

The South African ‘Ecological Reserve’, A Travelling Concept

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ABSTRACT

With its ‘ecological reserve’, South African National Water Act of 1998 is perceived as one of the most ambitious Water Acts in the world from an environmental perspective. At first sight, this ‘ecological reserve’ provision could be mistaken for a typical case of North–South policy transfer when actually it was initially engineered by the Department of Water Affairs and its civil engineers in the 1970s–1980s. The paper shows the renewed influence of the scientific community over the definition of the concept during the debate leading to the adoption of the Water Reform Act in the mid-1990s. While investing in the international arena, South African hydro-ecologists managed to reinforce their position in the domestic arena at the same time. Therefore, we demonstrate complex interdependence between domestic and international levels benefiting this travelling concept. Finally, we emphasize that for hydro-ecologists, the international arena was never a resource already there but an opportunity created.

Introduction

The National Water Act (NWA) is an act reforming water policy in South Africa. Voted in 1998, some of its provisions might appear surprising at first sight: for instance, the decision to create decentralized river basin organizations (CMAs) in a country where since the 1950s most of the rivers are interconnected through massive inter-basin transfers and centrally managed from a powerful division of national strategic planning within the Department of Water Affairs’ (DWA) Head Office (Bourblanc and Blanchon 2013). This provision might be revealing a typical North–South policy transfer. Another NWA provision seems to confirm this impression: the idea to secure an ‘ecological reserve’—some water flow reserved for the ecosystem health of the river. Indeed, the NWA is not only renowned for its declared objective of fighting against injustices inherited from the past. It is also perceived as one of the most ambitious Water Acts in the world from an environmental perspective with the creation of this ecological reserve (or ‘environmental flow requirement’—EFR).¹ Indeed, the ‘reserve’ is the only water *right* in the NWA. It has to be catered for before other water

licenses can be granted to strategic water sectors or users. The reserve is composed of ‘basic human needs’ (water provided for free to every individual in order to cover their needs on a daily basis such as drinking, cooking, and sanitation) and of the ‘ecological reserve’, that is, water that will remain in the river in order to ensure the long-term sustainability of aquatic and associated ecosystems. Such a progressive act, especially from an ecological viewpoint, can be surprising for a country facing a tremendous social challenge in basic water service delivery provision in extensive third world-like areas of the country.²

This raised the question of a possible existence of a policy transfer. After all, the diffusion of international ‘best practices’ is particularly visible in the water sector (Conca 2006). Moreover, developing countries going through a transitional regime period like South Africa are subject to a greater influence of international actors and their policy recommendations (Delpeuch 2008). Yet there has been no North–South transfer as far the ecological reserve is concerned. The ecological reserve is an endogenous concept (Biggs, Breen, and Palmer 2008) in the creation of which the DWA has played a pioneering role (Bourblanc 2013). Over the years, however, the South African scientific community of hydro-ecologists has managed to increase its influence over the concept to the point that it actually re-defined it (Bourblanc 2013). The purpose of this paper is to explain this renewed influence, by paying particular attention to the intertwined dynamics between the domestic and the international levels within the process.

There is growing evidence that South Africa now holds a leading role in the international ‘environmental flow’ (EFR) debate,³ especially on its determination’s methods. It has inspired Namibia, Zimbabwe, Mozambique, Zambia and Tanzania in Southern Africa and even Great Britain amongst other countries.⁴ To explore the influence that South African hydro-ecologists have had at both domestic and international level around EFR, we build on Hassenteufel and De Maillard’s review of various schools of thought whose focus has been to account for phenomena of transnationalization of public policies and policy norms (2013). These authors show that works on the global diffusion of policies (Dobbin, Simmons, and Garrett 2007) have been criticized for their rather mechanist vision often neglecting obstacles and resistance to diffusion. In contrast, transfer studies (Dolowitz and Marsh 2000; Evans 2004) grant better attention to the substance of what is actually being transferred and also focus more on actors. Yet these transfer studies do not contain a comparative dimension and could therefore benefit from the insights of the renewed works on policy convergence (Holzinger and Knill 2005). Finally, Hassenteufel and De Maillard plead for a multi-level approach focusing on actors and their circulation between policy levels. Building on Dezalay’s studies of global elites (2004), they acknowledge the interdependence between the national and the international levels through the concept of international brokers that allow overcoming the artificial distinction between transnational actors exporting policy models and national actors importing them. In this paper though, we would like to go even further and explore with Cabane (2013) a different role for these actors and show how these so-called brokers are not mere intermediaries between the national and the international

levels but actually how they contribute to the construction of these levels and policy arenas as well.

We have followed the adoption of the ‘ecological reserve’ provision through a process tracing approach, analysing the various understandings of the concept and studying the actors revolving around it at various times. Resisting the tendency to advance a functionalist explanation that postulates that EFR was ‘an idea whose time has come’⁵ or to take for granted the convergence of views between hydro-ecologists and civil engineers (Biggs, Breen, and Palmer 2008), we embrace a more sociological approach to unravel what made such an unlikely alliance possible.⁶ In that respect, we have used a public policy analysis approach. The data for the research consist of 20 semi-structured interviews with academics and researchers in South Africa, Australia and England between August 2010 and June 2013; with experts, consultants and former and current members of the DWA in South Africa; work in the International Commission on Large Dams (ICOLD) archives in Paris and DWA official documents in Pretoria as well as scientific publications about EFR. The paper covers developments in the ecological reserve’s understanding from the 1970s till the mid-2000s.

First, we analyse the origins of the ecological reserve initiated in the 1970s and 1980s by civil engineers from the DWA. Second, we examine its drastic change of trajectory in the mid-1990s under the influence of hydro-ecological scientists, some of them being employed as consultants by the DWA. We then provide a first set of explanations of such a shift in the concept’s understanding by arguing that this was done through a process of issue framing. Third, we provide a second set of explanations and demonstrate that such a shift was also made possible because South African hydro-ecologists managed to use the international level as a resource to increase their influence over the concept definition at the domestic level. At the same time we show how these hydro-ecologists contributed to the emergence of such an international arena that they used as a ‘resource opportunity’ and show the self-reinforcing process between domestic and international influence for these actors. In the last section, following Smith’s (2013) plea to cross fertilize public policy analysis and international relations traditions,⁷ we reflect on the complex interdependence (Keohane and Nye 1998) between various actors and across levels and discuss Haas’s concept of ‘epistemic community’ (1989) to account for the hydro-ecologists’ new influence over the EFR concept.

An emerging concern worldwide for river’s flow requirements

Environmental flows are defined in the Brisbane Declaration as the ‘quantity, timing and quality of water flows required to sustain freshwater and estuarine ecosystems and the human livelihood and well-being that depend on these ecosystems’ (<http://www.riverfoundation.org.au/images/stories/pdfs/bnedeclaration.pdf>). Until relatively recently, though, leaving water to flow in streams, aquifers or wetlands was considered by many to be a waste of a precious resource, especially for DWA civil engineers. What existed before the concept of

‘environmental flows’ was the idea of a ‘minimum flow’, which for instance was embedded in late eighteenth-century legislation in England. Its purpose was very different from environmental flows and was largely designed to maintain navigable canals or for the rights of downstream abstractors, for example. From the turn of the twentieth century through the 1960s, water management in developed nations focused largely on maximizing flood protection, water supplies and hydropower generation, hence the creation of dams. During the 1970s, the ecological and economic effects of these hydraulic projects prompted scientists, especially in the USA, to seek ways to modify dam operations to maintain certain commercial fish species for which a strong lobby revolving around commercial interest groups and anglers’ associations was mobilized. In Europe, the concept of ‘flow requirement’ also made its appearance in North European countries in the 1970s in a bid to dilute industrial pollution of rivers.

Katz (2006) recently did an international review of all existing legal frameworks recognizing a similar provision of ‘water for the environment’ (or EFR). Katz (2006, p. 35) states that: ‘Australia and South Africa stand out in terms of the legal protection that they afford freshwater ecosystems. [...] South Africa’s National Water Law of 1998 established water reserves—uses for which allocations are non-negotiable’. In Australia, if water provision to meet ecological requirements was recognized early on with the 1994 Agreement of the Council of Australian Governments (COAG) on Water Reform,⁸ the environment has only be seen as one of many users. If there is competition among these users, for instance in times of drought, the environment is not given priority.⁹ In South Africa on the contrary, the ecological reserve, along with the basic human needs reserve, is enshrined in the law as the only water right. All other uses need permits for use after the reserve has been established. Under this system, after the reserves are met, only water left over is available for allocation for other purposes, such as agriculture, industry, hydropower and non-essential domestic consumption. This stands in stark contrast to the policy existing in most of the world, under which ecosystems tend to receive only the amount of water left over after all other uses have been satisfied. South Africa legislation is therefore way more far reaching when it comes to the legal recognition of the EFR. In terms of EFR scientific expertise too, it is now recognized that:

Although historically, the United States has been at the forefront of the development and application of methodologies for prescribing environmental flows, using 37% of the global pool of techniques, parallel initiatives in other parts of the world have increasingly provided the impetus for significant advances in the field. (Tharme 2003, 397)

Now, Australian and South African holistic methodologies for EFR assessment, which typically incorporate all components of the flow regime, are at the cutting edge of EFR methodology internationally.¹⁰ They are based on a much broader concern about ecosystem protection or restoration.

The South African DWA leading the reflection on EFRs from the 1980s till the mid-1990s

The international arena might have provided the initial spark in the development of the idea of water for the environment, but, as we will see below, it rapidly lost ground compared to the South African arena, which kept on a steady pace in its reflection on EFR throughout the 1980s.

Discussing environmental issues within international non-governmental organizations: the ICOLD

Based in Paris, ICOLD historically focused on technical aspects of dam design, construction and operation. It is an association that gathers engineers from all over the world in a bid to reflect and share experience on how to improve dam building know-how. The enactment in the USA of the National Environmental Policy Act in 1970 is recognized worldwide as the formal inception of environmental impact assessment studies (Sowman, Fuggle, and Preston 1995, 45). This inspired ICOLD to initiate a reflection on environmental and social aspects, mainly looking at the relocation of people and then at environmental impact. Environmental factors related to water projects were discussed for the first time by ICOLD at their 1973 Congress and further discussion ensued in 1976. A technical committee dedicated to environmental issues was set up in 1977 and its first technical bulletin was released in 1981. Considering the greater awareness of environmental issues worldwide, which translated into a better integration of environmental issues in all the water development projects, ICOLD tried to react to the new trend. It acknowledged that:

a comprehensive environmental impact assessment, since 1971 mandatory in a growing number of ICOLD member countries, ought to become standard procedure everywhere as part of project conceptualization [. . .] and [that] special attention should be paid to any effect on biodiversity or the habitat of rare or endangered species. (ICOLD 1997)

However, dam safety has remained the main concern of the organization and the predominant concept pervading all its work. Indeed, it was not until 1997 that ICOLD published a position paper that presented guidance for environmental consideration, assessment and mitigation. In this position paper, no specific reference was made to EFRs.

If the ICOLD initiative remained a timid awakening, some ICOLD members like South Africa took the matter more seriously. Already in the mid-1970s, and even more so in the 1980s, Environmental Impact Assessments for proposed dams were being carried out before there was any legislative requirement to do so in South Africa. One DWA official in particular, a former ICOLD vice-president, is considered within the South African EFR science community as one of the founding fathers of the ecological reserve.¹¹ In the 1980s, this person was the Deputy Director of the Directorate for Strategic Planning (in charge of dams planning) in the DWA. He is remembered as the one who spoke for the first time of ‘a

water allocation for the environment' and the one who roughly estimated it at about '11% of the mean annual runoff' when the scientific community in South Africa was still reluctant to provide any figure. He acknowledged that ICOLD's emerging discussion over environmental impact assessment inspired DWA reflection on EFR.¹² However, in 1984 during a trip overseas with ICOLD '... it became obvious that South Africa had made some advances compared to other ICOLD members: 'I asked them about what they do for water for the environment. They were not doing anything; we were then leading in that respect'.¹³

Engineering environmental flows in South Africa

In South Africa, one of the first studies around environmental flows was done for the Pongola River (Heeg and Breen 1982). Like most of the dams built under apartheid, Pongolapoort Dam was almost exclusively meant to benefit white populations, in this case irrigation farmers. The dam was completed in 1974. Natal Parks Board managers were worried about the dam's impact on downstream natural reserves they were in charge of, and in particular on the animals in the reserve that might lack sufficient fresh water, now diverted elsewhere. They commissioned several studies from limnologists or aquatic ecologists. Fish spawning in particular became the main concern of these studies (Coke 1970). Furthermore, while busy with these studies, scientists discovered how dependent the African community, located downstream in a *bantustan*, was on the river for their daily subsistence. Sixty thousand people belonging to the amaThonga culture might not have been able to live from the river any more, which might have created trouble for the apartheid regime whose policy was, among others, to relocate black communities and contain them in certain areas away from the whites. Decommissioning of the dam to remedy the problem was never mentioned, and instead hydraulic engineering and artificial releases of water were the foreseen solutions to maintain the floodplain in a simulated natural state. Indeed, scientists themselves recommended controlled releases from the dam to simulate the natural flood regime (Rossouw 1985, 6–7).¹⁴

What should be understood is that although dams heavily modify the natural cycle of water courses, dams were not perceived by DWA officials as being at odds with the idea of providing for an ecological reserve. By analysing in more detail the initiative from DWA, it is clear that it presents a similar scenario to the one described by Fernandez (2009). She shows that the development of minimum flow requirements in France in the Adour-Garonne river basin has been closely associated with the project of compensating for the temporal and spatial variability of water resources. Contrarily to what we could have expected, it was not inspired by a conservationist vision of water resource but by the idea that the distribution of water in time and space could be corrected providing sufficient financial and technical means were invested (Fernandez 2009, 241).¹⁵

Not only did DWA pioneer the reflection on the ecological reserve, it also stimulated the development of scientific research in South Africa, contributing to the emergence of the new applied discipline of hydro-ecology that is

booming nowadays in South Africa. Already back in the 1970s, DWA ex-Deputy Director of the Directorate for Strategic Planning served in committees on Cape estuaries EFR research funded by National Scientific Research Agency. Until the 1990s, South Africa aquatic scientists could not answer the request emanating from the DWA regarding ‘how much water does the environment need?’.¹⁶ Although for this scientific community,

[environmental flow] was not a new idea. Every river biologist would know that you need water for the environment. It is in the mind of every scientist working with rivers [but still, what was new was the] idea that you can actually manage a system in such a way that you can provide it with at least some of the water that it needs.[. . .] We were inspired by DWA to feel that it was possible to do so.¹⁷

The Kruger National Park Rivers Research Programme (KNPRRP)¹⁸ was started in 1987 during a workshop convened by DWA. It remains noteworthy because of its influence both nationally and internationally for the development of a South African EFR assessment method. This research had been funded through the first national research programme on EFR (Cambrey 2010, 31) between 1986 and 1989 from the South African Foundation for Research Development (Ferrar 1989) as well as through DWA funding.¹⁹ In the late 1980s, DWA officials commissioned two South African aquatic scientists to carry out an international review of assessment methods, as no South African EFR method was yet available. Aquatic scientists were also brought in by the DWA as consultants in several water development projects the DWA was busy with. During these exercises in the 1990s, they continued developing their approach of EFR assessment.

Hydro-ecologists’ ‘coup’ during the adoption of the NWA (1998): issue framing and concept re-definition²⁰

Tracing back the genealogy of the concept of ‘ecological reserve’ in South Africa has revealed the instrumental role of DWA civil engineers in initiating the reserve in the 1970s. This pioneering role might have appeared surprising at first. Yet, a careful scrutiny of the early definition of the reserve showed to what extent the way the concept was conceived at that time could fit the mindset of civil engineers. In the 1970s as well as in the 1980s and early 1990s, the reserve was not permeated with an ecological logic and EFR was not perceived by DWA engineers to run against their hydraulic mission (Molle, Mollinga, and Wester 2009). Conceived in a typical planning approach, EFR could be perfectly accommodated by the then on-going policy of dam constructions, which, far from decreasing when the DWA started thinking about EFR, actually reached a climax across the country in the 1970s. Hence the collaboration between scientists commissioned by the DWA and DWA engineers did not lead to a decommissioning of dams nor even to a slowing down in the pace of dam-building projects.²¹ Instead they recommended and presented scenarios of water releases from the dam in a bid to compensate the detrimental environmental impacts of river regulation, channeling and taming. In summary, back at that time environmental flows were

engineered and made perfectly compatible with civil engineers' axiology and work agenda.

Yet, the philosophy of EFR evolved tremendously after the concept was passed in the National Water Law of 1998. Today the rationale behind the concept is so different from the one carried out by its initiators in the DWA that some water experts talk about the ecological reserve having been 'hijacked'²² by the aquatic scientists in South Africa. At no point did DWA civil engineers or DWA officials that scientists could take control of the concept foresee it

People [at DWA] did not realise the implications of the Reserve, even at the time of the promulgation of the National Water Act. Better estimates of the Reserve only came later on. It was a principle, initially, not yet a calculus. [DWA officials] thought they could live with an 11%, but with 20% or more, it had other, political implications'. (Interview with ex-DWA Deputy Director, December, 2010)

De Coning and Sherwill (2004) mentioned the opening of a window of opportunity in the mid-1990s in discussions over the Water Reform Act. In the period immediately after the Founding Elections in 1994 this window of opportunity would have allowed a fundamental change, irrespective of the policy sector at stake. Indeed, this possibility to effect substantial change, thanks to the new political dispensation, was not only applicable to the water sector but to other policy sectors as well.²³ To account for the new influence of hydro-ecologists over the meaning and substance of the ecological reserve, we would like to provide two sets of alternative explanations that are more specific to the water policy-making process. First, our explanation points at the role of a specific framing of the issue. Indeed, during the debate over the NWA's drafting, South African Society of Aquatic Scientists (SASAqS)²⁴ insisted on granting EFR a specific status: it could not be considered as a water user just like any other, the environment had to be viewed as a resource upon which all the other water users were dependent.²⁵ This process of convincing the DWA of such a specific status started a long time ago. Hydro-ecologist academics, conservationists and DWA officials have had the occasion to mingle several times in the past since the start of the KNPRRP and the 'Kruger Park river trips' in the mid-1980s. This triggered a social learning process between these actors that would be very instrumental during the discussion over the new Water Act. More importantly, during the consultative process of NWA, the SASAqS made strategic use of the linkages between the human and the ecological reserve. Considering its developmental inspiration, the human component of the reserve is what could more definitively have convinced the new DWA Minister, Kader Asmal²⁶ that the reserve needed to be elevated to the rank of a *right* within the NWA, a right that takes precedence over any other use. Being associated with the reserve for daily human needs, the ecological reserve could benefit from the same priority status.

This issue framing would prove critical later on because it tied together two separate policy-making processes—one about EFR determination and one on water use licensing process. Indeed, if the (ecological and human) reserve was the only water right, and all the other water uses were subject to authorization, no

new water licenses could be issued in whatever stretch of a river without first determining and providing for the reserve. It meant that the time pace for implementing the reserve had been tremendously hurried. Taken as a separate piece of legislation, fine-tuning methods for EFR assessment could have stagnated for many years and been finally left aside, but now strategic economic sectors in South Africa (commercial agriculture applicants, electricity producers, etc.) needed EFR to be determined as soon as possible before getting their water licenses. Combined with the particular context of regime transition and of a strong restructuring process within the DWA²⁷ which would durably disorganize the DWA, this explains how all these factors put aquatic scientists in an advantageous position to sway the way the ecological reserve would be (re-)defined in a more eco-centric way.²⁸ According to the law, only DWA officials could decide at which ecological class the reserve would be managed,²⁹ but they relied on scenario-based EFR methods to be able to do so. However, the scientists could not yet provide these scenario-based EFR methods to DWA officials. Therefore, in actuality, scientists have been determining the reserve, not the DWA and they have done so with the bias that we could expect from river ecologists, that is, a far-reaching eco-centric approach.³⁰

The second set of explanation for the scientists' re-appropriation of the EFR definition relates to their 'bluff' around the readiness of their assessment methods and the capacity of the aquatic community to determine an ecological reserve. Indeed, during the drafting period of the NWA, the ability of South African scientists to convince policy-makers that they could determine the reserve through validated assessment methods was critical (King and Pienaar 2011). The blessing that South African scientists received at the international level was an important argument in front of DWA elites for convincing the DWA of the readiness of their assessment methods. A scientific recognition at the international level was also important in the sense that EFR determination methods had to be scientifically defensible in a court of law, given the expectation that some existing water users may challenge the quantification of the reserve if it was likely to impact on their current water uses. We explore this explanation a bit further in the next section, in which we highlight how South African scientists made use of the international level to consolidate their influence over EFR at the national level.

A self-reinforcing process between the international recognition of EFR and scientists' power consolidation at the domestic level in the mid-1990s

In this section, we examine how the new international credit that South African scientists received over time had an impact on policy-makers' willingness to delegate to scientists crucial EFR determination tasks that would eventually change the face of EFR in South Africa. We build on Cabane's works on the institutionalization of disaster studies in South Africa. Cabane (2013) shows that the institutionalization of disaster studies into a scientific discipline *produced* the transnationalization of the field of risks and disaster management as much as

it simply built on the transnationalization of the field of risks and disaster management. This happens through a back and forth process that reveals the mutual influence between the domestic consolidation of an academic discipline and the emergence of international/transnational arenas dealing with disaster management. Her hypothesis about interactions between domestic and international processes is worth pursuing and applying in our case as she emphasizes the role of scientific experts not only as *intermediaries* of norm transfer between international organizations or fora and the local environment, but as the actual *producers* of knowledge, narratives and norms for both the domestic and the international arenas. Therefore, in the following sections we depict on the one hand how particular elements within the hydro-ecology community in South Africa made use of the international level³¹ as a resource to foster their position in the domestic arena. On the other hand, we show how the international level is not a pre-existing resource that the scientific community has seized but rather that this scientific community contributed to the construction of this international arena and norms.

The international level: a resource 'already there' or an opportunity created?

International collaboration started for South African scientists as a result of the participation at an international conference of limnology in Munich in the late 1980s, which put individual Australian and South African academics in contact. This was followed by a visit of the Director of the Water Resources Directorate in the DWA to Australian academic institutions working on environmental flows in 1990. Soon a study tour of South African scientists to Australia was funded in 1991 through the South African Water Research Commission's research funds. The two countries share some common physical conditions, that is, a similar semi-arid climate and similar river flow regime, which are found to be amongst the most variable in the world.

This study tour initiated a sustained collaboration between South Africa and Australia for the next 10 years, with several back and forth visits from both sides. Following it, leading South African hydro-ecologists were quick to show the policy-makers that their EFR assessment methods had already been validated by the international community, with the first application of their method outside South Africa being attempted on the Logan River in Australia in 1996. Actually, the trial would be short lived as the Australians decided that the method was not best suited for the country; especially the lack of a scenario-based method was a major shortcoming for Australian policy-makers. Nevertheless, this helped South African scientists impose their own approach of the ecological reserve at home through a claim that foreign countries had already adopted their methods (King and Pienaar 2011). They claimed the same with their collaboration with Lesotho. One of the leading South African hydro-ecologists wrote later on:

International use of the South African flow assessment methods by local scientists began with a DWA-funded [EFR assessment method] application on the Senqu River in Lesotho

in 1995, and followed with a World Bank-funded application of the developing [...] methodology on the Senqu-Orange [River] system in 1997/8'.³² (King and Pienaar 2011, 162)

To reinforce their position at home during the negotiation of the Water Reform Act, South African hydro-ecologists sought to make an opportunistic use out of this fuzzy international reference. Indeed, back in the mid-1990s, the international arena was still at that stage part of the bluff strategy that South African hydro-ecologists used to convince decision-makers that their EFR assessment method was ready to use and already validated by their peers at the international level. In the next section, we examine the elements that helped in building this international level in the realm of EFR.

Drivers of EFR institutionalization at the international level: epistemic community and international organizations

In the following sections, first we depict the attempt by a group of scientists to foster the internationalization of the EFR concept, then we turn to the role of international organizations in this attempt at internationalizing the EFR concept.

An expert knowledge-driven institutionalization of EFR at the transnational level?
In 2007, some 750 scholars, practitioners and policy-makers met at the 10th International River Symposium and International Environmental Flows Conference in Brisbane, Australia. Former collaborators of South African hydro-ecologists at the University of Griffith convened the Conference. Their Brisbane Declaration called attention to the need for dramatic shifts in the rules, norms and decision-making procedures of global water governance. Among these, the declaration called for a deeper integration of environmental flow assessments into land-use and water management practices (Blaney 2011, 2).

Over time, this declaration has proved important for the reason that it marks the first international attempt to articulate a coherent assessment of and prescriptions for the global challenge of environmental flows. Since then, a growing worldwide partnership consisting of environmental NGOs (The Nature Conservancy—TNC; the World Conservation Union—IUCN, among others), academic and research institutions (Delft Hydraulics; DHI Water and Environment; the Centre for Ecology and Hydrology—CEH; the International Water Management Institute—IWMI, among others), policy think tanks (Stockholm International Water Institute—SIWI; Swedish Water House) or development aid agencies (the Global Water for Sustainability Program—GLOWS, funded by USAID) have created the Global Environmental Flows Network. South African EFR scholars are very active in some of these organizations, therefore ensuring the dissemination of the EFR concept in the global arena and also ensuring the diffusion of a narrative about South Africa's pioneering role in EFR's determination methods worldwide. In particular, the Natur Conservancy, and later the IWMI employed a former doctoral student of one of the leading South African hydro-ecologists.³³

Some scientists have claimed that the Brisbane Declaration was the product of an aquatic science community,³⁴ but it is still too early to determine whether or not

we are witnessing the transnationalization of the EFR concept through the emergence of an epistemic community in the sense that Haas (1989) gave to the concept. So far, another actor appears to have been more instrumental in securing a growing internationalization of the concept is the World Bank.

The World Bank as a crucial driver of EFR institutionalization at the international level. In the 1990s, the World Bank developed a new concern about the downstream impacts of dams:

... until the mid-1990s, [World] Bank support for environmental and social work was heavily focused on evaluating and addressing the upstream impacts of dams. By the mid-1990s, these assessments had expanded to include downstream environmental and social issues with about equal frequency, underscoring the evolving concern about downstream impacts. (World Bank 2009, 4)

This new interest was triggered by major protests against massive dam buildings funded by the World Bank in Sri Lanka, India and Africa.³⁵ The anti-dams international NGO International Rivers and local social movements with which International Rivers built alliances led these protests. In a bid to continue funding such massive water developments, the World Bank had to tackle the issue differently and address the concerns of these international and local movement protests. It was mainly the social impact of dams for downstream populations (rather than the environmental impact) that retained World Bank's attention.³⁶ This led to the initiative of the 1998 World Commission on Dams (WCD).

The 2000 World Commission on Dams' report

Born in February 1998, out of a workshop sponsored by the IUCN non-governmental organization and the World Bank in April 1997 in Gland (Switzerland), the WCD was initiated as a result of heightened conflicts in the 1980s and 1990s largely due to the social and environmental impacts of dams. Under the chairmanship of Kader Asmal, then Minister of Water Affairs in South Africa, WCD's objective was to review the development effectiveness of large dams and develop criteria for the planning, monitoring and decommissioning of dams. It gave birth to a report published in 2000 in which one of the seven key principles and actions that the commission proposed all actors should adopt and implement was 'releasing tailor-made environmental flows [that] can help maintain downstream ecosystem and the communities that depend on it' (WCD 2000, xxxvi). Although the WCD's recommendations are not legally binding, the World Bank voluntarily embraced them in a bid for it to resume its activity of dam funding.

Katz emphasizes the fact that the WCD published a thematic report on methods for measuring environmental flow needs, bringing international attention to the issue (2006, p. 30). The WCD recommendations especially regarding environmental flows encouraged the World Bank to recognize that efforts were needed to 'build the Bank's in-house capacity in [environmental flow assessment] by broadening the pool of ecologists, social scientists, and environmental and

water specialists trained in [it]' (World Bank 2009, 7). In that respect, following Cabane (2013), we can see how international organizations have not only relied on pre-existing scientific knowledge but also ensured the very development and dissemination of that scientific knowledge too. Goldman (2007, 18–20) also emphasized the role of expert knowledge in the new development regime of the World Bank revolving around what he calls green neoliberalism, showing how World Bank needs experts to legitimize its action. In our case, the World Bank promoted scientific expertise around EFR for the reason that it had to train its global team of project managers both in the developing countries where it was funding water development projects and within its own organization as the World Bank had to comply with new policy guidelines in the 2000s. In the case of South Africa, let us add that the World Bank already contributed to the development of scientific expertise and hydro-ecologists empowerment through the LHWP in the mid-1990s.

The Lesotho Highland Water Project and the early development of EFR international expertise for South African hydro-ecologists

A fully integrative environmental flow assessment methodology combining environmental, social and economic factors in assessing the impacts of different flow scenarios was developed and applied during the Lesotho Highland Water Project (LHWP) by leading South African hydro-ecologist consultants. The World Bank underlines that:

The Bank's support for the Lesotho Highlands Water Project has contributed to the development of a [South African] method [of environmental flow assessment . . .] which systematically addresses the downstream biophysical and socio-economic impacts [. . . that later on, the World Bank described as] pioneering work on the Lesotho Highlands Water Project, and its growing influence in introducing environmental flows into government water policies. (World Bank 2009, 6–7)

Following that collaboration on the Lesotho Highland project, one of the leading South African aquatic scientists, would serve as member and then team leader of the World Bank–Netherlands Water Partnership Programme on Environmental Flows from 1999 to 2002 (King and Pienaar 2011, 165). Today the World Bank seems to have endorsed this initiative on environmental flows, as its 2009 report suggests, its specific objectives include to:

Develop an analytical framework to support more effective integration of environmental flow considerations for informing and guiding (a) the planning, design, and operations decision making of water resources infrastructure projects; (b) the legal, policy, institutional, and capacity development related to environmental flows; and (c) restoration programs; Provide recommendations for improvements in technical guidance to better incorporate environmental flow considerations into the preparation and implementation of lending operations. (2009, 3)

The World Bank (2009, 4) also recognizes that now 'Environmental Flows Assessments are an intrinsic part of integrated water resources management'.

Complex interdependence between actors and levels in the mid-1990s

Here, we would like to emphasize that the potential South–North transfer identified has more to do with a favourable set of circumstances than it has to do with the efforts of an epistemic community successfully setting an international agenda for EFR. Indeed, although we have underlined the role of scientific actors, it would be difficult to talk about an epistemic community gathering around the promotion of EFR as this loose EFR scientific network lacks most of the basic characteristics of what constitutes an epistemic community according to Haas (1989). Actually, for the most part, the promotion of the EFR concept relies on career opportunities as perceived by specific South African scientists. The strategy used by these actors and the self-reinforcing process between the international investment of these actors and the domestic consolidation of their power resemble very much the strategy described by Dezalay (2004, 11), talking about globalization elites and *courtiers de l'international* ('international brokers') playing on the interdependence of the national and international levels as far as their career is concerned. In our case too, we observed something very similar to what Dezalay depicts: navigating between policy levels, these elites invest at the international level in a bid to reinforce their positions in the domestic arena and at the same time rely on their domestic reputation to increase their influence at the international level. This underlines how much these actors now build their resources and skills not only at the domestic level but at the international one too and especially at the nexus between the two levels (Hassenteufel 2005; Massardier and Sabourin 2013), demonstrating that levels of action cannot be analysed separately from one another.

In that respect, we subscribe to the statement about what has been depicted by Keohane and Nye (1998) as a complex interdependence and intertwined dynamics between national and international levels, between governmental and non-governmental actors as well as between the transnational society and inter-governmental organizations. Above we have evoked how national and international arenas are tightly connected through the work of scientific networks, but it is also true that the very existence of such scientific networks has relied on DWA vision. Indeed, at first, scientific expertise around EFR was initiated by the DWA even though the involvement of South African researchers in EFR and what they would eventually make out of it escaped the control of DWA at a certain point in time in the mid-1990s. It was also the DWA that started the international collaboration between South African and Australian aquatic scientists. Yet later on, South African hydro-ecologists managed to make use of this emerging international collaboration and recognition to foster their ability to sway the direction that EFR was taking at home. Finally, we have exposed a complex interdependence between the transnational society and inter-governmental organizations to build the international arena around EFR through the relationship between South African hydro-ecologists and the World Bank. Indeed, following Cabane (2013), we showed that the development of South African hydro-ecologists' expertise and their empowerment at the national level helped build the

international arena around EFR as the World Bank, principal actor in the dissemination of the concept worldwide, relied on their expertise (and later on also promoted their expertise) to consolidate the institutionalization of the EFR field at the international level. These hydro-ecologists were thus not mere mediators, translators or brokers between international and national levels. Actually, they actively contributed to the constitution of both these international and national EFR arenas. In addition, we showed how much the institutionalization of EFR at the international level also benefited from an alignment of quite different agendas coming from various organizations, the World Bank especially supporting the concept for different reasons than international NGOs (IUCN, TNC, etc.), which also promoted the concept together with EFR scientific networks.

Conclusion

The objective of this paper was to trace the coming of age of the concept of ecological reserve from the pioneering role held by the South Africa DWA and its civil engineers in the 1970–1980s to the renewed influence of the scientific community starting the mid-1990s. More precisely, the ambition was to explain how it was possible for South African hydro-ecologists to redefine the understanding of the concept in the run-up to the drafting of the new Water Act from the mid-1990s onwards. Not satisfied with the explanation in terms of window of opportunity that the change of regime would have provided for substantial change to occur, we explored two alternative sets of explanation to account for this renewed role played by hydro-ecologists. First, we emphasized the benefits derived from a specific issue framing within the water reform's policy-making process. Second, we evoked the legitimating effect that the international recognition of South African EFR methods provided for South African hydro-ecologists. Although we showed that these scientists tried to make use of the EFR international arena to consolidate their position at the domestic level, we also underlined the fact that this international arena was not pre-existing aquatic scientists' attempt at using it as a useful resource at home during the debate on water reform. Finally, we reflected on the ability of these scientific actors to build their resources at the articulation between national and international policy levels and on complex interdependence between various actors and policy levels which ultimately benefited the travelling concept of 'ecological reserve'.

Notes

1. For the rest of the paper we will either use the term 'ecological reserve' or EFR, which is a term by which the concept is best known worldwide.
2. It is undeniable that the ecological reserve adds important financial costs for the DWA, which has to implement it, together with water access for all.

3. Personal communication with International Rivers Executive Director, Pretoria, March 2013; Phone interview with a leading international hydro-ecologist, Centre for Ecology and Hydrology, Wallingford, December 2010.
4. Phone interview with a leading international hydro-ecologist, Centre for Ecology and Hydrology, Wallingford, December 2010.
5. Interview with an aquatic scientist, Cape Town, August 2010.
6. We speak about an 'unlikely alliance' because of the fact that a priori river ecologists are not prone to welcome the work of civil engineers whose task is to build water infrastructures that most of the time irremediably modify the ecological condition of a river ecosystem.
7. Smith (2013) advocates cross-fertilization between the literature in public policy analysis and the literature in international relations in a bid to study the internationalization of public policies.
8. The 1994 Agreement of the COAG on Water Reform committed the state governments to a clear timetable for developing water resource plans that would cater for environmental flows.
9. Interview with a water expert, Australian National University, Canberra, June 2013.
10. Personal communication with International Rivers Executive Director, Pretoria, March 2013.
11. Interview with a leading aquatic scientist, professor of freshwater ecology, Cape Town, August 2010.
12. Interview with ex-DWA Deputy Director, December 2010.
13. Interview, Pretoria, 1 December 2010. In his address at the congress of the Limnological Society of South Africa (which later became the SASAQs) held in Grahamstown in May 1980, he had already mentioned this international context, with ICOLD's emerging discussion over environmental issues following environmental impact assessment laws passed in several ICOLD country members.
14. The flow releases from the dam that some of the scientists proposed to maintain ecosystem services delivery to people can arguably be seen as having an environmental justice's objective. But it is also worth mentioning that despite being one of the very first ones to be determined, the Pongolapoort dam ecological reserve has hardly ever been implemented. The same can be said of the rest of the reserves determined in the country later on. Until today, the ecological reserve exists mainly on paper.
15. The author also shows that the reservoir construction did not stop with the implementation of minimum flow requirement; on the contrary, it acquired a new utility: allowing low flows to be sustained for the sake of the environment.
16. Not used to providing hydrometric information, scientists were not ready to provide even one figure to DWA and have been even mocked for their approximate answer that the required flow should be 'about the level of a foot ankle' (Cambray 2010).
17. Interview with a leading aquatic scientist, professor of freshwater ecology, Cape Town, August 2010.
18. This programme gathered water resources managers, funding agencies and aquatic scientists.
19. Interview with one of the leading Australian hydro-ecologists, professor of freshwater ecology, Brisbane, June 2013.
20. It is important to say that the word 'coup' is only used to emphasize the radical change underwent by the concept of EFR during the adoption of the NWA. This should be understood neither as a pejorative characterization nor as a normative judgment over hydro-ecologists' role.
21. It was in the 1980s that the biggest dam construction project, the LHWP, was adopted.
22. Interview with an aquatic scientist, Pretoria, 2011. Again, this term is not used in a pejorative sense but to underline the complete 'overturn' in the meaning of the concept that hydro-ecologists managed to achieve in the run-up to the drafting of the new Water Act.
23. This explanation in terms of 'window of opportunity' was also endorsed later on by Biggs, Breen, and Palmer (2008).
24. The ex-Limnology Society of South Africa.
25. Interview with ex-SASAQs representative in the NWA experts' panel, professor of aquatic science, Grahamstown, November 2010.
26. A human rights narrative had more prospects than an 'environmental' rights narrative in a post-apartheid and transformation context (interview with a leading aquatic scientist, professor of freshwater ecology, Cape Town, August 2010).
27. With a lot of former white elites leaving the Department after the end of the apartheid regime, replaced by political cadre deployment from the new ruling ANC party.
28. For more details about this re-direction of the concept of Ecological Reserve, see Bourblanc (2013).
29. Basically, whether the environmental flow provided will cater for near natural conditions, or an overall good ecological status, or slightly degraded conditions, etc.
30. For more details about this process, see Bourblanc (2013).
31. Either through their participation to international projects or through their involvement in international experts' networks.

32. We will go back to the critical involvement of South African hydro-ecologists in the LHWP in the following section.
33. Not surprisingly, this common perception about South Africa EFR success story has been publicized by environmental NGOs such as The Natural Conservancy (see Brian Richter's writings in particular) and by International Rivers (interview, Pretoria, March 2013).
34. Interview with one of the leading Australian hydro-ecologists, professor of freshwater ecology, Brisbane, June 2013.
35. Interview with ex-World Bank official in charge of EFR, Canberra, June 2013.
36. Interview with ex-World Bank official in charge of EFR, Canberra, June 2013.

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