of benefit sharing, as follows:

"In the context of transboundary watercourses, benefit sharing may be defined as the process where riparians cooperate in optimising and equitably dividing the goods, products and services connected directly or indirectly to the watercourse, or arising from the use of its waters."

Most of the available freshwater in the SADC region is transboundary in nature, and the SADC Guideline on benefit sharing (to be produced as the next stage in the present process) will therefore be of considerable importance. This Concept Paper represents an intermediate document in the development of the SADC Guideline, with the following issues being addressed in its subsequent sections:

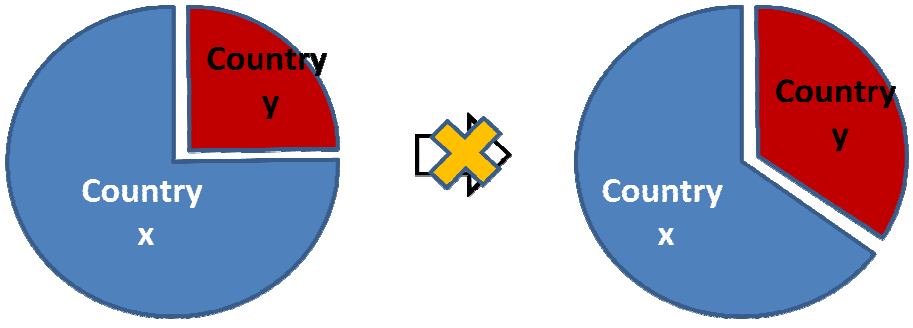
- ***rationale*** for implementing benefit sharing arrangements;
- ***concepts*** associated with benefit sharing;
- ***example*** of benefit sharing mechanisms implemented in Africa.

II. RATIONALE

Parties sharing transboundary watercourses commonly encounter problems, when attempting to allocate the water volumes that are available. The primary cause of this is the so-called Zero-Sum Dilemma, which exists where the volume of water is finite and is capped. In these circumstances, a reallocation of water implies that what is gained by one riparian, is lost in equal amount by one or more other parties. The riparians losing water volumes in such scenarios are commonly relectant to proceed to an agreement, for obvious reasons (Figure 1).

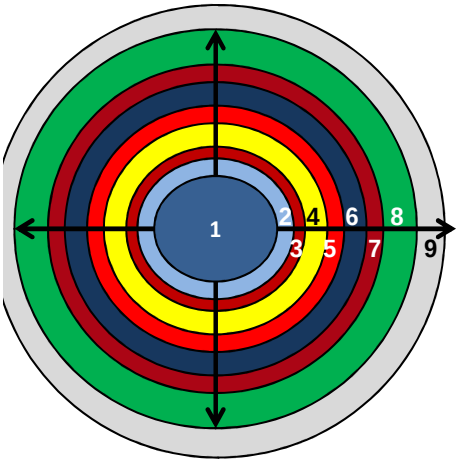
Fortunately, there are several ways in which the Zero-Sum Dilemma can be overcome, these involving the attainment of one or more type of Positive-Sum Outcome (PSO – sometimes termed a 'win-win solution'). A PSO is characterised by simultaneous improvements over time in the circumstances of all the riparians sharing a trans-boundary watercourse.

Figure 1. Volumetric zero-sum dilemma in a closed river basin



In a closed river basin, reallocation implies that the gain by one is lost by another, making it difficult for the two parties to agree.

Figure 2. Methods for increasing available water resources



Methods

1. The *status quo.*
2. Reducing losses.
3. Reusing wastewater
4. **Desalination.**
5. Reusing desalinated water supply.
6. Inter-basin transfers.
7. Reusing transferred water supply.
8. Optimising uses of Green Water.
9. Promoting Virtual Water.

III. CONCEPTS

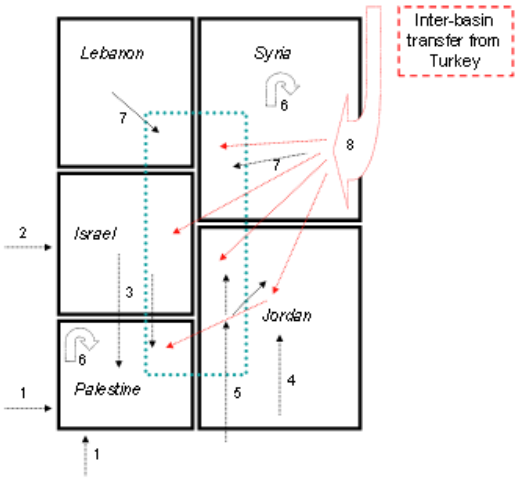
3.1 Increasing available water resources

It is often possible to attain a PSO simply in relation to water volume, without considering other benefits connected to the water itself. This is because the water volume available to support domestic use and economic activities within a transboundary basin is in reality not capped, and can be increased. Figure 2 shows how this may be achieved, using a range of methods to enhance the total water volume available to the riparians sharing a trans-boundary watercourse.

The methods available are summarised in Figure 2 and are described briefly below:

- Most water supply systems in developing nations in particular suffer from large losses, due to leakage, illegal connections, and other problems. These losses can be reduced by refurbishment and improved controls (circle 2 in Figure 2, light blue), considerably improving supplies reaching the end user.
- Wastewater reuse – usually for agricultural purposes – is growing in many areas of the world, as water stress increases (circle 3 in Figure 2, dark red).
- Costs for the desalination of brackish or marine waters have reduced dramatically in the last two decades, and this option is being taken up by more and more water-stressed countries (circle 4, yellow). The desalinated supplies are generally employed for domestic use, and can easily be treated and reused thereafter (circle 5, red).
- Inter-basin transfers may also be used, to transfer additional supplies into water-stressed areas (circle 6, dark blue). These can also be reused in the agricultural sector (circle 7, dark red).
- Insufficient attention has been paid to date to Green Water (soil water; circle 8, green), and there are considerable opportunities to enhance the returns from this resource, especially through supplementary irrigation using Green Water and Blue Water in combination.
- Virtual Water is 'embedded' in crops and other products (Allan, 1998, 2002), and this is also a most important resource in water-stressed countries.

Figure 3. Potential interventions in the Jordan River Basin to increase water availability



Components

1. Desalination, Gaza
2 . Desalination, Israel
3 . Reallocation, Israel/Palestine
4 . Disi abstraction, Jordan
5 . Red-Dead Conduit, Jordan
6 . Wastewater re-use, Syria and Palestine especially
7. Inter-basin transfers in-country, Lebanon and Syria
8. Inter-basin transfer from the Seyhan/Ceyhan in Turkey

Phillips *et al.* (2009) have used this basic concept to propose a range of bilateral and multilateral activities in the Jordan River basin, that would increase the supply of fresh water for all five riparians over time (Figure 3).

This generates a Positive-Sum Outcome, because all of the riparians can receive enhanced water supplies simultaneously, and hence all parties experience net benefits over time, compared to the *status quo*. Such a form of PSO can be considered to represent benefit sharing in one guise (i.e. simply connected to the volumetric allocation of water), and the riparians would need to cooperate in realising some of the interventions shown in Figure 3.

However, Sadoff and Grey (2002, 2005) broadened the concept as a whole by suggesting that four categories of cooperation and benefits/costs exist in connection to trans-boundary watercourses (Table 1). This introduces a wide range of distinct forms of benefits that are connected to water, and are relevant in negotiations between riparians sharing trans-boundary watercourses.

This general approach has been further developed by more recent conceptual studies and practical experience, and the forms of benefits connected to transboundary waters have been expanded. The following section describes recent conceptual developments, these being proposed to underpin the SADC Guideline on benefit sharing.

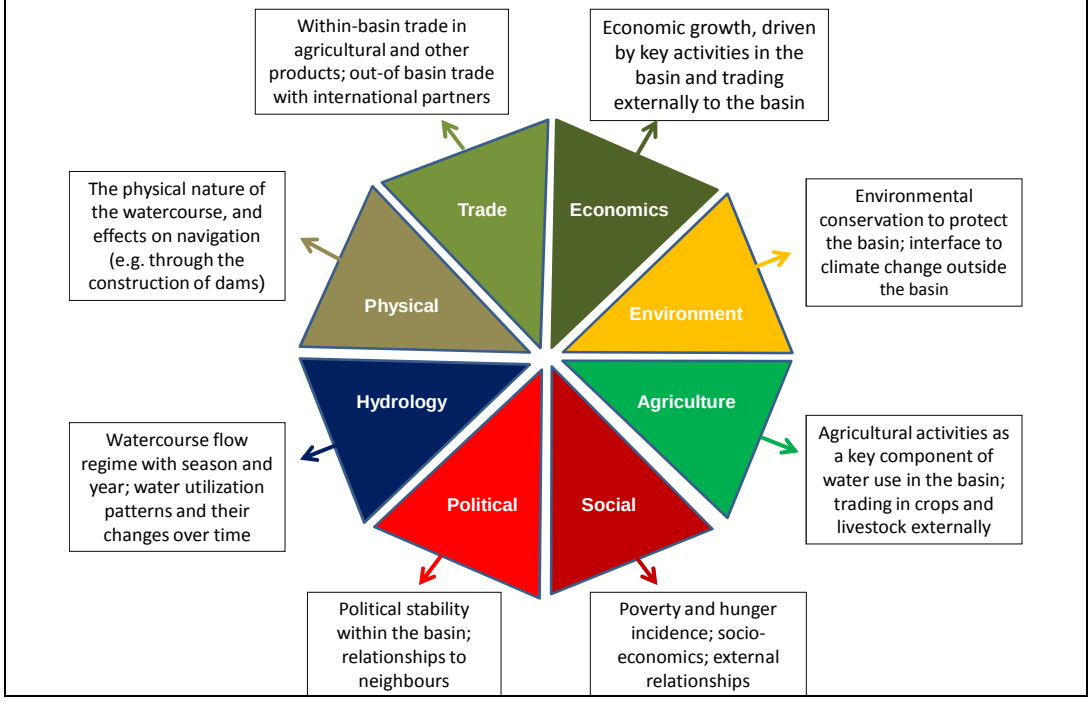
Table 1. ***Categories of cooperation and benefits as proposed by Sadoff and Grey (2002).***

Type	*Challenges*	*Opportunities*
Increasing benefits to the river.	Degraded water quality, watersheds, wetlands and biodiversity.	Improved water quality, river flow characteristics, soil conservation, biodiversity and overall sustainability.
Increasing benefits from the river.	Increasing demands for water, sub-optimal water resource management and development.	Improved water management for agriculture/ hydropower, flood-drought management, navigation, environmental conservation, water quality and recreation.
Reducing costs because of the river.	Tense regional relations and political economy impacts.	Policy shifts from dispute/conflict to cooperation/development; from food/energy self-sufficiency to food/energy security; reduced conflict risk and military expenditure.
Increasing benefits beyond the river.	Regional fragmentation.	Integration of regional infrastructure, markets and trade.

3.2 Broadening the basket of benefits

The early work on benefit sharing has been repackaged to classify benefits connected to trans-boundary watercourses in eight distinct categories, these being visualised as segments of a 'Benefit Wheel'. A Benefit Wheel is shown in Figure 4, with examples of the types of benefits being given for each category.

Figure 4. Types and examples of benefits



There are several matters of relevance to Benefit Wheels:

- Benefit Wheels can be generated to characterise the countries sharing a watercourse; trans-boundary basins as a whole; parts of those basins; and smaller geographical areas. This provides a tiered approach to analysing the utilisation of fresh water, which is especially useful in unpacking and repacking complex relationships.

- Benefits can be described in semi-quantitative fashions at least, using this technique. While the approach is mainly conceptual in nature (and should not in most cases be considered totally quantitative), the use of indicators can assist in determining the size of the individual segments in a Benefit Wheel. For example, the hydrology segment in a Benefit Wheel can be quantified in terms of the available renewable water resource (on a *per capita* basis), coupled to the dependency ratio. Similarly, the agricultural segment depicts the contribution of that sector to the total GDP, coupled to the proportion of the workforce employed in the sector. Additional types of indicators can be found to underpin the other segments of the Benefit Wheel.

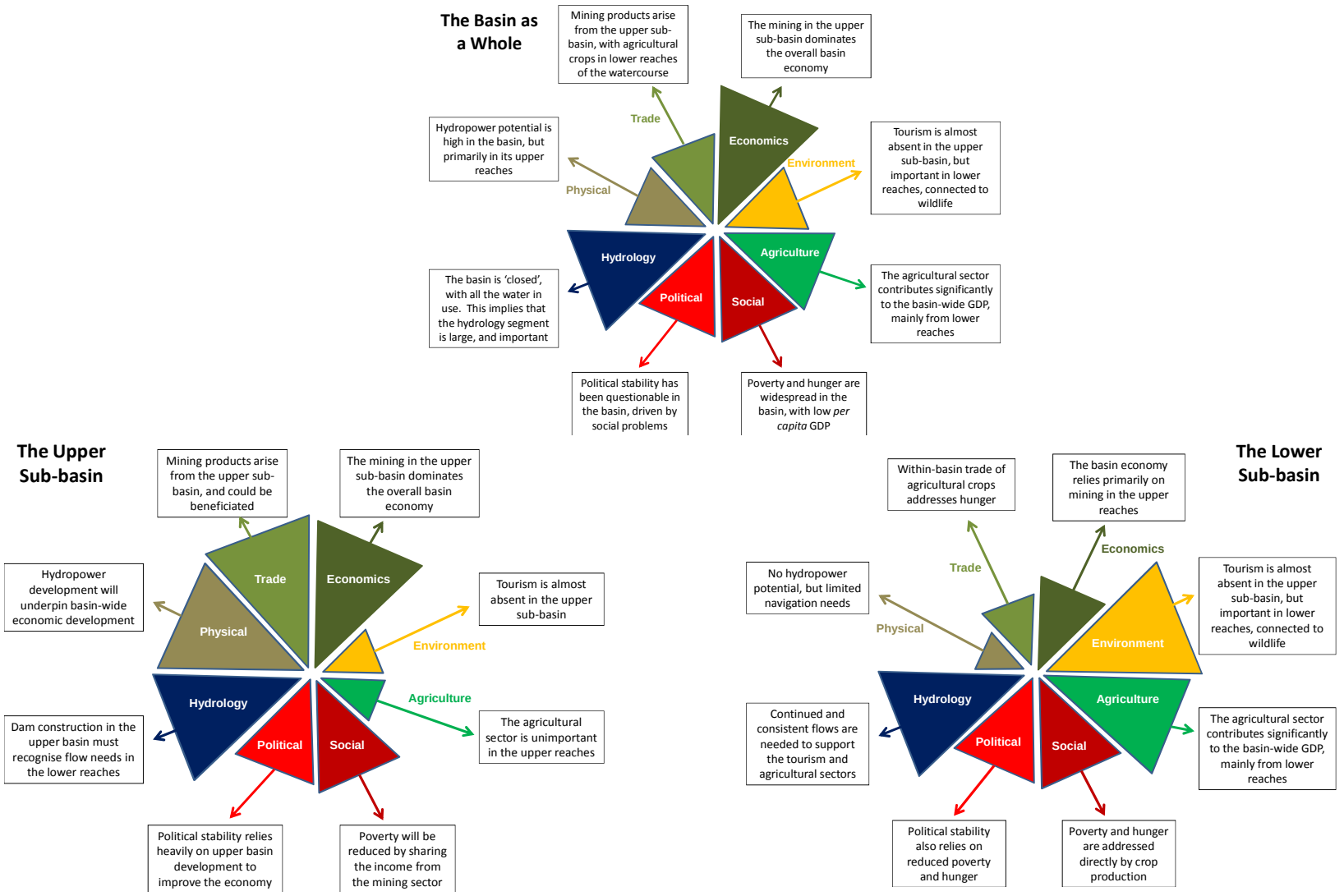
- Just as available benefits within a trans-boundary basin can be described using a Benefit Wheel, so can benefits externally to the basin. Most of the latter relate to aspects of trade between the basin riparians and other countries internationally, outside the basin. One particularly important example in this sense involves Virtual Water, which is the fresh water used to produce crops or industrial goods (Allan, 1998, 2002). Virtual Water represents the out-of-basin component of the Hydrology segment of the Benefit Wheel.

An example of this type of approach is provided in Figure 5, which uses a 'theoretical basin' that displays spatial heterogeneity. The distinct Benefit Wheels of relevance to the upper and lower sub-basins reveal the key drivers of the basin components, and they 'unpack' the opportunities for benefit sharing. Thus:

- The hydropower development in the upper sub-basin will be the main driver of the whole-basin regime for trade and economic growth. However, the planning should recognise the downstream needs for water volumes, and the preferred variation of these over seasons. With careful planning, both types of needs can be satisfied and the *status quo* can be improved in both the upper and lower reaches of the basin.

- The agricultural products and hard currency income from tourism in the lower sub-basin are important to those populations, and must therefore be protected by ensuring that the flow regime (following dam construction) allows them to continue and expand.

Figure 5. Theoretical application of the benefit wheels at basin and sub basin levels



If it is now assumed that the upper and lower basin depicted in Figure 5 represent distinct upstream and downstream States, a generic pattern for potential benefit sharing begins to emerge. Thus, in such a circumstance:

- The downstream riparian would support dam construction and hydropower development by its upstream neighbour, but would negotiate seasonal flows that protect (and preferably, enhance) its agricultural sector and tourism revenues;
- Attempts to expand the agricultural sector upstream could be foregone, and the upstream riparian would concentrate on realising the higher added value of water that is available from industrial expansion, probably tied back to its mining sector;
- Hydropower could be traded to the downstream riparian at favourable terms, reflecting the cooperation between the parties and the fact that the new dam represents an additional consumptive use of water upstream, and these flows have been denied to the downstream neighbour;
- The downstream riparian could improve its agricultural and tourism sectors (in part, through the use of the energy provided by the dam) and could trade staple crops back to the upstream party at favourable costs.

These are only a few components of a much broader benefit sharing arrangement that could emerge. The important concept to note is that the upstream and downstream entities have distinct situations in the *status quo* and different optimum trajectories for development (these being reflected by their respective Benefit Wheels). The two parties are much better by cooperating than by competing for water – hence, a multi-faceted PSO is available.

This relatively simple example serves to reveal two especially important points concerning benefit sharing:

- Greater room for negotiation – and much more chance for success – is created when the numbers and types of benefits are increased. This is known as 'broadening the basket of benefits' (Phillips *et al.*, 2006), and reflects the fact that different riparians commonly aspire to distinct development end-points, and are thus able to 'horse-trade' in negotiations when many potential benefits are available for consideration. It is particularly notable that this scenario is clearly totally different from a negotiation where the parties compete for a capped water volume, as in the Zero-Sum Dilemma discussed previously.
- PSOs are the key to many negotiations relating to water and benefits, as agreement is much easier to attain when all riparians are predicted to experience enhanced conditions simultaneously over time.

IV. APPLICATIONS

Four regional case studies will be presented at the 4th RBO workshop to illustrate the implementation of benefit sharing arrangements. Therefore, the Concept Paper concentrates on an example from elsewhere: the Senegal River, where an unusual form of benefit sharing was introduced in the early 1970s (Klaphake and Scheumann, 2006; Yu, 2008).

The Senegal River basin always exhibited highly variable flows both seasonally and inter-annually, with severe adverse impacts from periodic floods and droughts. Initial discussions revealed that the three lower riparians had shared interests in relation to potential benefits from the basin, and that these interests were complementary in nature (Fox and LeMarquand, 1979). The fact that complementary interests existed resonates with the Benefit Wheels discussed previously in the present paper.

The *Organisation pour la Mise en Valeur du fleuve Senegal* (OMVS) was created in 1972 between three of the riparians (Mali, Mauritania, Senegal). With considerable assistance from a range of external partners, the three countries agreed on a detailed infrastructure development programme focusing on the following key objectives:

- Promote food self-sufficiency in the basin;
- Reduce economic vulnerability to climatic fluctuations and external factors;
- Accelerate economic development; and
- Secure and improve the incomes of basin populations.

Cooperation between the riparians was a fundamental component of the OMVS Treaty and the development programme that followed. This extended to the co-ownership of infrastructures and to agreements on the shares of the costs and benefits for all parties involved. The benefits were calculated using a system known as 'the key', and were distinct in percentage terms from the allocation of costs (Table 2).

This overall approach effectively recognised the different levels of socio-economic development of the riparians at the time of the agreements, and their distinct Benefit Wheels. 'The key' was based on three cost/benefit components: hydropower, irrigation, and navigation (Table 2). The OMVS continues to manage the Senegal River at this time, and most parties argue that the cooperative nature of the agreements and activities has been largely successful. Whilst it is clear that some unforeseen costs emerged and improvements in benefit sharing might be possible, this is an unusual and important example of an early attempt at benefit sharing on a major trans-boundary watercourse.

The process of benefit sharing is under continual development, both practically and conceptually. Recent work has begun to clarify how 'new water' generated by the interventions shown in Figures 2 and 3 above may best be utilised in trans-boundary basins. One especially important and innovative technique involves the Trans-boundary Waters Opportunity Analysis (TWO Analysis), which seeks to optimise both the water volumes available and their specific uses (Phillips *et al.*, 2008). To date, the TWO Analysis has been employed in the Jordan River basin, the Nile system, and elsewhere (Phillips and Woodhouse, 2009; Phillips, in press).

Table 2. Cost and benefit key in the Senegal River Basin

Country	Contribution to the Cost of the Dams (%)	Benefit Shares (%)		
		Hydropower	Irrigation	Navigation
Mali	35	52	11	80
Mauritania	23	15	31	12
Senegal	42	33	58	8

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