

Some learnings from the water, food and energy nexus about decolonising the Green Economy for an Anthropocene Southern Africa

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Intro: the origins of and underlying tensions in sustainable development

It is generally agreed that global social and economic development should be environmentally sustainable. This agreement was encapsulated in the phrase 'sustainable development' which is now the overarching goal of the United Nations, as expressed in the SDGs that were adopted in 2015.

Yet there remains a significant tension about the interpretation of those goals. This is reflected in other development strategies and, it is suggested that it is particularly acute in the economic domain since this is often where national interests are most clearly expressed.

The green economy was, together with sustainable development, an early 1980s conceptual response to the emerging contestation between the developing countries' goal of development and the developed countries' prioritisation of environmental sustainability. (Pearce, D.W., Markandya, A. and Barbier, E., 1989. *Blueprint for a green economy* (Vol. 1). Earthscan.)

This contestation continues in and between developed and developing countries.

Essentially, it is about the relative priority given to social and environmental issues, to people and to nature. This reflects broader debates around the green economy: Is the goal that of deep ecology and the ecofeminists to change the way we live and preserve the natural environment or the eco-modernists goal of "restructuring capitalism along more environmentally sound lines" (Dryzek JS (2013). *The Politics of the Earth* (3rd ed), Oxford University Press.). Is the focus changing? A recent paper (Lindholm 2017) describes "a displacement from "conserve" to "develop" in the discourse about "green versus grey infrastructure" as a significant feature of the debates.

My thesis is that, for a variety of reasons, much of the green economy debate in South Africa is derivative of the debate in developed countries and reflects their preferences and priorities rather than domestic context and priorities.

This reflects cultural influences and deliberate policy promotion as well as lived experiences. A starting point must be to recognise that many South African academics, public managers and policy makers, black and white, live in a rich world cultural and material enclave, within what is still a relatively poor country. They take for granted the reliable and affordable availability of water, energy, food, shelter (and the livelihoods required to support them). This is the privileged of Thabo Mbeki's two South African nations; we may only disagree with him that it is not a division between black and white but between a relatively rich group of black and white; and a poor group almost all of whom are black.

As a consequence of this divide, and the fact that our policy priorities are determined primarily by the privileged, many of the focus areas and recommendations have limited application to our broader national circumstances. It is for this reason that I suggest that we urgently need to decolonise our approach to the Green Economy and develop sustainable development strategies that are appropriate to our objective circumstances.

To support this deliberately contentious position, this paper considers first the broad thrust of green economy approaches and then considers the 'water-energy-food nexus', which has been proposed (by the north) as a useful conceptual tool to guide resource management. It explains the origins of the WEF Nexus, how it has been promoted and why, in many cases, the approach has been unhelpful.

It then considers some of the drivers behind the process of promoting the green economy and the resultant dissonance between approaches proposed and the southern context and concludes by outlining how an indigenous approach to the green economy would differ from current prescriptions.

The different challenges of the Anthropocene – a growing South and static North

A first general statement must be that the green economy cannot be about re-establishing a 'pre-human' natural environment. This is true for both the rich and poor worlds. In the 21st Century, the world has formally entered into what is termed, the "Anthropocene", technically, a new period of geological time dominated by human impact on the Earth.

In practical terms, this is recognition that the earth is now what people make of it. The question that raises is "what kind of world do we want that to be?" The answer will necessarily depend on who you ask. That is particularly relevant in our consideration of the Green Economy. This is the challenge that the 'ecomodernists' accept and the 'deep ecologists' reject and it is important to recognise that the green economy debate is already polarised by this difference.

That polarisation often simply reflects the different political perspectives from which the green economy is being considered. But there is a more fundamental divide. Rich and poor countries face fundamentally different challenges as they enter the 'Anthropocene age'.

As a generalisation, developed countries have relatively stable populations and have largely achieved basic human development goals. While protecting the other material standards of living that they have achieved, they often seek to achieve a 'better' 'natural' environment. Since they have already transformed their landscapes and aquatic environments, this implies that they are now simply making a set of 'design choices' about their future physical environment. It is characterised by restrictions on physical development for subjective reasons to meet new preferences; these are introduced even where they require financial tradeoffs.

But these approaches have an economic component as well. So in Europe, development strategies locate the continent at the centre of global development in an increasingly explicit manner. This is well expressed by the European Commission's report on "Green Growth for Jobs and Prosperity *in the EU*" (Perez et al 2016) (*emphasis added*):

"... environmental challenges, rather than being a threat to growth, constitute the best opportunity for reviving wealth and job creation in the EU. Moreover, it has noted that what could be called the 'green good life' has found a culturally fertile ground in the European countries, where it has been spreading faster than in other regions of the globe. This provides a domestic demand context that can entice business to innovate in a green direction, while using it as a test ground for competitive exports."

The report proposes a policy framework whose:-

"... object would be to accelerate the existing regional trends and to bring the European economies to a leadership position in the lifestyles and production methods that will make the global economy prosperous and viable. This would result in strengthening an emerging 'European Way of Life' that can become the new global aspirational model in the information age, in the way that the 'American Way of Life' became the model in the age of the automobile."

Perez, C., 2016. Changing gear in R&I: green growth for jobs and prosperity in the EU. Report of the European Commission Expert Group "R&I policy framework for Green Growth & Jobs." European Commission Directorate-General for Research and Innovation, Brussels

What does the picture look like from the other side of the fence?

Developing countries must still grow their economies in order to achieve minimum human development standards for their populations, which are still increasing. This involves massive investments in urbanisation and ongoing rural transformations on a scale seldom experienced in developed countries. In most cases, with some honourable exceptions, societies and their political structures are struggling to keep up with the changes rather than structure or even influence them.

These investments will have to be underpinned by economic development strategies that provide the resources required and support the development of more prosperous and inclusive societies. They cannot be predicated on strategies that were developed, in the first place, to ensure the establishment and sustenance of "an emerging 'European Way of Life' that can become the new global aspirational model" – unless, that is, it is demonstrated that it is also designed to ensure an equitable distribution of income and wealth in the process.

Sub-Saharan Africa including most countries in Southern Africa is the epitome of this scenario. Africa's population is expected to grow from 1.2 billion in 2015 to 2.5 billion in 2050 and 4.4 billion in 2100 (United Nations, Department of Economic and Social Affairs, Population Division (2015). World Population Prospects: The 2015 Revision, Key Findings and Advance Tables. Working Paper No. ESA/P/WP.241.)

The challenge for Africa is thus to imagine a physical structure that can accommodate this increase in population and meet their basic energy, water and food requirements underpinned by economies that can assure Africans of adequate livelihood opportunities. The magnitude of the challenge can be grasped by considering that these population increases alone are greater than the total current (and future) populations of both Europe and North America. Clearly, this will require transformations of the economies as well as the physical environments within which people live and work.

Much of the population increase will be accommodated in urban areas which require support from the wider landscape for, at the least, their food and water. The proportion of Africa's population in urban areas is expected to rise from 40% to almost 60% by 2050 (United Nations, Department of Economic and Social Affairs, Population Division (2014). World Urbanization Prospects: The 2014 Revision, Highlights (ST/ESA/SER.A/352).), from 480 million to 1500 million in just over 30 years.

Already, over 50% of the earth's surface has been modified by human activity; much of the remainder is relatively unpopulated mountain, tundra, desert and forest (Hooke, R.L., Martín-Duque, J.F. and Pedraza, J., 2012. Land transformation by humans: a review. GSA today, 22(12), pp.4-10.). Given the impending economic and pressures, the implication is that there will no longer be a natural environment but rather an environment created by people. The challenge will be to ensure that the environment so developed is sustainable, in the simplest sense of the words, "meeting the needs of the present, without compromising the ability of future generations to meet their own needs."

Given the scale of the impending change, Africa cannot afford to have its imagination constrained by what Europe (or the developed north more broadly) considers to be a 'green good life'.

The water-energy-food nexus as a lens into the green economy discourse

The centrality of meeting the basic physical needs of rapidly urbanising societies makes the so-called water-energy-food (WEF) nexus a useful lens through which to focus on these issues.

The WEF nexus is not a particularly useful paradigm for water management. It does not address the fastest rising water demands from the rapid growth of industry and domestic water use in cities, or

the desire to protect the aquatic environment. But it does show how a paradigm that emerged in the north (ironically at the other WEF, the World Economic Forum) to meet northern concerns is transmitted to the South, often with good intentions but sometimes inappropriately.

First, its northern roots: in the USA, concern arose about the impact of bioethanol production on food production and water use, not least because maize was the primary feedstock for both bioethanol and beef production. It was linked to a wider set of concerns about overuse of water in general and a desire to reallocate water from agriculture to the environment in the arid western states.

In Europe, during a severe heatwave in 2003, France famously had to shut down some nuclear power stations because water temperatures in the rivers it used to draw cooling water had risen too high. In Denmark, there were widespread problems of pollution by agriculture of what was otherwise plentiful groundwater – Denmark has more pigs than people in its relatively small territory. In Britain, in 2010, energy production accounted for 31% of all water abstractions (only domestic was larger, with 48%) and parts of the country had to make hard decisions about a division of water between domestic, energy and agricultural uses.

These examples all connect water with energy and/or food but there is little obvious commonality between them, highlighting one of the limitations of the WEF nexus. Further, while these issues were novel in their particular locations they were by no means the first or only local conflicts over access to water for different uses.

In countries of the south, awareness of the interaction (and potential competition) between different water uses is hardly new. In the Southern African region, concern for the sustainability of natural resource utilisation in South Africa's water sector long predated the environment and/or development debates and was a determinant of both energy and agricultural policy in the apartheid era (South Africa 1970; South Africa 1970. Report of Commission of Enquiry into Water Matters, Government Printer, Pretoria.).

Similarly, the founding documents of the SADCC (Nsekela 1981; Nsekela AJ, Southern Africa: Towards Economic Liberation, Rex Collings, London 1981 p.146-188) discussed the potential contribution of water resource development for energy and agricultural production but cautioned about the importance of integrating such projects into national and regional development plans.

Further afield, Brazil has long integrated electricity production from hydropower and the burning of bagasse (sugar cane waste) into an efficient and productive agricultural and energy system. (Barroso, L. A., Lino, P., Ralston, F., Porrua, F., & Bezerra, B. (2008, July). Cheap and clean energy: Can Brazil get away with that?. In Proc. 2008 IEEE PES General Meeting, Tampa, FL).

In the second half of the 20th century, China, India and Pakistan all engaged in major water resource development whose goals usually combined water for agriculture, hydropower generation and flood protection. And in 1977, the first (and only) United Nations Conference on Water recommended

"a shift from single-purpose to multipurpose water resources development as the degree of development of water resources and water use in river basins increases, with a view, inter alia, to optimizing the investments for planned water-use schemes. In particular, the construction of new works should be preceded by a detailed study of the agricultural, industrial, municipal and hydropower needs of the area concerned."

Given this background, the sudden surge of interest in the relationships between water, energy and food is puzzling for many practitioners. Why, despite this long history of a structured exploitation of water resources in support of different dimensions of social and economic development, is there this interest in promoting this WEF nexus approach? The outcome is often a profound dissonance between the domestic goals and strategies and those that are advanced by external partners.

How external discourses impacted on Southern Africa's green economy perspective.

Hydropower development constrained

It is probably in the area of energy that the impact of external discourses is most evident and where the dissonance between indigenous priorities and the dominant external approaches has been most acute and best documented.

Since 1980, Southern Africa has sought to promote the exploitation of its hydropower potential (Nsekela 1980). This should have been facilitated by the two prior colonial adventures, the construction of Kariba and Cabora Bassa (as it then was) dams. The former, in particular, was not an optimal project. It created a very large reservoir (the largest by volume in the world) which is relatively shallow, covers a large area and has a high rate of evaporation. The Cahora Bassa reservoir is the 16th largest in the world, measured on the same basis.

The generation capacity currently supported by these two projects is relatively small (2000MW and 2100MW respectively) given their size. However, the established storage capacity could support the construction of a cascade of a further three dams that would require very little storage but could more than double the generation achieved from the river's flow (World Bank 2011. The Zambezi River Basin, A multi-sector investment opportunities analysis summary report, World Bank, Washington).

In other contexts, we have documented (Muller M, Chikozho C, Hollingworth B, Water and Regional Integration The role of water as a driver of regional economic integration in Southern Africa, WRC Report No 2252/1/14, Water Research Commission, Pretoria 2015) the failure to develop this hydropower capability despite the 1980 resolutions of SADCC to use the resource for regional benefit and the looming power shortages that caused such disruption in the 1st decade of the 21st century. This was in large measure due to the opposition of donors to water resource infrastructure development because it did not accord with their environmental preferences. This is well known and has demonstrably constrained the ability of SADC members to promote their preferred strategies.

The economic contribution of such dams, once built, is demonstrated by the fact that, after Mozambique took ownership of Cahora Bassa and renegotiated tariffs with South Africa, its major client, it took just 9 years to pay back the US\$800 million debt it incurred in the takeover process.

Unexplored gas production potential in South Africa

The lack of progress on developing the power potential of the Zambezi illustrates the (ongoing) long story. A more recent example of how framing by northern green economy agendas has impacted on South Africa's development agenda is provided by the debate about the exploitation of shale gas.

A domestic source of gas would greatly assist South Africa in making the transition from coal to less CO₂ intensive modes of electricity production. But although there is substantial geological potential, the presence of commercially viable shale gas reserves has not yet been proven. Exploration has been stalled for years by environmental objections, many of which focused on water.

Drawing from campaigns in the USA, the debate has been flooded with warnings of the impact on water resources. There have been claims that the quantity of water required would deplete local reserves in the dry Karoo. These ignore the fact that water for fracking is required occasionally, for a few days; if properly designed and constructed well fields were built, they would likely increase rather than decrease local water availability in the long run. Concerns have also been raised about water pollution and toxins in drilling fluids; yet many of the technologies associated with fracking are in daily use, at a far larger scale and in much closer proximity to groundwater, in existing mining operations.

The potential development impact of shale gas development is best illustrated by the US experience. Despite the USA's famous recalcitrance on climate issues even before Donald Trump, it has reduced CO2 emissions significantly. This was largely due to the availability of cheap gas which displaced the coal that had previously dominated electricity generation. This environmental benefit is also recognised in climate conscious Europe. Many of the European countries that are leading the drive to increase renewable generation are relying on gas to fill the gaps when intermittent supplies of solar and wind fail.

So the opposition to gas prospecting in South Africa on environmental grounds is suspect and the focus on water issues is largely tactical and that the real issue is the environment-development tension. Underlying much of the opposition based is the desire to maintain the Karoo's 'natural' environment, even though many of the affected areas of the Karoo have been substantially altered. What this is thus really about is the enforcement of rich peoples' environmental preferences at the expense of opportunities for poor people.

Medupi coal power's water impacts artificially increased

But the influences of external debates on South Africa's policy choices continues.

The requirement that the new Medupi power station should be fitted with equipment to remove sulphur dioxide from its flue gases is another example. This had its roots in the contentious involvement of the World Bank in the project – driven in large measure by the need for South Africa to take some money from the Bank which was providing extensive, free, technical advice but getting little lending business in return.

Medupi was a difficult project to offer, given the pressure for the Bank to stop lending for hydrocarbon based generation. To mitigate the impact of its investment in coal generation (which should have been the redline issue), the Bank insisted on flue gas treatment.

Whether that was a sensible requirement is wide open to question. The area around is not heavily populated. There are many other parts of South Africa where investments in air quality improvement will bring far greater benefits. A particular problem with flue gas removal is that it is water intensive and since 1970, the thrust of South Africa's energy policy has been to reduce the water use in inland electricity generation, reflecting limited water availability. The approach taken in the Medupi project - investing in dry cooling but introducing wet cleaning - ran counter to that more systematic approach and would appear to be designed to address northern environmental agendas rather than to support sustainable development in South Africa.

Local versus system focus – impact of imported Sustainable Urban Drainage systems

One consequence of importing paradigms from other contexts is that they will often not reflect local needs or address problems at appropriate scales. This is illustrated by the increased focus on water resource management at an urban scale.

In Europe and some parts of the USA, there has been considerable interest in the new approaches to urban drainage design. This has been driven by two distinct concerns. On a practical, operational level, many older cities have drainage systems in which relatively clean storm water and highly polluted wastewater are collected and removed through a common sewer network. While the flow could be treated during dry periods, sewers would regularly discharge into rivers or the sea when flows increased as a result of rainfall. The resultant pollution became increasingly unacceptable and engineering measures were required to mitigate it.

One approach was to increase the capacity for transporting and treating the collected wastewater. This was expensive and energy intensive. A more modern approach is to use engineering measures to

slow down the flow of stormwater into the system by building 'detention ponds' and using more absorbent surfaces (grass or other porous materials) instead of impervious concrete and tar. (J. MARSALEK - Evolution of urban drainage from cloaca maxima to environmental sustainability, *Acqua e città* . I Convegno nazionale di idraulica urbana, Sant'Agnello, Italy, 28-30 settembre 2005, (<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.601.6370&rep=rep1&type=pdf>))

Related to this, another effort expands this by applying the principles of the circular economy to urban water management. In this approach, considerable effort (and expense) is incurred to collect water at a building or locality level as well as to recycle 'grey' water and even to treat sewage locally. The long term aim is to enable cities to become more self-sufficient in meeting their water needs.

Both these approaches have attracted interest from South African researchers and seen considerable effort to replicate them (Neil Armitage, Michael Vice, Lloyd Fisher-Jeffes, Kevin Winter, Andrew Spiegel & Jessica Dunstan, *The South African Guidelines for Sustainable Drainage Systems*, Water Research Commission Report No. TT 558/13, May 2013.). However, this focus neglects the fact that South African cities generally do not have 19th century 'combined drains' which mix stormwater and sewage. Also, in response to the frequent occurrence of very local, intense rainfall, stormwater is generally managed by designing roads as the 'collectors' for stormwater which is then channelled to natural water courses.

Stormwater is often polluted by waste in the area drained but not systematically by sewage as is the case in the temperate north. The primary urban drainage problem in growing South African cities is the absence of primary drainage rather than sewage pollution. Indeed, in the absence of adequate surface drainage, households often connect their gutters to sewers with the result that treatment plants are overwhelmed and discharge raw sewage into rivers.

The larger scale water resource challenges of South Africa are also fundamentally different. Planners in temperate climates are usually concerned about the accumulation of water and related flood risks. However, the primary water management problem in South Africa is that almost 95% of rainfall never reaches a river. Measures to reduce flooding and increase infiltration will increase further evaporative losses and reduce the amount of water available for storage in reservoirs to support use during dry periods.

Grey versus Green infrastructure

Many of the conflicts, whether about dams for energy or in support of cities reflect a generalised opposition to the construction of water resource infrastructure. This is still so acute that the World Water Council felt it necessary to compile a book of examples showing why built infrastructure was needed in a growing world (Tortajada, C (Ed.) 2016. *Increasing Resilience to Climate Variability and Change - The Roles of Infrastructure and Governance in the Context of Adaptation*, Springer Singapore.) This debate is particularly anomalous in an African context where variable and unreliable rainfall make it particularly important to store water in order to assure farmers of a reliable source to support their production.

The approach to sustainable urban drainage thus reflects a broader thrust of work in the north which seeks to increase the use of green rather than grey infrastructure, ecological systems rather than built infrastructure. Classical examples of this are the protection of catchment areas to avoid water pollution and reduce treatment costs as was famously – and appropriately – done for New York City's water supply. The principle is expanded to suggest that wetlands may be used to reduce pollution as well as to store water and mitigate floods. These approaches are increasingly being systematised into an overall planning paradigm. (Palmer, M.A., Liu, J., Matthews, J.H., Mumba, M. and D'odorico, P., 2015. *Manage water in a green way. Science, 349*(6248), pp.584-585.)

However, once again, the approach is derived from the experience of relatively rich slow growing countries and communities. While there is no doubt that natural ecosystems do provide useful

functions, they require extensive land areas and often cannot help to mitigate extreme variability. As an example, the waters of the Okavango, the third largest river in Southern Africa evaporate and disappear, almost unused, from the swamps/wetlands of the Okavango Delta illustrating in a very practical way that wetlands consume large volumes of water. (Wetlands are also globally significant emitters of greenhouse gases although this can be mitigated if their water levels are managed.)

The debate is often taken up in a relatively uncritical way which does not locate the concepts in context (a South African example is provided by <http://www.gcro.ac.za/outputs/map-of-the-month/detail/grey-vs-green-infrastructure/>). The challenge for developing countries is to find an appropriate balance between built infrastructure and natural ecosystems, essentially to design a sustainable Anthropocene environment. (Muller, M., Biswas, A., Martin-Hurtado, R. and Tortajada, C., 2015. Built infrastructure is essential. *Science*, 349(6248), pp.585-586.)

One country which has effectively done this is South Korea which in its half-century transition from rural poverty to a developed, industrial economy had to manage the flood and drought risks of a dramatically variable climate while protecting scarce agricultural land and enabling the expansion of its cities and industrial areas. Its approach was controversial, as exemplified by its Four Rivers Restoration project. This was promoted as a "green economy" project, but criticized by some as "an ecological disaster" (Normile, D., 2010. Restoration or devastation?. *Science*, 327(5973), pp.1568-1570.). Yet only a package of dams, dykes, and hydropower plants could reduce deadly flooding and sustain land and water availability – and the inclusion of artificial wetlands as well as multipurpose reservoirs with recreational features as well as flood control functions provide an example of how a sustainable and acceptable Anthropocene environment may be produced.

The SDG priority for wastewater treatment

Ironically, there is one domain in which infrastructure construction is positively encouraged. A recent development that illustrates the systemic nature by which northern priorities drive southern development agendas has been provided by the inclusion of a specific sanitation target in the UN's 2015 Sustainable Development Goals. As part of SDG 6 which is to ensure availability and sustainable management of water and sanitation for all, a specific goal is set for wastewater treatment:-

6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

The wastewater treatment goal was strongly lobbied by the global water industry which, since it failed to make significant inroads on the overall provision of municipal water supply and sanitation services is now targeting wastewater as a less controversial niche where it can develop profitable businesses. In particular, one approach may be to offer the services as PPPs, with the private companies reimbursed on a toll basis for according to the volume treated.

While it is usually desirable to treat wastewater before disposing it into the broader environment, it is often not a priority. In poor communities, the optimal strategy is usually to promote improved household sanitation. This also has broader environmental benefits since it reduces local pollution that would otherwise enter into the environment directly. Even in better off communities where wastewater is channelled into drains and sewers, it may often be discharged into large rivers or the sea without causing serious harm – as was demonstrated in practice across Europe and North America for most of the 20th century.

A more appropriate approach is to be guided by local service provision and environmental policies and priorities. Initially the lobby sought to set relatively high standards for treatment which would have created through 'soft regulation' a huge potential market. Only when the cost of this was recognised to be a barrier was a more general approach taken. However, the approach of promoting large

investment projects through commercial structures as a national priority creates a range of potentially inappropriate incentives as much current South African experience demonstrates.

Discussion – drivers of the policy agendas

The examples above illustrate how the external agenda can result in sub-optimal outcomes for Southern Africa development. It is thus important to understand the mechanisms of transmission as well as measures that can be taken to mitigate negative impacts while retaining the positive. Much external input is useful, introduces new approaches and produces benefits. So the option of pulling up the drawbridge and relying on local resources is not proposed. It is suggested that the best approach is to understand the drivers that may result in inappropriate approaches being transmitted since an understanding of the drivers enables a targeted strategy to address them.

The drivers come in three separate although interrelated categories, political, economic and technical.

Political drivers

The political drivers are often obvious. Germany is one of the most prolific promoters of 'green' approaches to development with a substantial investment in aid to the environment, energy and water sectors in Southern Africa. This reflects its domestic political history. The German Green Party has been one of the strongest in the world; it was a member of ruling coalitions between 1998 and 2005. During this period, it had significant influence on foreign policy, notably development aid (where one of its members was a deputy Minister) as well as on domestic environmental policy. During this period, there were interesting tradeoffs between domestic German positions and those adopted internationally, notably in the water sphere. The idea of establishing autonomous river basin management was rejected inside Germany but vigorously promoted externally; meanwhile, domestic German water legislation explicitly sought to open up developing country markets (Bundestag, 2001. Nachhaltige Wasserwirtschaft in Deutschland (Sustainable water management in Germany). Drucksache, 14, 7177, Berlin.)

Similarly, in the USA, elected politicians policies on dams were used as a measure to determine whether they should be endorsed or not by environmental organisations. But the US Senator who introduced a clause into the US 2014 budget to block lending by the World Bank for large dams (which won him continued inclusion on an environmentalists' 'approved' politicians register) he did not oppose hydropower use in Vermont, his home state, which indeed was increasing and extending its purchases of cheap Canadian hydropower.

Economic

As I have recorded elsewhere,

"For many OECD governments, water is an area of economic opportunity. For all its focus on environmental issues, Germany's national water reform also aimed to promote competitiveness and open up developing country markets; Netherlands identified water as a top economic sector, and expected to "stand out on the world market, profit from growing world trade, exploit opportunities for growth in emerging markets"; France actively promotes its private water utilities; Scotland recently proclaimed itself 'a hydro nation'." (Muller, M. 2015. The 'nexus' as a step back towards a more coherent water resource management paradigm. *Water Alternatives* 8(1): 675-694),

These economic motives are clearly important. Much of the global politics of water since the 1992 World Summit on Sustainable Development has been driven by efforts to open up water-related markets to the global private sector.

Academic and Technical

As illustrated in the examples described above, much of the debate about environmental policy broadly and water related policies specifically has occurred in academic circles. Some of this research is frankly polemic in nature.

So one reason advanced to promote river-basin scale management has been that it offers greater prospects of success than either national or global levels where conservationist policies attract greater scrutiny. (Conca, K. 2012. The rise of the region in global environmental politics. *Global Environmental Politics* 12(3): 127-133.) The same author made his priorities clear when he acknowledged that he sought "instruments of governance without government" to stop people from "pushing rivers around" (Conca, K. (2006). *Governing water*. Cambridge Ma: MIT Press.)

Polemic research agendas are easily transmitted from north to south by research funding arrangements in which research teams in the north are encouraged to develop proposals that involve southern partners. Since the north takes the lead and the south has limited research funding, this is an obvious and effective route for the transmission of paradigms, preferences and explicit policy agendas.

Domestically, South Africa's Water Research Commission should be the leading channel to ensure that the research it funds reflects domestic priorities. However, two factors militate against this. Firstly, its governance no longer reflects the stakeholders who fund it. It was always a strength of the organisation, which is funded by levies on municipalities, industries and agriculture, that its board included representatives from those sectors. This is no longer the case. Second, it has actively pursued partnerships with external agencies which are predominantly from the north. This is bound to influence its own research agenda through both hard (funding) and soft (cultural) mechanisms. But it also fails to draw strategic direction from African contexts. So a proposal to review strategies for the development of irrigated agriculture in line with the African Union and NDP framework was rejected because it lacked "scientific and technical credibility".

Interplay of politics, economics and technics

There is an obvious but nonetheless interesting interplay between the different drivers of the dominant paradigms and discourses around the water and related dimensions of the green economy. In the USA's transactional political system, the tradeoff of local political support in return for active policy interventions in another domain is nicely illustrated. A similar interplay between the domestic agenda and the international one is clear in Germany's differentiated approach to water policy at home and abroad. This was reflected too in the allocation of ministerial responsibilities to the Green Party in areas of environment, foreign and development policy when it was a member of the ruling coalition.

There is also a stark interplay between the aid and economic agendas in countries like the Netherlands, where water management is regarded as a potential pillar of the economy and is supported by development aid (including substantial research funding). Denmark has a similar profile. The Danish Hydrological Institute is a curious mixed research institution and state enterprise that is often contracted by nominally unpaid bilateral aid projects to provide support services. It has also developed a substantial commercial line of technical products for water resource management which it markets aggressively, not least through its aid channels.

But the interaction between political, economic and academic agendas is well illustrated by the experience of the Mekong River Commission. The MRC was almost exclusively donor funded. In its initial incarnation as the Mekong Committee, it was supported by the USA as part of its TVA (Tennessee Valley Authority) diplomacy which sought to promote river basin planning and development as key to transformative development – it would bring a “a second Bolivarian revolution” to Colombia promised the TVA’s David Lilienthal promised it would bring (Neuse, 1996, p. 261).

In 1995, after the Vietnam war, European donors took over support for the MRC and refocused it on environmental and social issues with a strong emphasis on research. It produced many PhDs and other research but had little practical impact on development policy, not least because the donors who led it were resolutely opposed to infrastructure development. Yet there is huge demand – and potential – for hydropower development in the Mekong. So recently, China (which is a riparian state but not a member of the MRC) launched a parallel structure, the Lancang-Mekong Cooperation Mechanism which includes all riparian states, bypasses the MRC and is supporting hydropower projects – an example of decolonisation in practice?

Conclusions – decolonising the development strategies

This paper began with the assertion that the objective of promoting the green economy cannot be to re-establish a ‘pre-human’ natural environment. This is true for both the rich and poor worlds. In the 21st Century, the world has formally entered into what is termed, the “Anthropocene”, technically, a new period of geological time dominated by human impact on the Earth.

A further assertion is that the aspirational green economy must be for a state of global development that is both socially inclusive and environmentally sustainable. It is unlikely that either Perez’s “emerging ‘European Way of Life’ ... in the information age” or its predecessor, “the ‘American Way of Life’ ... in the age of the automobile” will provide an appropriate vision. Yet it is paradigms from those contexts that underpin research in the field.

The European example does, however, provide a useful model in that it considers where its society should be seeking to go in the longer term. By analysing the nature of such a society and its requirements, from material provision through to the nature of livelihoods, it is able to identify useful directions for future research.

The question then is whether we can do the same for South and Southern Africa and indeed for the continent as a whole?

There are some frameworks that might assist. They differ however from the European emphasis on the environment since they necessarily have to address the larger challenge of accommodating far more people and finding ways of assuring their livelihoods and dignified lives. That this has to be done in a way that is environmentally sustainable in the long term goes without saying. But it is unlikely that we will be replicating the approaches of Europe and North America with their very different contexts.

This is no easy task. It is striking and concerning to see how many countries currently seek to achieve middle income status in the longer term through processes of industrialisation, just as other regions begin to consider that the age of industrialisation is past.

It is then reassuring that many also believe that agriculture will, in the medium term, remain the basis of livelihoods if not the drivers of their economies, probably a realistic projection of the likely rate of change from present circumstances. Similarly, many still expect to be exploiting both renewable and non-renewable natural resources to support their further development even as the potential commercial markets for such resources in the developed north begin to shrink under the influence of the circular economy.

A consequence of this combination of contexts - the needs for reliable water for agriculture and urban services, clean power for industry a physical environment that can still provide a range of services even if they are no longer truly 'natural' – provides some guidance as to the research requirements. How much water for agriculture? How to ensure its reliability?

An African policy framework and the research agenda to support it must address these questions. But they are different to the topics that currently dominate the domestic research agendas. Perhaps the real weakness is that overarching policy does not demand answers to questions that are sufficiently well defined. Perhaps too much intermediation in the discussion has been allowed to external partners, which inevitably weakens its precision.

In this regard, it is relevant that Ethiopia, the one African country that was never really colonised, has developed and is implementing a water agenda in support of a national development agenda. At the heart of this is the promotion of electricity production using the available natural resource – clean hydropower. Where financial and technical support was not forthcoming, it mobilised its own. At the level of local economies, the focus is on intensifying agricultural activity, but ensuring that this is done sustainably and inclusively. Integrated conservation initiatives backed by extensive, indigenous land reform and supported by a significant applied research agenda are linked to protecting the capacity of hydropower systems. The political framework through which this is being driven has been challenged, internally and externally and it may all end in tears but, for the moment, the country which does not 'enjoy' a colonial legacy is demonstrating its ability to promote a sovereign agenda for a green economy, within which water knows its place. It perhaps offers a useful perspective to others on the continent who still need to decolonise their research and development agendas.