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Continuity or Change in the Infrastructure Turn?: Reform of the technicians' realm in a World Bank Dam

_Abstract (147 Words)

Development in Africa is undergoing an infrastructure turn, no more so than in resurgent dam building. But how are new projects planned and constructed? Are we seeing repetition of much maligned practices that underestimated economic, environmental and social costs, or have past critiques changed infrastructure building in the 21st century? Using the concept of the technician's realm that describes short-sighted and expert-centric 20th century practices of dam building, this article analyses the incorporation of reformist ideas about knowledge production, mitigation and compensation. It uses a detailed case study of the Rusumo Dam, and examines the decision-making processes of the World Bank and a new dam-building organisation, Nelsap. Significantly, this case involved a marked design revision to reduce impact, but also top-down and depoliticising impact assessment and policymaking. It therefore demonstrates nuanced change in the infrastructure turn, the incorporation of reform and continued relevance of past critiques.

Key Words: Dam Resurgence, World Bank, Reform, Development, Infrastructure, Impact Assessment, Rusumo Falls Dam, Nelsap, Hydropower

INTRODUCTION

Particularly in Africa, development has taken an infrastructure turn (Nugent, 2018). Partly inspired by their economic transformation, governments in Africa are turning to the emerging powers, and particularly China, to finance and build ambitious development projects.

Equally, as Mawdsley's (2018) analysis of the UK's Department for International Development shows, traditional development organisations are also increasingly focused on infrastructure and industrial policy. She particularly demonstrates attention shifting from smaller poverty-reduction development projects towards economic growth targets; something reflected in the Millennium Development Goals (MDGs) as oppose to the economic infrastructure elements of the Sustainable Development Goals (SDGs). This trend in infrastructure construction and the principles of development harks back to the dominant development ideas of the mid twentieth century; of strong state-led intervention that aimed to deliver economic growth through large-scale projects, especially in agriculture, energy and transport infrastructure. But with this apparent trend towards building large-scale infrastructures, is this new trend of infrastructure construction replicating critiqued past practices? How are 'traditional' development actors like the World Bank operating in this new infrastructure turn?

This article studies such questions through perhaps the premier infrastructure project, large hydropower dams. More than other infrastructure, dams' size and grandeur suggests the arrival of modernity and the promise of development, whilst their sophisticated engineering necessarily gives a prominent role to experts. Dam building has closely followed trends in international development. Post-World War Two, developing countries led an infrastructure boom which rapidly declined from the 1980s. From roughly the mid-1990s to the mid-2000s very few dams were constructed, particularly in Africa. Concerns about the severity of social and environmental impacts drove this near-cessation in construction, as did questions over

Figure 1 World Bank Group Lending for Hydropower Development, Fiscal Years 1991-2014 (Source: Rex et al., 2014, p3)

dams' economic effectiveness, with studies indicating the underperformance of dams' hydropower generation and irrigation supply. However, despite essentially no change in technology, dam construction has returned (Zarfl *et al.*, 2015). The World Bank is an important actor initiating these policy changes. Having been perhaps the key funder of dams from the 1960s, the World Bank started to withdraw in the 1980s (McCully, 2001, p. xvi). This is symbolised by retreats from notable projects like India's Narmada Dam (Goldman, 2005) and is further demonstrated by the dramatic fall in dam funding to 0 loan approvals in 1999, shown in figure 1. However, this trajectory reversed. Following policy statements supporting hydropower construction in 2003, 2009 and 2013, dam finance increased. Thus, particularly amongst so-called traditional donor organisations, is there change in dam building's return? To what extent is the apparent 'infrastructure turn' replicating the past or have critiques translated into the adoption of reform?

This article studies these questions using an in-depth case study of the World Bank financed Rusumo Falls Hydropower Project (hereafter Rusumo Dam) on the Rwanda-Tanzania border. It is financed by the World Bank and implemented by a new river basin authority, the Nile Equatorial Lakes Subsidiary Action Programme (hereon Nelsap); an agency of the Nile Basin Initiative. The dam started construction at the end of 2016 after a decade of study, local engagement and compensation schemes. Usefully, Rusumo Falls Dam consequently allows a rare study of what in the author's judgement appears to be 'best practice' in the infrastructure

turn. Moreover, the case fills a gap in detailed empirical studies of this infrastructure-resurgence era, particularly by the World Bank where the existing literature tends to be primarily critical (Baird *et al.*, 2015; Goldman, 2005; Moore *et al.*, 2010). Nelsap's role adds further importance. It is a new type of river basin authority, one originally initiated by the World Bank alongside other donors in 1999 to embrace 'good governance' and 'best practice' ideas around international water management, but also to unlock infrastructure projects. The Rusumo Dam is the first infrastructure project constructed by this new institution. Overall then, this case study constitutes a particularly good opportunity to ground examination of new and returned infrastructure actors and consider changes in this era's practices.

The article proceeds by explaining the concept of the *technician's realm*, an analytical device that describes the policy practices of past-era river basins and therefore allows assessment of changes to implementation practices. It then turns to the case of Rusumo Dam, assessing its design, knowledge production and mitigation. Broadly, this project demonstrates that change has occurred: there are new ambitions to reduce the negative impacts of dams amongst relevant officials in the Bank and Nelsap. However, rather than wholesale change, this resurrected dam project involves many of the expert-centric, depoliticising practices of the *technician's realm*. Consequently, this pattern of continuity and change suggests that the incorporation of reformist ideas can matter, but rather than displacing pre-existing modes of 'doing development', they are merely added.

This article was founded on primary research carried out over two field trips in 2015-2016 that were part of a thesis and included 100 interviews with relevant officials from ministers to mid-ranking civil servants in Rwanda and Tanzania. In particular, interviews engaged with Nelsap, the energy utility companies, energy ministries and environmental assessors. In 2017, interviews were also carried out at the World Bank (see quoted interviews in appendix). This

method is most appropriate for investigating the complexities of decision-making processes and the values informing it. The methodology was also crucial in the context of authoritarian countries with limited public information. To triangulate data, planning and news reports relating to the project were analysed. Whilst the author has carried out research on wider dam-building and electricity-sector policy making in Rwanda and Tanzania, it does not feature strongly here because the governments handed authority to Nelsap and thereby played a lesser role in implementation. In addition, 52 local-level interviews with Rwandan and Tanzanian residents were conducted using a purposive sampling method that involved deliberately selecting interviewees to capture the gamut of wealth, poverty, geography, gender and age in the Rusumo valley. Interviews were typically between 30-40 minutes, often extending over an hour and are listed in the appendix. This provided an important dataset enabling verification and nuancing of official reports. To avoid the researcher's biases and limited contextual knowledge, inductive methods were used that involved participants leading guided field walks that explained livelihoods and changes to the affected landscape. Given these methods, data was analysed using an iterative process of rereading, sifting, sorting and triangulating, from which key experiences emerged.

DAMS AND THE ERAS OF DEVELOPMENT POLICY

Thinking about the best way to achieve development, and about the potential role of infrastructure in socio-economic progress, has shifted over time. In the simplified schema of Hart (2001), an important change occurred in the 1980s when neoliberal ideas replaced the state-centric modernisation ideology of the 1950s-1970s. The latter became dominant after World War Two, under the influence of Socialist and Keynesian thought. Modernisation development schemas prescribed a focus on the state and stressed its ability to change the economy and society (Leys, 1996; Rist, 2010). This involved economic ideas about the importance of rationalising economic activity 'from above', the creation of large projects and

the application of the latest scientific advances (Scott, 1998). Key theorists in this era (e.g. Lerner, 1958) were also focused on the need for social change, the importance of breaking so-called traditional ways of thinking and acting, which they blamed for creating supposedly backward, inefficient, unproductive agriculture and manufacturing. Policies therefore focused on the introduction of ‘modern’ technologies and ways of working. In agriculture, green revolution programmes sort to mechanise farming, increasing productivity through creating larger, rationalised, industrial farms the adoption of technologies from fertilisers to tractors. Another focus was on grand projects of industrialisation. The ideas and policies of this era were not homogenous: Rostow’s (1960) capitalist stages-of-development model aimed for a consumer society, an ambition which contrasts with the Marxist-inspired dependency theorists prescribing a bigger role for a protectionist state (Rist, 2010). Despite such variations, modernisation ideas frequently stressed the importance of infrastructure as a key ingredient to achieving such modernisation.

Dams and the *Technician’s Realm*

Modernisation ideas about development particularly influenced dam-building policies: the infrastructure could deliver electricity for industrialisation and urbanisation, and water for irrigation. Moreover, dam’s concrete monumentality had symbolic importance. Their size signifies the power of the government, their technological sophistication embodies images of modernity, as does their ability to rationalise rivers (Kaika, 2006). In line with beliefs about the state’s preeminent development role, the importance of science and ability of experts, this era involved a set of dam building practices that empowered technicians in river basin institutions. The exemplar dam building organisation inspiring such *technicians’ realms* was the Tennessee Valley Authority (TVA). It was designed to have a total mandate for valley transformation, changing the supposedly backward hillbillies of the mid-west to modern citizens through industrialisation underpinned by hydropower dams (Klingensmith, 2007).

This term, the *technicians' realm*, builds on Ellul's (1964) conceptualisation of '*technique*', defined as the practices that, through aiming to increase efficiency, render nature and society subservient to technology and the decisions of experts. In practise this involves a planning process that narrowly defines progress as involving concrete infrastructure and the implementation of technology, that sees efficiency as only applying to human-created environments and activities. This explicitly ignores the value of any pre-existing system and therefore overlooks trade-offs stemming from development projects. Byrne and Toly (2006) and Agbemabiese and Byrne (2005) apply Ellul's work to electricity and dam-building, analysing the primacy given to engineers in dam-project decision-making and the consequent exclusion of situated, local knowledge and of livelihood concerns. The empowering of experts to create knowledge and produce designs that exclusively focus on modern technology's implementation side-lines engagement with positively or negatively affected peoples whilst the exclusive appreciation of the built environment breeds degrees of short-sightedness to the trade-offs of a project: "Social consequences are relegated to the status of problems-to-be-solved" through rationally derived solutions (Byrne and Toly, 2006, p. 21). Such practices contrast with those who assert the political nature of infrastructure that negatively affects some whilst benefiting others. Crucially then, this concept involves the empowerment of a particular type of expertise, one whose worldview is relatively narrow and focused on concrete engineering. This is described by Li (2007) as *rendering technical*. She uses this to conceptualise anti-political processes whereby experts define problems and circumscribe their boundaries in such a way that their interventions becomes the solution, and particularly applies it to poverty reduction strategies whereby 'experts' focus on symptoms rather than the social processes causing poverty. The technician's realm builds on this work to describe a project's planning phase when knowledge about the local environment and impacts is produced and implementation methodology formed.

River Basin Organisations inspired by the Tennessee Valley Authority (TVA) best exemplify the *technician's realm* concept. Facsimiles include India's Damodar Valley Corporation (Klingensmith, 2007), this case study's Kagera Basin Organisation (KBO) and Ghana's Volta River Authority. Agbemabiese and Byrne (2005) argue that the latter's construction of Akosombo Dam embodies Ellul's concept of technique as engineers were tasked with discerning compensation, a process described as technological optimising that had little involvement from, or accountability to, displaced communities. Thus, empowering somewhat autonomous hydrocracies of technicians (Molle *et al.*, 2009, pp. 328–245) leads to a 'development-from-above' model and, as Klingensmith (2007) argues, scientific approaches to progress where local concerns or alternative development ideas are absent. Adams (1992, p. 106) echoes this critique, claiming that river basin planners often 'lack ... understanding of existing environments and their uses', particularly the complex political ecologies that underpin smallholder livelihoods. The *technician's realm* therefore describes the institutionalisation of hydrocracy principles that understand dams as inherently developmental and assert the necessity of practices empowering experts, depoliticising decision-making and excluding local communities and their situated knowledge from influencing a project's governance.

Of relevance to this past dam building era, and to the theorising of the *technician's realm*, is Scott's (1998) thesis of high modernism. In brief, he conceptualises the past development era as involving an ideology with two key tenants: Firstly a belief in the binary of backward traditional, smallholder-farming livelihoods against modern industrial ones, and relatedly, a conviction in the binary of scientific technical knowledge against what has been called indigenous knowledge; that is knowledge that is not derived from scientific methodologies or formally codified. As an ideology, high modernism prescribes total societal, economic and ecological transformation. Consequently, it requires a significant degree of ruthlessness,

uncompromising authoritarianism and a highly capable state, a standard which means that high modernist plans are rarely implemented in full. Moreover, it is important to treat high modernism as an ideology with specific idea-practices, not a panoptic analytical tool that homogenises all development efforts as negative. What Scott and others (e.g. Ferguson, 1994) usefully provide is an ideational conceptualisation of key policies in the past development era and the central assumptions behind these policy prescriptions.

Critiques of modernisation and the rise of neoliberalism

The 1980s started a shift away from such state-led, modernisation approaches to development (Leys, 1996). Reflecting a global political shift, the ‘Washington Consensus’ grew which preferenced a liberalised competitive market without trade barriers. This was premised on seeing the state in a more negative light, as the creator of market distortions and debilitating tax and regulation (Hart, 2001). Whilst institutions like the International Monetary Fund (IMF) and World Bank and their Structural Adjustment Programmes tended to push this agenda, Harrison (2001) also points out that developing countries’ politicians and civil servants frequently imbibed such ideas. With the emphasis on monetary and liberal economic policy, and a reduced state, traditional development donors shifted from financing infrastructure projects. The *small is beautiful* thesis (Schumacher, 1993) provided rationales for this, contrasting large-scale economic interventions (painted as ineffective and the cause for indebtedness) with more efficient and smaller-scale projects. A further ideational shift started in the 1990s as international development took a ‘social turn’ (inspired by Stiglitz (2002) and others). This orientated efforts towards a focus on poverty alleviation and goals in education, sanitation, health and the environment.

Dam-building policies reflected these critiques. Whilst the twentieth century is replete with examples of dams underpinning economic activity (e.g. the electricity of Kariba Dam for Zimbabwe and Zambia or Akosombo Dam’s for Ghana) evidence of the infrastructure’s costs

mounted. This included economic studies which demonstrated dams' frequently poor return on investment. For instance, Singh's database of Indian dams concludes that their economic costs have been far greater than their benefits (Singh, 2002). Moreover, dams' socio-ecological record is frequently underestimated. Dams have displaced significant numbers of people, conservatively estimated by Scudder (2012) to be 40 to 80 million. Scudder asserts the importance of this figure in light of his comprehensive database of dislocated people which demonstrates the slim chances of communities recovering their former economic and social levels. Such research shows the frequent inadequacy of compensation measures, even in cases of meaningful mitigation efforts. Dams also affect socio-ecological systems, meaning the biospheric functions that support ecologies and livelihoods. However, knowledge-production in dam assessments has frequently failed to appreciate such system-wide impacts. Adams (1992) finds practices in the 1980s focusing most on the direct, bounded impacts of reservoirs rather than those of the wider river system and particularly dams' downstream impacts. This overlooks the way the river can transmit nutrients and water that underpin farming, fauna and flora, particularly in basins with a marked seasonal pulse and dry-season recession agriculture along river banks.

As a result, in 1999, the economic, social and environmental record in dam building, and in order to resolve increasingly effective protests, pro and anti-dam actors instigated a science-policy interface aiming to chart more sustainable, less poverty-inducing dam-building practices. Called the World Commission on Dams (WCD), it brought together researchers, officials and activists, creating an evidenced-based set of reform measures that prescribed holistic assessment of the impacts of dams, more rigorous consideration of mitigation and a comprehensive set of compensation and benefit-sharing measures. At an official level, the WCD's recommendations haven't been adopted universally, for instance only influencing the World Bank's safeguarding protocols around dams (Scheumann and Hensengerth, 2014).

However, the WCD echoes broader shifts in international development which included a growing focus on poverty reduction and sustainable development following the 1984 Bruntland Report. However, in the latest context of the widespread return of large concrete infrastructure, and not least the increase in dams, to what extent have such initiatives entailed lasting change in development practices? Is this development-policy push towards economic growth, state led development and infrastructure replicating past practices of the *technician's realm*? Have reformist, poverty-alleviation ideas lasted? This article analyses these questions through the Rusumo Falls Dam.

NELSAP, THE WORLD BANK AND THE RUSUMO DAM

The Project's History and Implementer Nelsap

The Kagera Basin Organisation, an institution inspired by the TVA, first pursued Rusumo Dam. Despite numerous studies¹ it was unable to initiate construction and dissolved in 2001². However, a new and more effective organisation rose. The Nile Basin Initiative (NBI) was launched in 1999 with donor support particularly from the World Bank. The NBI quickly created two 'technical organisations (to do) ... developmental projects in ... (different) parts of the Nile'³, with the *Nile Equatorial Lakes* region grouped into one *Subsidiary Action Program*; Nelsap. As an early Nelsap leader explained, the organisation's 'mandate (was) to be a platform ... for the identification of projects and (their) preparation'⁴. Notably, this illustrates Nelsap's apparent purpose to aid hitherto-blocked cross-boundary initiatives, to implement development projects rather than instrumentalise a holistic framework of water governance or critical analysis of the water-energy nexus (such as that made by Verhoeven, 2015). This is further emphasised by institutional decision-making within Nelsap. The secretariat identifies projects in national governments' plans, assesses their technical engineering feasibility and attempts to forge cross-government agreement and funding

commitments. Whilst a ministerial level steering group makes final decisions, Nelsap predominantly empowers engineering expertise with a mandate to implement infrastructure projects.

Although discussion below also demonstrates Nelsap's embrace of dam-implementation reforms, Nelsap's premise suggests that in addition, the organisation has adopted policy elements, as well as projects, from past-era river basin authorities. Nelsap is partly premised on principles of technology and human-controlled rivers as progressive, overlooking the potential value of pre-existing bio-physical systems and their livelihood and environmental services. The politics of development, the trade-offs between a project's winners and losers, are therefore refuted by discernment of the 'right' development solution. However, ideational principles are not the only factor explaining the pursuit of infrastructure and Rusumo Dam. There are few dams globally which are built across national boundaries with Itaipu and the nearby Ruzizi II⁵, representing rarities. Rusumo thus provides an opportunity for Nelsap to prove itself. Interviewees reflected this. A current Nelsap leader asserted that Rusumo is 'exemplary and exciting' showing the 'success of delivering infrastructure' and how the political difficulties of 'international boundaries can be overcome' through its successful 'model'⁶. There is a desire for Rusumo and Nelsap 'being quoted as a transboundary project that works, an exemplar, where more than one country can work together'⁷. Indeed, Nelsap aims 'to found a centre of excellence'⁸ on the back of the project's success, with 'donors now very interested in this model' of 'River Basin Excellence'⁹. Therefore, materialist interests co-exist with more ideational factors in Nelsap's interest in Rusumo Dam¹⁰.

Rusumo Dam was, 'as a concept, presented and approved in 2001' by the Nelsap Ministerial Committee¹¹. A studying phase followed, with the World Bank showing their support financing a review of the Rusumo's existing documents. Rusumo reached final governmental approval in 2012 (Artelia, 2013a). This handed decision-making to Nelsap's technicians,

meaning that they took key political decisions about dam design, energy transmission and mitigation. In 2013, the World Bank, after some hesitancy, agreed to finance the dam, with the African Development Bank separately funding transmission lines. The article focuses on this planning period after national governments handed over decision-making authority. The World Bank played a key role, financing construction and influencing the project's parameters because of its stringent conditionalities. We now turn to analyse these conditionalities.

Reformed Practices in World Bank Finance?

As the most comprehensive effort to investigate dams' developmental potential in a balanced way, the World Commission on Dams' relatively critical finding that 20th-Century projects underestimated significant costs and overestimated benefits, carried weight. Whilst gaining less uptake amongst developing country governments, it did influence many 'traditional' development actors. Some donors withdrew from dams (e.g. the UK), whilst Germany adopted the WCD's report (Scheumann and Hensengerth, 2014). The World Bank took a more nuanced stance, accepting the report's principles, but not its policy recommendations. This is reportedly because the Bank felt the recommendations would constrain lending activity (Moore *et al.*, 2010). Rather, the Bank has instituted a safeguarding policy that requires a series of checks to avoid negative impacts and meet high compensation and mitigation standards (Goodland, 2010). Scheumann and Hensengerth (2014) suggest that these efforts have increased the standard of early-stage compensation, established Environmental and Social Impact Assessments (ESIAs) as the norm, and fostered practices of mitigation and specific local development schemes that aim to improve the livelihoods of affected households. This matches wider trends in the Bank during the 1990s and early 2000s that included adoption of at least the language of participation and a focus on supporting the poorest (Francis, 2001). Arguably, in accepting the need for reform, the World Bank

appeared to cement rejection of past modernist ideas about dams' inevitable, linear connection with development.

However, such policies are not incompatible with depoliticised, expert-centric practices. It is possible to treat the safeguards as technical steps which guarantee mitigated social and environmental injustices and 'clean', 'green' hydropower projects, rather than as a process of critical thinking that helps understand and address negative impacts. For instance, the World Energy Council (2015, p. 23) downplays the fundamental trade-offs entailed by dams: 'While some impacts are unavoidable, most can be minimised or mitigated and compensated for'. Indeed critiques of mainstream participatory approaches claim that such reforms do just that, incorporating new technical steps rather than challenging practices (Francis, 2001; Hickey and Mohan, 2004). The justifications for Rusumo indicate some persistence of high-modernist ideas. For instance, a lead official stated that it was 'technically, the best solution' for a 'very hydro rich' region¹². This language suggests that pursuing energy infrastructure is essentially scientifically derived; having a good engineering site and closing an electricity demand gap means Rusumo 'technically make sense'¹³. Moreover, officials described Nelsap's central role as positive because it also enables depoliticised project implementation: 'Nelsap a way of technically separating (politics) and delivering' the project¹⁴; 'Nelsap really good, process smooth ... political influence not that high'¹⁵. But is such discourse reflected in the project's practices? Starting with consideration of the project's geographic context, analysis proceeds to examine the presence of a *technician's realm* in processes of design, knowledge production and compensation, considering whether reforms have influenced infrastructure projects today.

IMPLEMENTING RUSUMO

The Rusumo Falls Dam

The Rusumo Falls Hydroelectric Power Project, as it is officially known, sits between the two border villages of Rusumo. These settlements, perched on spurs reaching out from hilly upland areas into a flat valley, are separated by a majestic waterfall that thunders reddish water over a 40-metre drop, creating rainbows and a permanent spray forest inhabited by a troop of monkeys. Behind the falls a vast, seasonally-covered marshland sits in the large flat-bottomed valley. Each distinctive border town is on a main national road and orientated to the business of border trade and long-distance lorries carrying goods from Dar-es-Salaam. Upstream however, agriculture predominates, and a regional culture is evident, with families and a local dialect crossing national borders. The agricultural land in the valley, whilst

Figure 2. A Collection of Images of Rusumo Falls and the Kagera Valley: (from top left to right) Rusumo Falls; The two Rusumo Villages on each side of the river; The Kagera river above the falls (also showing water collection points); The upstream marshland

contesting with wild animals, is rich with seasonally renewed irrigation and fertile sediment. The valley floor's dark soil and dense flora contrasts with the dry, sparse upland framing it.

The US \$340 million dam will sit on top of the falls, taking advantage of their height to divert water through a tunnel and 80MW of electricity-generation capacity. This represents a comparatively good cost/return ratio compared with the under-construction \$2.2bn 600MW Karuma Falls (Uganda) and is similar to the 27MW \$112 Nyabarongo Dam. National transmission lines will transport this power across the region to Rwanda, Tanzania and Burundi¹⁶. Once completed, a relatively shallow reservoir will cover 977ha (Artelia, 2013a), displacing homes, fields and permanently flooding seasonal marsh areas. However, the project was not always planned at this size, with initial designs envisaging something far larger.

Pre-emptively following the World Bank's standards, given its early indication of support, consultants completed extensive studies from 2008. Initial engineering, economic feasibility and ESIA reports were finished in 2011. The latter indicated displacement of 17,450 households under a Full Development Scheme. In September 2011, pushed particularly by the Bank¹⁷, a 90MW Intermediate Development Scheme (IDS, see figure 3) was examined. However, its ESIA still showed displacement of 9000 households. Consequently, Nelsap and civil servants chose a third run-of-river design without reservoir storage capacity. Although this entailed lowering the dam by 5 meters, and its generation capacity to 80MW, it reduced the number of households affected to 685, under a 10th of the IDS scheme. These reductions are therefore significant: The decision demonstrates reactivity to historical experience, recognising that hydropower technology does have negative impacts and acts to significantly reduce them.

Figure 3 Map of Project Area, also Showing Impact from Full, Intermediate and Run-of-River Schemes (from left to right, with RoR speckled).
Source: Artelia 2013

Whilst this could illustrate a political trade-off and the outcome of holistic thinking including affected communities, interviewed national civil servants depicted the revisions as a purely technical exercise. Similarly, a World Bank official described ‘technical people (who find) a technical solution’¹⁸, and an involved Rwandan civil servant stated that relevant technical officials ‘finally agreed on optimum size (through exclusively rational deliberation)’¹⁹. These quotes imply that Rusumo Dam’s design revision was discerned by science and was therefore uncontroversial. This contrasts with the decision’s apparent premise that (echoing the WCD) dams entail sufficiently negative impacts that it is worth reducing hydropower production. Nevertheless, this episode does demonstrate significant consideration of negative impacts during Nelsap and the World Bank’s planning. The author knows of no comparable revision to avoid negative impacts in the past 20th century dam-building era. Therefore, whilst decision-makers seemingly understood Rusumo’s design reduction as a process of optimising to be undertaken by technicians, such practices have some significant differences with those critiqued in the past.

Producing Knowledge About the Valley

The ESIA process involved an extensive social and environmental baseline study. Whilst detailed and seemingly accurate in discreetly understanding households’ activities, the ESIA misses the connections and flows between biophysical systems and livelihoods. As indicated above, the valley has two distinct economies; one based around trade along the main road and another on the river and land, especially the fertile valley floor area and land that is regularly flooded. However, these two economies are in-fact intimately connected, with many people engaging in both and the river providing drinking water, fish and fertile, irrigated agricultural land.

Figure 4 Farmland adjacent to the Rusumo villages: This image highlights the richer valley-floor land compared to drier, uphill land, and the different agricultural uses of each.

The fertility of land on the valley floor is currently fundamental to the volume and the variety of crop production, as surrounding dry hill land provides no equivalent conditions. For instance, in the isolated Kabuye Village, a strip of annually-flooded land was used to grow income-generating Tobacco and will now be permanently flooded. A new, narrower strip is likely to be intermittently flooded through the reservoir's rise and fall. Theoretically, the smaller strip could have similar properties to the lost land²⁰. However, reports and interviewees had not considered this and regardless, reservoir levels would be subject to the logics of the Rusumo Power Company whose mandate concerns electricity generation and demand, reducing predictability for farmers. In interviews, up-river residents also expressed concern about the reservoir increasing habitat for hippos and monkeys which plague farmers and fishermen. The ESIA fails to mention these potential social implications and concerns.

Consequently, much of the valley's interrelated ecology and livelihood system does not appear in the ESIA. Documents record discreet facts of what is farmed, but not of how that connects to the river's hydraulic regime and how Rusumo Dam will change this biophysical system in the future. Similarly, it does not describe the gamut of connections outlined in the

project-introduction above, between the river and valley farmers and villages. By narrowly defining ‘project affected people’ (PAPs) as those with directly displaced assets or jobs, the ESIA overlooks the valley’s wider socio-ecology, precluding more fundamental questioning of the dam. This finding echoes Adams’ (1992) writings about disconnect and narrowness in past EIAs, thereby suggesting continuity and reform within the *technician’s realm*. Whilst the decision to down-scale shows a responsiveness absent in other dam cases discussed above, outside experts and their agendas dominate knowledge production over situated, local perspectives and values. Thus, in-line with some reformist initiatives, meaningful efforts to understand the project’s locality were made, but only through a top-down, expert-orientated mode. Moreover, Usher’s (1997, p. 59) ‘mechanism of pervasive appraisal optimism’ seems to be at work, with reports rubber stamping rather than influencing the dam’s construction and adopting a ‘positivist notion that (experts’) ... methodology offers objective, value-free information’ (Usher, 1997, p. 105). In Rusumo a pattern existed where reformist initiatives to reduce the dams and infrastructure’s impact are present and, to some extent, had meaningful impact. Significant time and resources were devoted to Rusumo Dam’s assessments. However, with knowledge production interpreted as a science best wielded by experts to the exclusion of more situated understandings and perspectives, these assessments failed to meet the ideals advocated by the WCD or by individuals within the Bank²¹. These *technician’s realm* practices are significant as they produced the baseline for designing compensation

Providing Compensation

In line with the World Bank’s safeguards, Rusumo includes a large compensation programme. It considers land and its fertility, but also lost production and planted flora. In addition, compensation includes household and business transportation costs to support relocation and livelihood reconstruction. Moreover, as discussed below, the compensation programme included tenant farmers, accommodation renters and employees. All PAPs, in an

effort to improve and not merely compensate, are additionally eligible for the livelihood restoration scheme and for preferential employment during construction. Rusumo's compensation adopts many of the ambitions supported by Scudder (2012), in reducing the number of PAPs and in attempting to make recipients better-off. Furthermore, practices appear to address critiques of dams as enclaves (Mohan, 2013): Rather than sealing off the construction site to local employment and procurement, shipping labour and supplies exclusively from elsewhere, this dam's stringent guidelines demand that PAPs and local residents are counted before hiring external labour and that local procurement is preferenced (Artelia, 2013b).

Many people in the valley received compensation and asserted support for the project having experienced varying gains. One household in Tanzania-Rusumo stands out in this regard. They lost land and houses to the construction site, but the male household-head had managed to re-build two houses for his different wives, and buy new land, trees and animals. A number of other Tanzanian households who have lost land and houses had built new, improved homes with their compensation money, even if they hadn't been able to buy the same quality of farmland. Additionally, interviewees described larger Rwandan asset owners of houses and shops receiving sizeable compensation sums and moving to Kigali to set up businesses in the capital's more active market. Overall, this specific focus on restoring livelihoods and the broader range of compensated items significantly contrasts with 20th century dams described above. One well-researched example is Akosombo Dam, where displaced communities were forcibly moved to consolidated, 'modern' villages attached to large-scale, poorly-performing plantations. This left the displaced without viable livelihoods (Agbemabiese and Byrne, 2005; Miescher, 2014).

However, Rusumo's apparent compensation success masks a more complex, power-laden reality. The majority of interviewed, compensated people described losing out to varying

degrees. One common grievance cited the rates of compensation paid, particularly in their apparent arbitrariness. One individual involved in deciding prices described how a district government team would decide rates just by viewing houses from the outside. He argued this meant the process was subjective and uninformed, preventing the establishment of ‘proper’ values²². Moreover, the calculation of yields used statistics provided by local authorities, based on generalised land types (Artelia, 2013a), thus excluding each farms’ particular conditions and the knowledge of landowners. This demonstrates an invisibilising of *metis*, meaning the situated knowledge and values which land prices might ordinarily capture (Scott, 1998). Moreover, many people asserted the difficulty of finding replaceable land. This stems from the contrast between appropriated rich valley-floor agricultural plots and drier, sparse uplands. This was particularly problematic in densely-populated Rwanda. However, this concern does not feature in considerations of the dam’s impact, or in resettlement plans.

In addition, whole groups seem to have been largely overlooked including the poorer spectrum of tenant farmers, house renters and business employees. All were supposed to be recognised by the compensation process and included in meetings and the livelihood restoration program. Additionally, tenant farmers were supposed to receive compensation for the labour they had put into the land (including improvements like irrigation systems), growing plants and the value of one year’s yield. Residential renters were allocated financial support with three month’s fees and transportation costs. Meanwhile, formally organised fishermen, brick makers and other employees were due two months’ pay through their employer or cooperative (Artelia, 2013a, pp. 3; 5). However, the fieldwork found few enrolled in this way, and many who been missed. For instance, the fieldwork specifically found that the compensation planning process miscalculated the number of fishermen, tenant farmers and residents and those using marshland that will be flooded by the reservoir. This stemmed from the way in which the baseline report and compensation design did not

sufficiently understand livelihoods and involved limited participation of affected peoples, whose knowledge and perspectives could have acted as a corrective. One typical household had rented valley-floor farmland and a house but had received no direct communication from project officials. Rather their landlord, who was enrolled in the compensation scheme, told them they needed to leave. This left them one year on, with a smaller, lower quality home and no farmland²³. Another example included farmers on the upstream Rwanda side who were renting land that had been compensated. They were growing beans in the future reservoir area but only their landlady, and not project officials, had contacted them²⁴.

Improper counting was also apparent for brickmaking and fishing employees and cooperative members. The census for this group seemed to understate their numbers and include the wrong people. The ESIA records 14 fishermen as being present in the valley (Artelia, 2013a) but my interviews indicated that this number was much larger, with just one group of Tanzanian fishermen stating that their cooperative was 25 strong. Additionally, a large number of people on both sides of the valley reported fly-fishing as one of their main activities. This discrepancy could stem from fishing being a predominantly wet season occupation. Reportedly this season's volume of water, as well as increased numbers of insects, makes fly-fishing easier. Thus, a potential misunderstanding of local livelihoods, lack of rigor or, as some suggested, corruption in enrolling people, has meant a large number of interviewed fishermen did not receive compensation and were not enrolled as PAPs. Therefore, a pattern of missing renters, wage labourers and more marginal communities exists. This suggests the significance of the limited impact assessment and uncomprehensive efforts to record potentially affected people. On paper, a grievance mechanism was supposed to resolve such problems. However, the only meaningful action taken by the mechanism seems to have come in its first tier, where a committee made of PAPs was able to settle land-border disputes: No money was allocated for solving cases and the final tier of courts were

not viewed as a realistic possibility by interviewees, who cited issues of literacy, confidence and know-how²⁵.

Overall, this analysis demonstrates unequal outcomes far from the comprehensive compensation asserted by Nelsap technicians and official reports. A considerable proportion rebuilt livelihoods and even experienced improvements, particularly in terms of house quality. However, echoing the nearby World Bank-financed 1980s Ruzizi II Dam that dramatically understated the number of affected people by approximately 15,000²⁶, many others, especially those with less power, appear to have been excluded. This ranged from fishermen, where surveys appeared to underestimate those involved in this seasonal activity, to tenant farmers and renters who were simply missed. The sole reliance on one-off surveys by outside technicians, without sustained participation, provides one explanation for this. Rather than the apolitical veneer of compensation, this would suggest a misunderstood and strongly political process with the more powerful securing better deals than the economically marginalised.

Consulting the people and Developing Livelihoods

The RAP asserted principals of participation: ‘In line with the relevant international requirements, consultation with, and participation of, affected communities and individuals are key elements of the RAP development and implementation process’ (Artelia, 2013b, p. r). In line with this, elected local community members joined international Nelsap conferences during Rusumo Dam’s planning phase. One of the Tanzanian Rusumo representatives appears to have been particularly active in calling for adjustments to the project’s compensation process and in asserting implementation ideas, suggesting compensation for fishermen and brick makers²⁷. Once the project had been approved in 2012, a more active series of meetings with the various villages began. This involved convening large groups to explain the project and give opportunities for questions²⁸. Another method of ‘participation’

involved appointing Rwandan and Tanzanian committees of PAPs. These could have been a vehicle for delegation or collaboration in decision-making, or a tool for PAPs to raise concerns and advocate change. Rather, the committees were primarily used for implementation: Their main function was to organise and educate, and in the grievance mechanism explained above. Individual instances of consultation have occurred, but PAPs involvement wouldn't rank as above 'collaboration' or 'partnership' in conceptual models, a composite of which are depicted in figure 5 (Shipley and Utz, 2012, pp. 30–31). Therefore, whilst inclusion attempts appear limited. Even the most involved Nelsap conference representative was on-balance critical of the project, citing its lack of participation. This is significant given the corrective role potentially played by participation in ensuring the capture of affected peoples and in improving compensation and mitigation measures.

The disconnect between the project's participative aims and practise is well illustrated by the Livelihood Restoration Scheme. The scheme originates in World Bank principles of improving affected peoples livelihoods. Additionally, it served as an alternative to

Figure 5 Composite of participatory models reviewed by Shipley and Utz (2012, p 30-31). Including the International Association of Public Participation and Arnstein (1969)

compensation for renters, tenants and employees, none of whom were losing formally owned assets. Additionally it supported those using the legally ambiguous seasonally flooded marshland²⁹ (which is illegal to use on the Rwandan side and varyingly recognised as legitimate in Tanzania). Using the scheme as compensation assumes the straightforwardness of *doing development*, that one can easily create new and improved livelihoods. From the critical development studies school, such an assumption ignores the problematic history of immanent, externally-initiated rural development attempts (e.g. Ferguson, 1994).

Nevertheless, Nelsap offers a range of programmes, from agricultural crop support, to business development and livestock rearing (Artelia, 2013b). Consultations with the resettlement committees shaped these final offerings³⁰, but the scheme was primarily decided before local engagement by consultants undertaking the RAP. Their primary influence came from regional district government officers and secondarily, from regional NGOs (Artelia, 2013b).

Most interviewees involved in the Livelihood Restoration Scheme strongly critiqued it. Apart from not being enrolled, interviewees complained that the scheme was top-down and unresponsive. Officially registered PAPs (which as we have seen excludes many directly losing from the dam), were supposed to be able to choose which programme to enrol in, but a number of Tanzanian-Rusumo interviewees denied having such a choice. When it came to the Scheme's implementation, the choice of specific animals for instance, or feedback on what did and didn't work, interviewed current committee members and enrolled PAPs felt powerless. A useful illustration here comes from one of the main programs involving livestock rearing. Interviewees critiqued the use of non-local cow breeds because of poor husbandry knowledge among recipients and because these cows were unsuited to the dry season's poor-quality grass and lack of water. Household 14Tz described how a cow consequently died within a year. Similarly, a number of interviewees expressed

powerlessness. The head of one family was especially angry with the rabbit program which he felt he had no choice over, exclaiming ‘why do we have these fucking rabbits?!’³¹.

Fundamentally, whilst having gained a better-quality house, he cared about the land they had been unable to replace: For them rabbits would not bring a livelihood foundation, or even useful diversification. Such shortcomings appear particularly problematic given that the restoration scheme is supposed to function as compensation for those with unrecognised/informal land ownership. Whilst the presence of the RAP is notable, representing a significant departure from past dam building practices with an attempt to spread local benefits, the restoration scheme echoes classic development critiques involving attempts to change livelihoods with limited input from recipients, questionable appropriateness and the empowerment of experts. Arguably, this would have been avoided had the recipients had a stronger role in shaping the programme and if the scheme’s planners had paid more attention to local knowledge and the valley’s specificities, rather than implementing essentially pre-decided national plans. Echoing Li (2007), the RAP served as a tool to render livelihoods technical, focusing on symptoms (e.g. absent livestock assets) not poverty’s social causes.

CONCLUSIONS: REFORMED *TECHNICIAN'S REALM*?

Dam Building Policy Process	Reformist Policy Measures	Implementation in Rusumo Dam	Effectiveness
Knowledge production	More detailed and systems-based survey of livelihood and environmental baseline conditions; Consideration of impacts across environmental and social systems;	Wide-ranging, detailed surveys with multiple experts over three years	Detailed assessment of livelihoods but not of interrelationships between riverine and livelihood systems nor of long-term upstream and downstream effects
			No consideration of replace-ability of seasonally flooded land
Design and Operation Mitigation	Change the design of the physical infrastructure and its operation to reduce impacts	Dam revised from storage reservoir to run-of-river scheme	Reduced number of affected people from 17,450 to 685
			Did not consider operation mitigation
Compensation	Holistic compensation moving beyond assets to livelihoods	Broad compensation including moving and production costs	Majority who received saw as broadly fair
			Issue with recognising fertility of land
			Issue with being able to replace seasonally flooded zone
			Some affected left out- particularly renters
Livelihood Restoration Scheme	Establish new livelihoods for affected people and diversify income sources	Created livelihood projects based on international consultant reports and district authorities	Some proposed projects deemed useful by interviewees (e.g. fishing). Others contested (e.g. cloths shops/rabbit keeping)
			Opaque process of enrolment in schemes; Corruption alleged; Affected households missed out
			Limited participation in designing the scheme and ensuring its relevance
Participation	Increase the involvement of local communities to reduce negative impact and ensure relevance	Created local committees of officially affected people; held regular meetings with affected peoples; conducted consultative surveys	Did not meet standards of 'participation', more 'consultation'; the local committees acted mostly to disseminate and organise
Benefit Sharing	Share the benefits of the dam with affected communities	Spent US \$15m on a benefit fund for the districts affected by the original dam design.	Spending decided by District governments without village level input; spending opposite to perceived priorities in Tanzania-Rusumo
			Money spread over large area so little will reach the affected villages
			No plan for long-term benefit sharing directly from the dam/the Rusumo Power Corporation

Figure 6 Summary of reformist principles and their implementation in the Rusumo Dam project

This analysis of Rusumo Falls Dam therefore contributes to debates in development studies on the increasing infrastructure turn and the practices that trend involves. The dam demonstrates the influence of the World Bank's more stringent safeguards in pushing reformist policies, evidenced here by the degree of people, assets and activities compensated for, but also in terms of the attention on measuring impacts. These efforts attempt to address past academic and policy critiques of disconnect between dam implementing technicians and the infrastructure's negative socio-ecological outcomes. Indeed the intention to leave PAPs better off follows Scudder's (2012) recommendation and favourably contrasts with the upstream Rwandan Nyabarongo Dam: Nyabarongo's compensation was less generous and the range of people included, far smaller (Dye, 2016). Past dam critiques also influenced mitigation principals that led to the striking revision of Rusumo's size, involving a 25-fold reduction in directly affected households compared to the initial full development scheme. Such findings mark Rusumo out from most historic dams, indicating some of the differences that exist in the present-day infrastructure construction trend: There are increasingly established practices of ambitious impact assessment, mitigation and compensation.

However, amongst such meaningful reform, a *technician's realm* appears to have persisted in the Rusumo project, leading to a number of negative outcomes. Despite the language of participation and holistic assessment, Nelsap and local officials and consultants predominantly undertook decision-making, understanding impacts as discreet, not as a connected socio-ecological system. Even if Rusumo does represent a 'good' infrastructure option of development potential with small socio-ecological impact, such an openly political appraisal embracing likely trade-offs was absent. Rather, the decision making process rendered development as technical: The dam became the scientifically derived 'right' solution. Implementation was treated as a process whose key decisions should be made by consultants, Nelsap engineers and regional government experts as they could scientifically

discern optimal outcomes by following ‘best practices’ to understand the valley, direct compensation and divine local development. The result of these *technician’s-realm* practices, was the underestimation of impacts and over-estimation of compensation efforts. This trend is significant given the important rise in infrastructure construction. On the one hand, it suggests the continued relevance of well-established critiques of development. Despite the decades since Chambers, Ferguson and Scott’s seminal works, or the establishment of criticisms on participation (Hickey and Mohan, 2004), these analytical lenses remain insightful. Although a new veneer of sustainable development policy exists, the imbalances in power, shortcomings in knowledge production and short-sightedness entailed by the *technician’s realm* results in a familiar pattern of winners and losers along social cleavages of wealth, geography and status.

However, this article’s demonstration of influential reformist mitigation policies also suggests that change has happened. Here, echoing Chen and Landry (2018), the World Bank pushed adoption of reformist policies concerning impact assessment, mitigation and compensation and, equally importantly, acted to enforce them. Such evidence contrasts with Goldman (2005) whose unsympathetic account simply paints the Bank as rendering the environment an exploitable natural resource and its attempts at participation, a farce. This study suggests that to some extent the Bank has learned and responded to past issues with dam building. Therefore, this case indicates the need for nuanced analysis of the growing wave of infrastructure construction because its practices of knowledge production and mitigation, and its related socio-ecological impacts, aren’t mere replication of the past mid-20th Century dam-building era. Therefore, differences in reformist-policy adoption could cause significant variation in the present-day infrastructure turn. As the so-called traditional development actors return to direct engagement in infrastructure, and as new institutions such as Nelsap are created to increase construction, the ambition and stringent enforcement of

practices around impact assessment, mitigation and benefit sharing will be particularly important.

I believe this article entails no conflict of interest.

ENDNOTES

¹ Agriculture (1979), engineering-feasibility (1987-1992) and environmental impacts (1993)

² Interviewee 1

³ Interviewee 1

⁴ Interviewee 1

⁵ On the Paraguay-Brasil and D.R. Congo-Rwanda borders respectively

⁶ Interviewee 5

⁷ Interviewee 1

⁸ Interviewees 1, 2

⁹ Interviewee 5. Echoed by interviewees 1, 2

¹⁰ Interviewee 5

¹¹ Interviewee 1

¹² Paraphrased Interviewee 11

¹³ Paraphrased Interviewee 11, 15

¹⁴ Interviewee 16

¹⁵ Interviewee 10

¹⁶ Reflecting policies for increased East Africa Community electricity trade (e.g. EAC 2018 Sustainability Policy)

¹⁷ According to interviewees 12,13,14

¹⁸ Interviewees 11, 15

¹⁹ Interviewee 9

²⁰ As Zambia's Kariba demonstrates (Scudder, 2012)

²¹ Interview 14

²² Tz26

²³ 34Tz

²⁴ 14Rw

²⁵ In contrast to interviewees 1,2,3,4, 5, 6,7 were 14Tz, 26Tz and 27Tz. Local interviewees appeared unaware of supposed financial support; This finding echoes other Bank projects like Nam Theun II (Goldman, 2005)

²⁶ Initially calculated at 135, with revisions demonstrating 15,000 were in-fact affected (McCully, 2001)

²⁷ 25Tz

²⁸ Interviewees 1,2,3,4, 5, 6, 7; 10Tz, 12Tz, 13Tz

²⁹ Interviewees 1,2,3,4, 5, 6, 7; Artelia, 2013a

³⁰ 26Tz, 27Tz

³¹ Paraphrased interviewee 14Tz

Appendix: Interviews

Local Level Interviews Cited

Rwanda Side	Main Participant	Tanzania Side	Main Participant
1Rw	Group including fishermen, shopkeepers and those compensated	1Tz	Male business man
2Rw	Household engaged in border trade	2Tz	Women, bar manager
3Rw	Women business owner	3Tz	Male shopkeeper
4Rw	Women landless	4Tz	Women shopkeepers
5Rw	Women, household renting farmland	5Tz	Male fisherman and brickmaker
6Rw	Women land-poor	6Tz	Women, shopkeeper
7Rw	Household, used marshland	7Tz	Women, compensated
8Rw	Male farmer, missed compensation	8Tz	Two women
9Rw	Male farmer, renter	9Tz	Male farmer
10Rw	Male farmer, compensated	10Tz	Group, farmers, traders
11Rw	Farmer, missed compensation	11Tz	Women and man compensated
12Rw	Household, received compensation	12Tz	Male fishermen and brickmakers
13Rw	Farmers, Fishermen Compensated and Uncompensated	13Tz	Male fishermen and brickmakers
14Rw	Upstream Uncompensated Renters	14Tz	Compensated household
15Rw	Border Smugglers	15Tz	Two women farmers missed compensation
		16Tz	Compensated
		17Tz	Local government official
		18Tz	Group of compensated males
		19Tz	Land owner upstream
		20Tz	Household missed compensation
		21Tz	Household missed compensation
		22Tz	Compensated household
		23Tz	Two women farmers
		24Tz	Women, household engaged in border trade
		25Tz	Women, former village representative
		26Tz	Compensated Male
		27Tz	Compensated Male
		28Tz	Female Kabuye
		29Tz	Large group Kabuye
		30Tz	Two households Kabuye
		31Tz	Household Kabuye
		32Tz	Large group Kabuye
		33Tz	Male, received compensated
		34Tz	Women, missed compensation
		35Tz	Women, compensated
		36Tz	Local government official
		37Tz	Male, compensated

Quoted Rusumo Dam Planners

Organisation	Position	Number	Date
NELSAP	Former Senior Leader	1	August, 2016
	Senior Leader	2	September, 2015
	Engineer	3	August, 2016
	Programme Officer	4	September, 2015
	Programme Officer	5	September, 2015
	Project Manager	6	September, 2015; August, 2016
	Project Coordinator and Social Lead	7	October, 2017
	Manager	8	August, 2016
Rwandan Energy Utility EDCL	Senior Official	9	August, 2016
World Bank	Manager	10	September, 2015; August, 2017
	Senior Hydropower Specialist	11	August, 2017
	Senior Hydropower Specialist	12	August, 2017
	Senior Safeguards Official	13	August, 2017
	Energy Specialist	14	September, 2015; August, 2017

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