

Virtual Water and the Nexus in National Development Planning

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Abstract Because of their great variety of uses and impacts, the development and management of water resources has to be coordinated with the needs of users. Hydro-centric approaches such as ‘Dublin’ Integrated Water Resource Management (IWRM) convene stakeholders to water-focused processes on a river basin scale and emphasise environmental conservation rather than resource development. Hydro-supported processes work at the scale of political units and focus on ‘problem-sheds’, demand centres and supply systems, rather than river basins and develop multi-purpose rather than single purpose responses. As mandated at the UN’s Mar del Plata water conference, they seek integration with national development strategies. The evidence suggests that hydro-supportive processes are more effective in coordinating water management with other sectors because they operate at common political and administrative scales. Concepts such as “Virtual Water” and the “water-food-energy nexus” may usefully inform national and regional development planning by helping to identify inter-sectoral trade-offs and synergies. But they are unlikely to provide the basis for national policies on which regional cooperation and action depend, given the many other factors that have to be considered.

1 Introduction and Background

Text Box 1 Complementary Endowments Offer Opportunities

Complementary endowments offer opportunities

Minister Trevor Manuel, chairman of South Africa’s National Planning Commission and champion of the SADC/Nepad North-South Corridor project, has highlighted the opportunities offered by greater regional cooperation:

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As we imagine different futures for our different countries, we should also have the courage to imagine ourselves working together as a single region. If we do that, we find that the balance of our endowments looks a little different. If we combine our access to capital as a region, with the diversity of human resources that we have, the independence dividend that is now maturing in the region, with our extensive natural resources [...] a completely different set of opportunities would arise. And while we would still have large numbers of relatively unskilled people, they would have far wider opportunities than if we simply worked as individual countries. (Manuel 2011).

Water is a factor of greater or lesser importance in many economic and social sectors and its management (as a resource) and provision (as a service) are often considered to be economic and social “sectors” in their own right. To the extent that there is a generic goal for water resource management, it is to achieve water security for society, defined as “*the availability of an acceptable quantity and quality of water for health, livelihoods, ecosystems, and production, coupled with an acceptable level of water-related risks to people, environments, and economies.*” (Grey and Sadoff 2007: 546).

The management of water as a renewable, “common-pool” natural resource whose presence is both variable and unpredictable, poses many challenges. Although freshwater is an important factor of production in many sectors, it does not need to be produced; the resource must rather be developed and managed. The immediate concern of “user” sectors is usually the quantity of water available to them. However, the need to maintain water resource quality both to sustain desired environmental conditions as well as to avoid prejudice to other users becomes increasingly important as levels of use increase. In many countries, management of flood impacts is also an essential function.

From a development policy and strategy perspective, water is a contextual resource endowment rather than a driving force. While, historically, early agricultural civilisations may have developed into “hydraulic societies”, the linkages between water and societal economic and social development have weakened as our ability to manage water to meet development needs has increased. Outside of agriculture and hydro-power, water availability is seldom a dominant determinant of the location of economic activity and water resource development and management is guided by demand rather than used to catalyse activity through supply. The dominant approach to water management has been to get the water to where it is needed, rather than to develop where the water is available—particularly in southern Africa.

The nature of management activities is often complex since it has to deal with extreme variability and uncertainty as well as the geographic location of the resource which is often not available in adequate quantities where it is needed without infrastructure investments. As use intensifies, there is often competition between users for access to limited supplies and a system has to be established that guides the allocation of what is usually considered to be a public resource. This process has to take account of changing social and economic priorities and preferences. A further challenge is to

take account of the need to sustain the resource and its underlying biodiversity and to reflect the environmental preferences and priorities of society.

While there are always likely to be infrastructure solutions to water availability and variability, these may become increasingly economically and environmentally expensive. Regional differences in water endowments may similarly require the transfer of water over longer distances between basins and nations or demand other responses.

A final contextual issue is the challenge of climate variability and change. There has been extensive discussion about the potential impacts of climate change on water resources, with warnings that it may amplify the destructive impacts of both flooding and droughts. There is however a widely held view amongst practitioners that current climate variability already requires a structured management response, which many communities and countries are still not able to provide. The preferred strategy for climate change is thus to build community, country and regional resilience by building the capacity to address current climate variability (Sadoff and Muller 2008).

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2 Water Resource Planning Is Contested Terrain

If water-related development decisions are to be influenced, it is necessary to understand the associated decision-making processes about water resource development, management and use and how diverse water-using sectors are engaged in these. It is also important to recognise that this is a contested terrain; a full description of the recent evolution of different approaches is beyond the scope of this paper (see Muller 2015 for more detail).

Because of its multi-sectoral use and impacts, water resource development and management has to be closely coordinated with the needs of users and water resource management institutions should be able to inform user sectors of the opportunities and constraints that water may pose for their activities. Two broad macro-approaches to introducing water issues into national policy can be distinguished, hydro-centric and hydro-supported.

A variety of “hydro-centric” planning processes have been promoted, often by environmental conservation interest groups. These are characterised by an attempt to “put water at the centre of development”, to make the physical boundaries of river basins the primary scale at which water is planned (e.g. European Water Framework Directive). In particular, they seek to resolve development trade-offs

between different sectors in forums established by water sector institutions. An earlier generation of hydro-centric processes (the USA's TVA scheme is the flagship for these) sought to stimulate development through investments in water infrastructure. These had mixed results and, currently, the emphasis of hydro-centric results is to protect rather than to develop the resource.

Hydro-centric approaches are particularly difficult to apply in transboundary river systems since they require water resources that are shared between nations to be managed jointly by an over-arching river basin organisation. It is difficult for such institutions to negotiate trade-offs between riparian states where the benefits accrue to one state and the costs are incurred in another. 'Benefit sharing', while often touted as the principle that should govern transboundary management is hampered by the complexities of agreeing a reasonable and equitable share of those benefits, particularly where these accrue to and from different sectors of economies and societies which do not have adequate voice in the management process.

Hydro-supported processes are those in which the development and management of the resource is guided by agencies which are part of a wider family of political and administrative institutions. These are driven primarily by user requirements and such user-led approaches are typical of most rapidly developing countries. The most obvious user-requirement in these cases is for adequate quantity and reliability of water supplies. Regulation of resource quality impacts is more difficult. While individual users can be required by water managers to treat waste discharges to certain standards to protect other users, the management of diffuse impacts must involve other sectors. So "diffuse" pollution caused by agricultural practices needs to be regulated in cooperation with the relevant agricultural authorities through formal governmental coordination processes.

Similarly, at regional level, the implications of differences between national water endowments will have to be addressed as part of overall economic management. So the viability of the large and costly intra-regional water transfers mooted by some authors as a solution to SADC wide variability in water availability will be informed by the economic perspectives of the user sectors rather than by water managers.

At a global policy level, the water-sector has, in recent decades (1992–present), been encouraged to follow what are effectively hydro-centric processes in which the conservation and even "preservation" of the resource is prioritised (IWRM, river basin planning) but these processes have had relatively limited impacts and outcomes. An earlier (1930–1990) set of hydro-centric approaches focused on the promotion of large water resource infrastructure programmes intended to catalyse economic and social development. Some of these are considered to have been successful (TVA, 3 Gorges) while others have had more mixed results (Kariba, which has not seen significant irrigation development) and some are widely regarded as failures (Mekong, where the instability after the Vietnam war paralysed, until recently, the planned infrastructure developments). While large hydro-centric resource programmes have often captured the imagination of both water sector managers and politicians, it is suggested that, in terms of economic and social impact, it is the hydro-supported processes that have had the greatest impact although, because this is "indirect", it is less visible. If water-related development

decisions are to be influenced today, it is useful to understand and track the recent evolution of these approaches.

Because of the contribution that water resources and their management make to so many different areas of human social and economic activity, it has long been suggested that water resource development and management should be addressed as part of overall national development strategy and planning. This was explicitly stated in the 1977 UN Conference on Water at Mar del Plata which sought to identify and recommend the actions needed for the “accelerated development and orderly administration of water resources”. Its Action Plan placed considerable focus on the need for a more coherent approach, emphasising the need for a

.... shift from single-purpose to multipurpose water resources development as the degree of development of water resources and water use in river basins increases, with a view, *inter alia*, to optimizing the investments for planned water-use schemes. In particular, the construction of new works should be preceded by a detailed study of the agricultural, industrial, municipal and hydropower needs of the area concerned. [...] This analysis would take into account the economic and social evolution of the basin and be as comprehensive as possible; it would include such elements as time horizon and territorial extent, and take into account interactions between the national economy and regional development, and linkages between different decision-making levels. (UN 1977: para 41).

To achieve this, it was recommended that the management of water resources should be effectively integrated and explicitly proposed that this should be through the mechanism of national development planning:

Each country should formulate and keep under review a general statement of policy in relation to the use, management and conservation of water, as a framework for planning and implementing specific programmes and measures for efficient operation of schemes. National development plans and policies should specify the main objectives of water-use policy, which should in turn be translated into guidelines and strategies, subdivided, as far as possible, into programmes for the integrated management of the resource. (UN 1977: para 43).

This theme was taken up again 15 years later at the UN Summit on Sustainable Development in Rio de Janeiro. The Action Plan prepared there, Agenda 21, states that:

The holistic management of freshwater as a finite and vulnerable resource, and the integration of sectoral water plans and programmes within the framework of national economic and social policy, are of paramount importance for action in the 1990s and beyond. (Chap. 18)

However, divides emerged between the developed countries that wanted to emphasise environmental sustainability and developing countries that sought greater emphasis on their economic and social development.

This is illustrated by the way in which the currently dominant hydro-centric approach was outlined in the final statement of a preparatory meeting held in Dublin before the Rio Conference. It focuses exclusively on basin level planning (its only mention of national development plans is in relation to training needs).

The most appropriate geographical entity for the planning and management of water resources is the river basin, including surface and groundwater. (Dublin 1992).

Water sector planning processes were seen as essential to the resolution of water conflicts. The Dublin statement also explicitly gave priority to environmental objectives:

Integrated management of river basins provides the opportunity to safeguard aquatic ecosystems, and make their benefits available to society on a sustainable basis.

Many of the key proposals made in Dublin were rejected by the Rio Conference. Aside from its emphasis on economic instruments over social objectives, recommendations from Dublin that were not taken up in Agenda 21 included: that river basins should be the unit of decision making; that stakeholders should participate fully in decisions; that future international meetings on water should be convened as multi-stakeholder fora in which governments would have the same role as business and NGOs. Nevertheless, the so-called “Dublin Principles” were widely adopted, particularly by donor countries in relation to their aid recipients.

One outcome of the Dublin Principles focus on environment, river basins and stakeholder participation was the convening of a World Commission on Dams. The Commission was dominated by anti-dam NGOs and its recommendations for reviews of alternatives to dam development and full prior consent by affected parties before development were widely regarded as unworkable. The result was that its report, in the words of one long-time observer of the water sector put it:

... contributed to a concerted action by the developing countries which were forced to unite by the biased report which otherwise may not have happened. With a combined voice, they could tell developed countries who had already constructed most of their large dams, that infrastructure construction is important for their socio-economic development and that they need such structures to produce food, generate energy employment and income, provide basic services and improve the overall quality of life of their citizens (Biswas 2012).

One outcome was however that donor countries and agencies became very reluctant to finance large water infrastructure and, although this position has moderated somewhat, the negative attitudes are still in place as demonstrated by the fact that large hydropower dams are still not eligible for Clean Development Mechanism financing.

The approach inherent in the Dublin Principles was also reflected in the European Union’s Water Framework Directive which was approved in 2000. This again focused on the environmental integrity of river basins, with basins as a unit of planning and full stakeholder participation. As described by the European Commission, the environmental requirements appear particularly onerous:

.... ecological protection should apply to all waters: the central requirement of the Treaty is that the environment be protected to a high level in its entirety. [...] the controls are specified as allowing only a slight departure from the biological community which would be expected in conditions of minimal anthropogenic impact. (EC WFD introductory note)

But European politicians refused to endorse proposals for river basin organisations to take responsibility for transboundary rivers—the requirement for “coordination” allowed most to carry on with business as usual although with additional reporting requirements. There were, nonetheless, requirements for aligning monitoring and

reporting systems, to ensure ‘good’ status was not reported as ‘fair’ just over the border. Aspirations to re-establish natural conditions were considerably diluted and sufficient loopholes were left to give national governments extensive discretion—the Netherlands simply declared the majority of its watercourses to be artificial (Heavily Modified Water Bodies), which only need to achieve good chemical status. The requirement for stakeholder participation is also being questioned; some governments find that they can only comply by paying participants to attend meetings.

After 1992, two institutions (the Global Water Partnership (GWP) and World Water Council), which were established outside the UN system to give effect to the Dublin Principles (rather than Rio’s Agenda 21), focused on this approach. The GWP and the Scandinavian governments that backed it took the lead in promoting Integrated Water Resource Management (IWRM) plans and elaborating how they should be produced. Although characterised as integrated approaches, they were conceived as water sector led initiatives.

The promotion of catchment and river basin management is an acknowledgement that these are logical planning units for IWRM from a natural system perspective. Catchment and basin level management is not only important as a means of integrating land use and water issues, but is also critical in managing the relationships between quantity and quality and between upstream and downstream water interests (GWP 2000).

The consequence of this hydro-centric approach was to concentrate on water sector based instruments rather than effective coordination with broader social and economic development—and political—processes.

... in many cases stakeholders represent conflicting interests and their objectives concerning water resources management may substantially differ. To deal with such situations the IWRM should develop operational tools for conflict management and resolution as well as for the evaluation of trade-offs between different objectives, plans and actions.

In 2002, at the Johannesburg World Summit on Sustainable Development, after strong lobbying by European delegations, it was agreed that all countries should prepare IWRM plans by 2005. This marked a turning point since it subsequently became clear that the nature and purpose of these plans was unclear and was based on a poor understanding of how water resource related matters were managed in practice. While a number of developing countries were funded to prepare such plans, they have had little impact, not least because the guidelines for their preparation focused on institutions and management instruments and almost completely ignored the infrastructure needed in most countries to enable such institutions and instruments to operate.

In response to the overwhelming emphasis on process and institutions and the underwhelming practical outcomes it became clear that a different focus was required. One response, emerging from the World Bank, was to focus on the achievement of the practical goal of water security, “the availability of an acceptable quantity and quality of water for health, livelihoods, ecosystems and production, coupled with an acceptable level of water-related risks to people, environments and economies”. The overarching strategy to achieve this was to invest in the institutions, information and infrastructure needed to achieve the goal.

At the same time, the World Bank sought to re-engage in infrastructure for water resource management.

A related but more specific response subsequently emerged from the business community, which recognised the need for practical outcomes to address the growing economic and social challenges in rapidly growing economies. This focused on the need for a sustainable set of relationships between water, power and agriculture (“the nexus”).

Business leaders at the World Economic Forum Annual Meeting in 2008 set out a Call to Action on Water, to raise awareness and develop a better understanding of how water is linked to economic growth across a nexus of issues and to make clear the water security challenge we face if a business as usual approach to water management is maintained. This report captures where the debate is now and sets out the challenge we face if nothing is done to improve water management in the next two decades (World Economic Forum 2014).

While the practical mechanisms to address these newly defined challenges remained unclear, the emergence of the “nexus” concept offers the opportunity to reconnect water resource planning with broader development planning; although it focuses primarily on the agriculture and energy sectors, practical approaches may spill over into other sectors. Unfortunately, nexus thinking has subsequently been driven primarily by the water sector, with little or no input from the energy and agricultural sectors, thus negating much of the potential of the nexus to reconnect water to broader development planning in a hydro-supportive manner.

More recently there has been a shift in African perspectives on infrastructure investment, driven by the demand from African Ministers, through their African Ministers Council on Water (AMCOW), for water to contribute more to the continent’s growth and development as well as by the recognition that Africa is the ‘under dammed’ continent (African Development Bank).¹ From an African perspective, perhaps the most important development has been the emergence of new sources of finance for large water infrastructure projects from China, Brazil and India which, more than any other intervention, has changed the water resource management discourse. Many donor-dependent countries now have alternative sources of assistance. They need no longer spend years in stakeholder consultations to justify clear infrastructure requirements and can often get responses that, while not always positive, are rapid in comparison to their experience with their traditional western development agencies. As a consequence, the rate of investment in large water infrastructure has increased significantly, the “revealed preferences” providing evidence of the impact of prior investment boycotts.

The contribution of China to this changing dynamic has in turn seen international environmental organisations, make considerable efforts to influence China’s policies. The strategy of international NGOs to link with business and finance partners to influence a major government is an interesting innovation in the broad strategy of promoting global regulatory harmonization which has been described by Drezner (2007).

¹Despite having two of the largest dams in the world, SADC States have an average per capita storage of just of 500 m³/person, against the global average of 1500 m³/person.

3 Water in Mainstream Development Planning—Could Virtual Water and Nexus Contribute?^{2,3}

As with water resource planning, national development planning has had a chequered history. In the 1960s, it was the mainstream approach in many countries, particularly newly independent developing countries but also in a number of developed economies. It declined in importance, in part for ideological reasons. But:

There were also well-founded concerns about the performance of planning since the outcomes often fell far short of the objectives. There was a variety of reasons for this, from unrealistic assumptions about internal capabilities and external markets as well as slow responses to external pressures such as the oil price shocks of the 70s. These problems were compounded in many cases by weak governments that were unable to link planning theory to implementation practice while economic technocrats, often from abroad, dictated development paths with little attention to local social and political geography (DBSA 2012).

[...] However, the legitimacy of the idea of planning for development was sustained by the fact that the countries that proved best able to navigate the global financial turmoil of the 1990s turned out to be the East Asian “tiger economies” whose centralized planning systems were an important contributor to their economic success (DBSA 2012).

There has been a revival in planning for development but in a modified form. Poverty Reduction Strategy Papers (PRSPs) addressed not just the socio-political impact of structural adjustment programmes but also helped to re-establish a budget framework and development strategy for donor-dependent countries. These were, however, short term measures:

There was a clear need in many countries for a better structured, more generic, long term development framework and the institutional arrangements to prepare and maintain it. Indeed, it has been argued that few developing countries have made significant economic progress without a long term development plan. A more substantive set of approaches has emerged which seeks to frame longer term and more comprehensive development programmes. They continue the trend away from detailed long term forecasting and avoid engaging in the detailed decisions on individual projects and investment allocation and focus rather on countries’ strategic direction (DBSA 2012).

These approaches go beyond technocratic efforts to identify global and national trends, to identify interventions and allocate resources to take advantage of them. Rather, they recognize the need, in complex societies, to bring focus to and generate consensus around key national priorities and coherence in pursuing them, mobilizing support from broad sections of society rather than simply managing governmental action. To the extent that they address development strategy their focus is on the development of long-term national visions and then seeking strategies to achieve them, built on an understanding of local endowments, challenges and opportunities (DBSA 2012).

²This section is drawn from the discussion document for a workshop for national planning agencies of SADC countries on Understanding National Development Planning and its Contribution to Inter-Sectoral Regional Integration, organized by the NPC and DBSA in August 2012.

³DBSA (2012).

In this new approach, the plan is a process rather than a product; it is effective to the extent that there is political leadership in its development, substantive involvement of the institutions concerned in its elaboration and discipline in its implementation.

[...] the plan can only be as good as the quality of the policies that are in it, which in turn will be largely determined by the quality of the institutions, in government and beyond, that contribute to it [...] A useful contribution of development planning has been to force sectoral agencies to consider the feasibility of their policies and proposals in the broader national context. In this sense, development planning can contribute to institutional strengthening (DBSA 2012).

A critical feature of national development planning in SADC is that it is conducted within a country political framework where national governments have direct authority over the public sector and considerable indirect suasion over other stakeholders since they set the direction of both regulatory and public spending interventions.

The political environment for planning at regional level in Southern Africa differs from that at national level primarily because it is undertaken on a cooperative basis without the benefit of direct political authority and with no system to hold national governments to account if they fail to meet their obligations. Inter-sectoral coordination is a particular challenge. While national development planning, which falls under the authority of a head of state and single executive, can achieve integration between sectors at national level the same is not true at a regional level. While decisions may be taken and announced, implementation may falter if regional discussions and decisions have not been adequately informed by national considerations. For this reason, regional plans are often not acted upon, as is highlighted in the electricity sector in SADC and described in the Chapter of this book on “[Electrical Power Planning in SADC and the Role of the Southern African Power Pool](#)”. This has been identified as a generic underlying issue by SADC in the course of its review of the progress made with its 2005–2015 RISDP.

To date, SADC’s main successes have occurred where cooperation has been required between single, inter-linked sectors. So transport networks, electricity grids and telecommunications systems have evolved with some degree of success. This reflects the abilities of single sectors to convene to identify areas of mutual interest and cooperate to address them, a process which regional agencies such as SADC can facilitate.

In areas where inter-sectoral cooperation is required, progress has been notably slower, perhaps because of the higher transactional costs, but also perhaps a result of a lack of a clear regional framework for cooperation for mutual benefit. So cooperation in agricultural development, which requires transport, trade and, potentially, water sector support has been less successful, judging by trade flows. The extent to which national interests may conflict in cross-sectoral planning is also greater; for this reason, progress in trade in services has also been slow.

Regional development planning is thus usually of a consultative and indicative nature. In this context, sectoral planning will still reflect national priorities and

trade-offs between sectors, while, in strategic sectors like water, trade and energy, efforts to promote *regional best options* will have to address sovereign security concerns as well as to manage the influence of national interest groups.

National development planning brings together the different sectors within an overall framework of policy and strategy and seeks to identify and address potential linkages, synergies and constraints between them as well as to make trade-offs between different priorities. A critical question is the extent to which regional cooperation and integration are included as objectives in national development planning processes and efforts made to ensure that development strategies are coordinated. A formal process of coordination would help to identify costs and benefits of regional policies at national level and guide negotiations and decision making. A review of national development plans in SADC found significant variation; while some national plans had entire chapters on regional integration, others ignored the subject completely. It has been suggested that approaches that could more effectively mobilize national development planning in support of regional integration need to be developed and implemented. The potential advantages of considering regional best opinions have rarely been effectively quantified and there has been little effort to address sovereign security concerns which are clearly justified, given ongoing instability in some SADC countries.

4 Water in Development Planning, National and Regional

All Southern African countries' national development plans address water and related issues and many make clear linkages between water and energy and water and agriculture, although not always in a coherent manner. The expansion of irrigation has long been recognised as an important intervention to increase the productivity and reliability of agriculture. The practical examples of Kariba and Cahora Bassa hydropower installations have highlighted the potential of water to produce energy although, aside from flood control, not the potential multi-purpose opportunities.

Beyond the Zambezi dams, South Africa has long dealt explicitly with the water-energy nexus, the strategic outlines of which were spelt out in the 1970 Commission of Enquiry report on water matters; interestingly, that report was not unduly concerned with the potential impact of water scarcity on irrigated agriculture, concluding simply that increased water use efficiency in agriculture would address most of the growing pressures. More recently, the national Department of Water Affairs identified the potential role of regional cooperation in agriculture as a strategy to address water constraints (see Box 2). However, the economic evidence is that South Africa will be a net exporter of agricultural products (some of which will be irrigated) for decades to come.

In other Southern African countries, there is an understandable priority for water supply and sanitation matters although there is increased emphasis on hydropower, both as a consequence of the failure of regional cooperation to provide energy

security as well as of the success of efforts to develop mining. Given the donor emphasis, language on IWRM is also prevalent in the water chapters of national development plans—one consequence of this is that much water-related development is addressed in the planning of other sectors, notably power and agriculture rather than by water authorities.

Text box 2 Practical Approaches to Regional Water-Food Issues (see Footnote 1)

Practical approaches to regional water-food issues

South Africa uses 60 % of its scarce water resources on irrigation, a substantial portion of which is used to irrigate crops which are regarded internationally as rain-fed crops. The question is therefore being asked about the extent of alternative production areas in southern Africa (particularly in selected neighbouring countries) for the range of crops which are presently produced sub-optimally under irrigation in South Africa. The objective of this study is therefore to provide an answer to this question with adequate confidence to allow the rational pursuit of this concept which could have far-reaching mutual benefit for southern African countries. The countries that were considered are Mozambique, Zimbabwe, Malawi and Zambia.

This broad assessment revealed that the four target countries possess a net area of about 26.6 million ha of high-potential rain-fed cropping land (referred to as “Premium” land use potential) with the following breakdown per country: Zambia 11.1 million ha; Mozambique 8.8 million ha; Zimbabwe 6.3 million ha; Malawi 0.4 million ha. The constraints include land tenure issues (the majority of the high potential rain-fed cropping area is occupied by subsistence farmers on communally owned land), population (the high rural population spread presents a challenge to commercialisation of agriculture), present land use (widespread subsistence farming), poor or lacking infrastructure and poor agricultural support services. However, the constraints are not considered insurmountable. With the appropriate vision, investment and support from the governments of the respective countries there are significant opportunities for extensive commercial agricultural development which could involve and benefit local farmers and their communities. The recent examples of South African farmers operating successfully in Mozambique and Zambia, with full government backing, have shown that these constraints can be overcome.

Whilst the principal objective of this study is to identify areas that are suited to rain-fed crop production, the existence of a considerable network of largely “un-tapped” surface water resources, especially in Zambia and Mozambique is highlighted. There is therefore an opportunity for expanded utilisation of the water resources in these countries for irrigation where there is a higher irrigation potential, in terms of both soils and climate, than exists for many of the irrigation areas of South Africa.

(Ex: DWA (2010))

The current SADC focus is water-centric, reflecting SADC's overall approach. Thus it has promoted the establishment of river basin organisations and encouraged them to engage in sector-led, basin-bounded planning exercises. Beyond contributing to a better understanding by water practitioners of their water resources, this focus has not helped national water sector agencies to engage with their own national development processes nor undertaken work at the regional level that could support that kind of endeavour.

This approach reflects both donor preferences (strongly expressed by the provision of technical assistance under the control of donor officials) as well as SADC's generic working models. However, it is becoming clear that these approaches are not producing significant results.

Major projects are proceeding (or stalling) without significant contribution from the regional water sector. Zambia is developing its hydropower resource on a national (or, in the case of Kariba, bilateral) basis and waited until most of the projects were underway before ratifying the Zambezi Watercourse Agreement in 2013. Development of the Batoka Gorge and Mphanda Nkuwa projects on the Zambezi is also being led by the power sector on a bilateral basis, with only limited input from a water resource management perspective.

Recently (2013), SADC convened an investment conference for the water sector which was poorly attended, not least because the major projects presented were already well known and under development through other channels while smaller projects appeared to reflect national wish-lists rather than strategic projects of regional significance.

The challenge for hydro-centric processes is to convene not just water sector representatives but also stakeholders from other sectors. Globally, few regional water institutions have any sovereign authority either to convene or to take decisions in respect of water management and use. The exceptions are the European Union which has an overarching political framework and the Senegal River basin where governments have formally delegated specific water management powers and responsibilities to a joint water management institution.

Even if there were substantive political framework, it would only be effective if the regional representatives of the different sectors were adequately briefed on the national issues and inter-sectoral trade-offs. In the absence of such a framework, it is necessary to place greater focus on generating and sharing information and participating in other sectors' processes and less on trying to tell other sectors what to do and how to organise themselves.

Hydro-supported planning in water resources focuses on identifying and engaging with strategy and planning activities in key user sectors. Where this has occurred, there have been notable successes. One example is the Lesotho Highlands Water Project, which emerged from engagement with urban and industrial users, during which it became clear that the demand for water would increase beyond the ability of the Vaal system to support it.

At a smaller scale, Swaziland's agricultural development required additional water to enable its sustainable expansion; the LUSIP project became one of the

catalysts that led the national water sector institutions to negotiate the Interim IncoMaputo Agreement which was signed in 2002.

After many years of argument, Namibia has now indicated that it intends to proceed with plans to tap the Okavango river to meet its development needs, despite continuing objections from environmental interests.

In the agricultural sector, there is renewed interest in water as a factor of production that has potentially opened the way for greater collaboration with water resource managers. There is however as yet little evidence to suggest that this is being translated into practical action. Similarly, while multi-sector modelling has demonstrated the potential of synergies on the Zambezi river between power, agriculture and environmental conservation, this has still to be translated into terms which the user sectors relate to—for example, in the power sector, there is a concerted move towards ensuring energy self-sufficiency even as the water-related studies demonstrate the benefits to be reaped from cooperative development and management.

One reason for the failure to make more progress with regional cooperation and integration in the water sector is the institutional and transactional demands that it imposes. This is a generic challenge. Integration cannot simply be driven by a single regional organisation. Many of its elements have to be implemented cooperatively by sovereign national governments. If its potential benefits are not understood—and preferably experienced in a practical way—by a significant proportion of a country's citizens, it will be hard to convince them to support it.

Judging by the slow progress made to date, Southern Africa's regional and national institutions have not generally succeeded in demonstrating those potential benefits. The problems with SADC's approach are recognised by the organisation itself and are generic and not limited to water. The organisation's own recent assessment includes, amongst ten "lessons learned" that:

There is no effective link between the SADC Secretariat, the SADC National Committees and relevant key stakeholders who are supposed to oversee and effectively implement SADC activities and programmes at national level (SADC 2011).

A failure to engage with broader development priorities and to focus instead on water centric issues has been blamed for the failure of the approach, most recently in the Mekong river basin where coordination efforts have been ongoing for over 50 years. As the former CEO (2004–2007) of the Mekong River Commission (MRC) has commented,

Hydro-diplomacy tends to be more environmentally than economically oriented [...] since the signing of the "Mekong Agreement" in 1995, donors have oriented MRC's activities mainly toward information and knowledge management, while downplaying its investment facilitation role.

With such a vision of the role of basin organizations, there is a risk that they will continue to be excluded from the national investment planning process. Governments will continue to complain about the lack of tangible results for the direct benefit of the population. They will also remain reluctant to increase their financial contributions.

Basin organizations may well get stuck [...] playing an insignificant role in the negotiations about the most critical issues. No doubt that knowledge is essential for informed

decision-making, but its generation and communication should first and above all be developed at national level, on the basis of the subsidiarity principle (Cogel 2014).

This in spite of the fact that the four countries of the Mekong River Commission signed an ‘Agreement on Cooperation for the *Sustainable Development* of the Mekong River Basin’ [emphasis added] and Article 2 of that agreement calls for “with emphasis and preference on joint and/or basin-wide development projects and basin programs.” Indeed the first prior consultation process under the 1995 Mekong Agreement, the Xayaburi Hydroelectric Project, focussed on hydro-centric concerns about potential impacts on the mainstream of the Mekong, and not on the contribution to regional energy security and growth. This process failed to establish any clear agreement on the acceptability of the project on that basis.

5 Political Economy of Regional Development Planning

Energy: As outlined above, the determination and evaluation of the opportunities and constraints posed by water resources—and other natural resource endowments— involves coordination between different political jurisdictions and across multiple sectors whose priorities and criteria, implicit and explicit, may be expressed in a range of different metrics.

While at a national level, development planning processes can establish a common metric to assess costs and benefits, this is more difficult to do regionally, across a diverse set of administrative systems. So while apparent benefits that could be achieved through regional planning and cooperation have often been identified at a conceptual level, it has proved difficult to detail their practical implications at a national level. As a consequence, many apparent opportunities have not been acted upon.

An example is provided by the power sector. According to the economic metric, the region would benefit considerably (in terms of cheaper energy) if a regional perspective was taken and a complementary suite of generation projects promoted (see Chapter “[Electrical Power Planning in SADC and the Role of the Southern African Power Pool](#)” for the details). In practice however, this has not occurred. Aside from the economic analysis of investments and operating costs, other metrics have been introduced. So countries are concerned about reliability of supply and their experience has been that there are higher risks to dependence on neighbouring countries than on their own capacity.

This situation has led to a preference for sovereign (national) rather than regional solutions—and indeed, a rejection of proposals for greater cooperation, despite the apparent benefits that they offer. In this case, a second-best regional strategy has emerged from CRIDF—once all countries have adequate generating capacity to meet their needs, they may use the regional power pool to trade and to purchase cheaper electricity if it is available elsewhere. This may realise financial gains for the sellers and buyers, reduce regional carbon emissions, and realise some modest

water savings, an illustration if not a product of the nexus and Virtual Water approach, with power not water as the driver. But it will be based on a sub-optimal investment strategy which has built more capacity than needed.

Agriculture: There is already extensive recognition of the potential for regional synergies in agriculture and for water to be exploited to strengthen regional food security at country level (see Box 3). However, if there is to be support for exploiting the extensive land, water and human resources outside of South Africa to produce food for the region, local metrics will have to guide the argumentation and prioritisation.

In most cases, a priority will be to ensure that agricultural development is accompanied by livelihood enhancement—certainly that livelihoods of poor rural populations should not be undermined. To the extent that the resource outside of South Africa is developed using farming models that expand livelihood opportunities for small scale farmers, this should also contribute to household level food security.

In this context, any support by CRIDF to the development of resilient, more productive, small scale agricultural production in the region will enhance resilience and food security across the region as well as providing direct household benefits. The regional benefit of these approaches will depend on wide-scale replication, whose local impacts and cumulative effects will have to be carefully assessed. While it may be possible to describe this in terms of Virtual Water and the nexus, and investments in water infrastructure may be a necessary part of such a strategy, they will only be complementary to the wider challenge of the establishment of farmers with the appropriate skills as well as the development of the farming systems, markets and support institutions and enabling infrastructure required to enable competitive production and trade to occur.

Similarly, mobilising the benefits of locating agriculture to take advantage of higher rainfall, and hence reduce the dependence on blue water will also require significant investment in other (non-water) infrastructure and institutions. Virtual Water and nexus thinking may help to highlight the need for hydro-supportive integrated national planning into perspective, and may introduce other options and trade-offs to this process.

Text Box 3 Trade-Based Food Security in South Africa’s National Development Plan

Trade-based food security in South Africa’s National Development Plan

“It is necessary to make a distinction in policy discourse between “national food self-sufficiency”, “food security” and “access to food by poor people”. South Africa is food-secure and has been for a number of decades. This means that it earns a trade surplus from agricultural exports and is able to cover the cost of food imports from those exports. The country has also produced enough of the staple cereal (maize) for all but three of the past 50 years (the exceptions being the droughts of 1984, 1992 and 2007). The composition of the maize harvest is changing, however, with more yellow

than white maize planted. This reflects the trend towards higher consumption of animal proteins and the fact that wheat, rice and potatoes are becoming the preferred staples as the population urbanises and becomes more affluent. In this regard, the national food-security goal should be to maintain a positive trade balance for primary and processed agricultural products, and not to achieve food self-sufficiency in staple foods at all costs.

Region-based approaches to food security should be investigated. As South Africa's agriculture becomes more specialised and efficient, there may be a trend away from the production of staples to higher-value crops. As there is only limited correlation between climatic events in South Africa and countries to the north of the Zambezi (although the drought of 1991/92 was regional in nature), regional cooperation may offer greater supply stability and resilience to droughts. Regional economic integration is best served when there are complementary interests and advantages between the parties, which may be the case in food production. Regional expansion of production, as seen in recent years, is favourable. South Africa should benefit from the opportunities this brings for trade, food stability and value-chain consolidation." (National Development Plan: p. 230)

These examples highlight the general principle that successful regional cooperation and integration depends on a clear identification and equitable and reliable distribution of the costs and benefits of any regional development initiative. One advantage that has been posited for "top-down" institutional structure of regional integration rather than ad hoc sectoral "bottom-up" approaches is that it is easier to negotiate packages of initiatives with an acceptable mix of costs and benefits in a multi-sectoral context than in a single sector. The high level of coordination that this requires both within regional institutions and between national and regional institutional families continues to present a strategic challenge to the achievement of the broader regional integration goal.

6 Conclusions

It has already been demonstrated that mobilising synergies and exploiting complementary resource endowments between countries could increase the productivity of agriculture and power production and reduce risks due to climate variability and change, potentially benefitting a range of economic interests and communities across the southern African region. The major challenge remains to give effect to this approach.

Some of the policy synergies would reflect the concept of Virtual Water by encouraging agricultural production in most favoured and least vulnerable areas. The nexus could be reflected in increased availability of relatively reliable and

“green” hydropower to countries of the region, traded through the Southern African Power Pool (SAPP). Similarly, trade-offs between irrigation and hydropower, albeit on a temporary basis during drought, could be informed by nexus and Virtual Water thinking. This should make it possible to enhance both food security and energy security for poor people in the region although that outcome would not necessarily be automatic.

However, decisions about the adoption of such policies will be taken primarily at national level and will depend on the political economy in each country. While regional cooperation may play a role and can certainly inform the process, the costs, benefits and trade-offs will need to be acceptable at each level of decision-making.

The implications for policy advocates is that, while regional institutions may be useful to develop understanding of potential synergies and channels through which to communicate this information, greater attention should be paid to national political economies and to national costs, benefits and trade-offs.

Development planning processes could make an important contribution to elaborating such multi-component regional integration “packages” but are still in their infancy in SADC and structures and methodologies that allow the various inter-sectoral trade-offs at national level to inform decision-making about regional integration have yet to be established. This imposes constraints on the potential for the development of cooperation on water-related opportunities.

In this context, the use of hydro-centric approaches to water resource planning within shared river basins rather than encouraging cooperation at the level of national economies may weaken cooperative inter-sectoral work since it tends to place water above and apart from mainstream planning processes.

The political economy that determines whether potential economic and social benefits are translated into political decisions remains poorly understood although it has been identified as a priority area for further research.

In this broad context, the concepts of Virtual Water and the nexus may usefully inform a range of discussions and be used to illustrate potential challenges of and responses to climate change. They are however unlikely in themselves to provide the basis for national policies on which regional cooperation and action depend, given the many other factors that have to be considered.

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