

## Thinking to practice: Applying complexity The Water-Food-Energy Nexus in Global Drylands: Bridging Science and Policy

*Daniel Yeo, Global Green Growth Institute Ethiopia, paper presented at the conference on the Water-Food-Energy Nexus in Drylands, Rabat, 12-13 June 2014*

Since the German government's Nexus conference in Bonn in 2012, interest in holistic approaches to water, food and energy has exploded under the catchy label of 'The Nexus'. The core tenet of the 'Nexus' approach is that water, energy and food are intrinsically linked at both the bio-physical level and the policy-making level – that decisions and actions on water, food and energy are linked and affect each other. This may be true, but it is not unique to the relationship between water, food and energy – most public policy issues are interlinked. For example, health and education; or infrastructure and trade and tax revenues. Therefore, to become more relevant, the 'water-food-energy nexus' needs to get beyond this superficial level and articulate what these links mean in practice.

Deep linkages create both trade-offs and synergies between the three policy issues – but also across different administrative or geographic scales and time horizons. For example, long-term national decisions about large-scale energy infrastructure can involve short-term trade-offs with local livelihoods and food security. The challenge for policy-makers is deciding the 'right' thing to do in a complex situation where there is no optimum solution. Nowhere is this more acute than in global drylands<sup>1</sup>, which act as 'pinch points', where water, food and energy challenges are most prominent and the consequences of decision-making can have critical impacts on people's lives.

Water, food and energy represent the very fundamentals of life and are essential for livelihoods, economies and industries. Their essential nature and ubiquity are perhaps what makes 'The Nexus' such a lasting and virulent concept. However, it is this ubiquity that makes responding to it such a challenge. At first glance, 'The Nexus' unites multiple actors at different scales with a single language and agenda. However, it fails to acknowledge that the nature of the challenges for water, food and energy depend upon context. The nature of water, food and energy and their uses are defined by geographical, societal and economic contexts. The nature of and responses are therefore different for each context – as a result, the subsequent discourses and framings of water, food and energy challenges results in approaches that are disconnected and at times contradictory.

Rather than conflating different agendas into one, the 'Nexus' approach can only become useful if it offers a more holistic approach that brings different agendas into the same forum, whilst acknowledging their differences – recognising that some framings are more powerful than others and therefore have more political traction and relevance. This paper offers three ways of framing the issues that currently have significant appeal with political elites. These framings are not the only ones, but in the author's judgement, these are those that have the most *political* resonance.

- Firstly, the exploitation of water, energy and food resources as **enablers of economic growth and development**. Water in and of itself is not an economic driver, but key growth sectors require reliable water supplies – it is a necessary but insufficient condition for growth. In turn, growth can provide the necessary resources for poverty eradication. Energy is similar, but can be a direct source of growth – for example, if it is exported in the

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<sup>1</sup> Defined UNEP as areas where the aridity index is less than 0.65. This means that average annual precipitation is less than 65% of the potential evapotranspiration of the area. Drylands can be further subdivided into: Dry sub-humid (0.5- 0.65); semi-arid (0.2-0.5); arid (0.05-0.2); and hyper-arid (<0.05).

form of petroleum products or electricity. Food is essential for growth by maintaining a healthy workforce but also commercial agriculture in some countries. This framing concentrates on the development or exploitation of water, energy and food resources.

- Secondly, as **amplifiers of strategic resource stress**. The flipside of being prerequisites for growth is that mismanagement of these resources can amplify resource scarcity – which at best acts as a drag on growth but in extremes can contribute to political instability if scarcity critically undermines the legitimacy of governments. Water is a resource challenge in itself, but it also serves to amplify other resource challenges by acting as a critical input and enabler in the extraction and use of food or energy. For example, irrigation can be a stressor of water availability in some context, but a solution to food security in others; water is also vital for security of thermal energy production. This framing is about avoiding and managing scarcity.
- Third, **an international relations challenge**. Energy and food are global, transnational challenges where the global food and energy systems require common *global* responses to maintain stability. Water is still a transnational challenge – but it differs from other global challenges in subtle ways. Water is a global challenge where the solutions are at national and sub-national level. However, at the same time, national policies (or their absence) can lead to implications beyond national borders, so multilateral action on water is needed to facilitate and co-ordinate responses rather than homogenise or consolidate them. This framing is about the political implications of water, energy and food use.

Each of these framings is complex, but also interlinked, exponentially increasing the complexity of the situation. However, currently, these links in and between water, food and energy is not adequately reflected in decision-making. Water, food and energy policy are made in isolation, without fully considering the implications for the other policy areas. The 'Nexus' points to the obvious interconnectedness, but not what to do about it– it needs grounding in the realities of developing and delivering effective public policy in messy and complex political economy contexts.

### 1. From science to practice

If the challenge is one of responding practically in the face of complexity, then what are the barriers? Often the underlying assumption is that governments and decision-makers themselves are the problem, that they do not understand the issues and prioritise self-interest. They are also seen as all-powerful and therefore, the strategy adopted by 'Nexus' advocates is to present them with the science and lobby them to 'do something' about it. However, in practice, running a country is difficult – a country is the ultimate form of a living system, a social manifestation of a complex adaptive system. If we consider a country to be a complex, living system, then no-one is truly in control. Governments have the mandate to play the leading role, but some actors are more powerful than others, and no one really has the reins. Instead decisions are made as an *outcome of how actors interact with each other*.

The core issue in translating nexus science into policy is therefore one of how a complex system (i.e. a country) makes collective decisions and specifically, the development and delivery of public policy. In other words, the core issue is one of governance. There are multiple interpretations of 'governance' and an entire body of literature – one of which is the CAR framework that sets out a practical way of understanding 'good' governance, around three concepts<sup>2</sup>:

- **Responsiveness** – a type of behaviour, where a government makes efforts to identify and meet the needs or wants of the people.
- **Accountability** – the institutionalised relationships that might bring about responsiveness. This can include the ability of citizens and parliament to scrutinise public institutions and government decisions.
- **Capability** – organisational attributes, the ability for leaders and governments to actually get things done.

The volume of statements of support and commitment to water, food and energy security as well as to 'The Nexus' indicates a relatively high level of responsiveness and attention to the needs and

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<sup>2</sup> After: Moore, M. and Teskey, G. (2006) The CAR Framework: Capability, Accountability, Responsiveness. What do these terms mean? A discussion note for DFID Governance and Conflict Advisers.

wants of people regarding water, energy and food. However, this attention does not guarantee that the needs and wants of people are treated equally – the views of elites are prioritised above those of the less powerful, which is perhaps why the three frames outlined earlier are most salient. However, regardless of ideological views and power relationships, difficult decisions need to be made in the process of running a country – and all decisions have winners and losers. But what is clear is that there is a desire to act on ‘Nexus’ issues. The more significant blockage to progress is not just taking the ‘right’ decisions, but actually implementing the decisions that have been made – the capability of governments to decide and act. For example, integrated water resource management (IWRM) is an undeniably sensible approach, but UN Water’s recent progress report<sup>3</sup> points to the lack of implementation of IWRM plans – only 15% of low HDI countries have implemented or reached an advanced stage of implementation.

The public discourse on governance tends to focus on issues of responsiveness and accountability – which are easier to identify and attribute – and quite frankly, more emotionally appealing. When failures of governance happen, we are drawn to identify a culprit and blame the malice or lassitude of an individual or an institution. This results in a focus on perfecting up-front decision-making, where energy is spent on arguing what the ‘right’ thing to do is. However, in the face of complexity, there is no optimal solution, so concentrating energy on working out what to do means that insufficient attention is paid to actually doing it. There is a need to get beyond finding the perfect solution and instead to focus on *implementing* ‘good enough’ solutions. Put simply, an imperfect something is better than a perfect nothing. This approach still raises the question of how to deal with the imperfections of up-front decision-making and how to mitigate unintended consequences – to which we will return later.

Therefore, if the ‘Nexus’ approach is about decision-making in the face of complexity, the failures are more often about a lack of state capability rather than malice. As outlined above, there are two critical functions of state:

- Making the ‘right’ policy decisions – understanding the policy problems and analysing the options to develop viable and coherent policy objectives.
- Delivering policies effectively – once policy decisions have been taken, the ability to implement them effectively and ensure that they achieve the desired outcomes.

The two functions are related and need to link to each other – particularly in the face of complexity, where the ‘right’ answers are difficult or impossible to identify.

### **Making the ‘right’ policy decisions**

Public policy requires difficult decisions to be made and for these decisions to be translated into clear policy objectives. The development of *effective* public policy needs to balance technical analysis with political compromises between different interests. A technically brilliant piece of policy is of no use if there is insufficiently broad political commitment to it.

The linkages between issues leads to synergies and trade-offs between policy objectives and across temporal, spatial and administrative levels. The sheer complexity of the issues at stake means that a ‘right’ answer is often impossible – the degree of trade-offs between objectives means that any solution will be sub-optimal. Effective policies need to be sensible from multiple perspectives in order to increase the likelihood that they will ‘stick’. Therefore the challenge is to develop objectives that are technically appropriate but also ‘good enough’ to be accepted or tolerated by those that have the power to prevent implementation. This is the gritty and brutal reality of political decision-making, but does not exclude the possibility of powerful actors taking a benevolent view and making decisions with the interests of the less-powerful in mind.

Therefore, for the ‘nexus’ approach to influence the real world, it’s not simply a case of ‘bridging science and policy’ in a technocratic manner, it has to take the political-economy into account. Who holds the power? Is the agenda relevant to the powerful and to powerful concepts? If not, then is there a framing to make it relevant? What are the attitudes and interests of the powerful? Who will gain and who will lose?

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<sup>3</sup> Status report on the application of integrated approaches to water resource management

## Delivering policies

Once policy objectives have been decided, they need to be delivered. This involves the identification of the most appropriate implementation model. Most governments have a set of public expenditure rules and processes, which seek to address the following:

- *Where will the funds come from?* Policies can be implemented using public funds (e.g. domestic revenue, Official Development Assistance, government borrowing) or through private investment (e.g. domestic investment or foreign direct investment using a range of sources including consumer expenditure, capital markets or bonds).
- *Who will implement the policy?* Implementing agents could be the government including parastatal companies; or it could be through non-state agencies such as the private sector or NGOs.
- *Who makes sure the implementers and funders do what they say they will?* Is this through public scrutiny and oversight? Does the state fulfil this function through contracts?
- *How will performance be managed?* The processes, systems and people required to deliver the policy and manage its development.

However, these rules and processes are not always fully followed and the policy analysis underpinning *implementation* is weak, particularly (although not exclusively) in developing countries. This can then be further amplified by lack of capacity to implement – typically through a shortage of staff or effective financial management. Governments will often attempt reforms to improve delivery capability, with varying degrees of success. Governance reform in developing countries is particularly problematic and numerous efforts, largely driven by development partners, have failed to achieve sustained improvements in performance. Andrews et al<sup>4</sup> attribute the failure of reform initiatives in developing countries to *isomorphic mimicry* where “governments and organizations pretend to reform by changing what policies or organizations *look like* rather than what they actually *do*”. Put simply, this is a focus on institutional form over function, where successful institutional models are copied from other contexts, but lack relevance or applicability in the particular national context.

Finally, the dominant policy delivery models are static and linear – they consist of conducting analysis, developing a plan, then implementing them. They are predicated upon knowing the ‘right’ answer and inflexible – changing or amending a policy counts as political failure and will be heralded as a ‘U-turn’. Given the degree of complexity involved in running a country, more iterative and adaptive approaches are needed – policy models that can dynamically respond to whether something is working or not.

## 2. Illustrating complexity – the case of Ethiopia

To illustrate the degree of complexity involved in ‘Nexus’ decision-making, this section will look into the case of Ethiopia. It is not a comprehensive case study, but a snapshot of reflections from the perspective of an actor partnering with government. However, the views contained within are individual professional reflections and are not necessarily representative of the Government of Ethiopia, nor of the Global Green Growth Institute.

### Context

Ethiopia has a federal structure, consisting of 9 autonomous regions (Kilil) and 2 city states (Addis Ababa and Dire Dawa). Policy and legislation is made at the Federal and the Regional level. Below the Regional government, there are administrative structures in the form of Zones, Woreda and Kebele. Drylands account for approximately 70% of Ethiopia’s total land mass and 46% of total arable land. Ethiopia’s drylands are mainly arid and semi-arid (aridity index of 0.05 to 0.5).

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<sup>4</sup> Andrews, M., Pritchett, L., Woolcock, M. (2012) Escaping Capability Traps through Problem Driven Iterative Adaptation (PDIA). Center for Global Development Working Paper 299

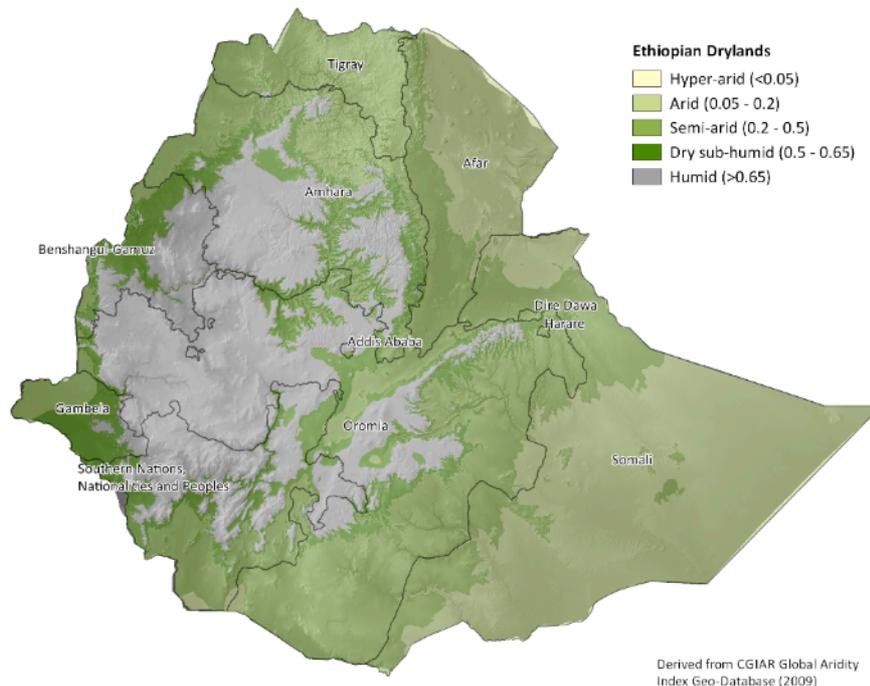
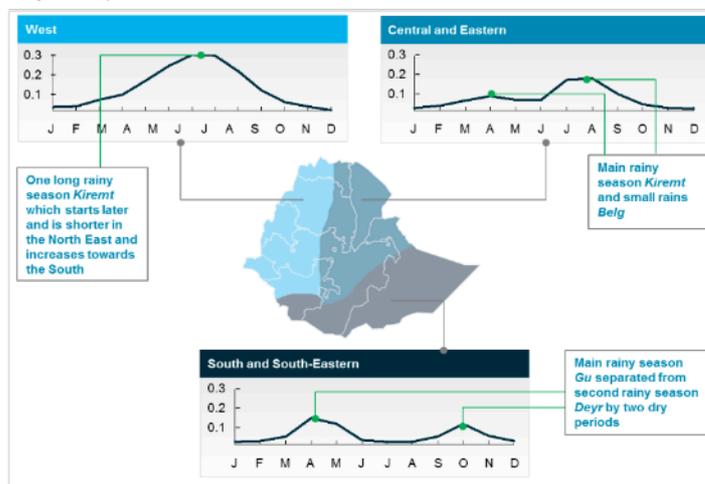


Figure 1 - Ethiopia's drylands

Annual aridity index only tells part of the story. Ethiopia's climate, and rainfall in particular, is extremely variable from month-to-month and from year-to-year. Although most rain falls between June and September, more detailed examination of the rainfall shows that Ethiopia has three distinct rainfall regimes:

Mean monthly rainfall per station<sup>1</sup>, '000mm, 1985-2010



<sup>1</sup> Averages extrapolated for 7% of missing data-points. West includes Debre Markos, Gondar, Gore, Jimma, Nekemte. Central and Eastern includes Addis Ababa, Awassa, Combolcha, Debre Zeit, Dire Dawa, Mekele, Mitehara, Robe. South and South-Eastern includes Arba Minch, Gode, Neghele  
Source: NMA

Figure 2 - 3 rainfall regimes in Ethiopia

Year-to-year rainfall variability is extremely high – with variations of up to  $\pm 30\%$  from the long-term mean in some areas (i.e. a 'dry' year can have as little as 70% and a 'wet' year can see up to 130% of mean rainfall).

### Key Federal policies

Ethiopia's current government is the Ethiopian Peoples' Revolutionary Democratic Front (EPRDF), a coalition of four regional political organisations:

- Tigray Peoples' Liberation Front (TPLF)
- Amhara National Democratic Movement (ANDM)
- Oromo People's Democratic Organisation (OPDO)
- South Ethiopian Peoples' Democratic Movement (SEPDM).

The Government's overarching economic goals are set out in the Growth and Transformation Plan (GTP) with the overall aim of eradicating of poverty through rapid economic growth. Their aim is to continue the country's historic double-digit GDP growth by increasing agricultural productivity and then rapidly shifting to higher productivity industrial activity (known as *Agriculture-Development Led Industrialisation*, ADLI). This is accompanied by social objectives targeting health and education. Ethiopia aims to be a middle-income country by 2025, with an economy that is resilient to climate and with no net increase in carbon emissions from 2010 levels (150 MtCO<sub>2</sub>e).

The Ministry of Water, Irrigation and Energy (MoWIE) is the lead ministry for the water and energy sectors; with the Ministry of Agriculture (MoA) leading on food security and small-scale irrigation. Regional Bureaux exist for each sector and are accountable to Regional Governments rather than Federal Ministries. The government's long-term plans that link water, energy and food fall under three headline objectives: irrigation for food security; hydropower for energy; access to water.

#### Irrigation for food security

Irrigation policy is divided between MoWIE and MoA, with the latter responsible for small scale irrigation (less than 200 hectares) and MoWIE responsible for medium and large scale irrigation. The GTP plans for agricultural growth are supported by the expansion of active irrigation projects from 237,156 ha to 1.8 million ha by 2015 (a shift from 0.4% to 3.3% of total arable land). IWMI estimates that irrigation contributed around 12% of Ethiopia's agricultural GDP and 4% of its total GDP in 2010<sup>5</sup>, which will increase substantially when the GTP plans are delivered. MoWIE has three policy objectives for medium to large scale irrigation:

- Enhancing national food security
- Job creation and employment
- Providing raw materials for agro-industry (e.g. textiles and sugar).

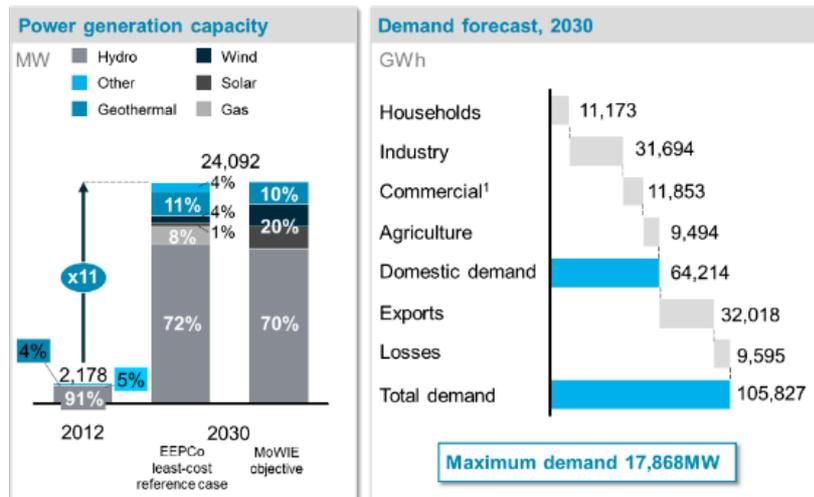
MoA's focus for small scale irrigation is on household food security. The main policy is the promotion of household irrigation through self-supply (mainly community or household built wells). The Productive Safety Net Program (PSNP) is a social protection mechanism to protect the most vulnerable in times of drought and hardship by addressing underlying causes of food insecurity – principally through food and cash transfers. Finally, a program of modernising agricultural practices is underway in the form of the Agricultural Growth Program (AGP) and through the Agricultural Transformation Agency (ATA).

#### Hydropower for energy

Ethiopia's power is currently generated almost entirely from hydropower and the government plans to scale up generation capacity principally through the expansion of hydropower. This involves a planned increase from 2,178 MW installed capacity to approximately 24,092 MW of available capacity by 2030. This will enable Ethiopia to stabilise domestic energy supply, meet future domestic peak demand and export additional electricity to provide foreign exchange income – which could bring in \$500m a year by 2017 and nearly \$2bn a year by 2030.

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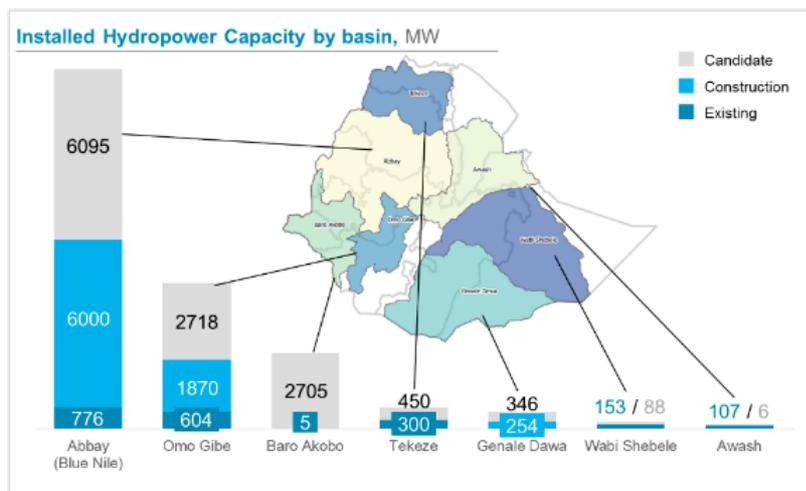
<sup>5</sup> Hagos, F.; Makombe, G.; Namara, R. E.; Awulachew, S. B. 2009. Importance of irrigated agriculture to the Ethiopian economy: Capturing the direct net benefits of irrigation. Colombo, Sri Lanka: International Water Management Institute. 37p. (IWMI Research Report 128)



1 Commercial figures include: commercial, street lighting and transport sectors  
 2 Other sources include Diesel, Biomass, Sugar and Energy from Waste  
 Source: EEPCo Masterplan report 2013; MoWIE Energy Study and Development Follow-up Directorate data

Figure 3 - Current and future generation capacity; Load forecast, 2030

There are currently 12 fully commissioned hydropower plants with a total installed capacity of 1,945 MW, amounting to an average generation capability of 8,629 GWh/year. There has been significant international controversy over the latest dams (Gibe III and the Grand Ethiopian Renaissance Dam), but domestic public opinion is strongly in support of hydropower.



Source: Ethiopia Power System Expansion Masterplan Study

Figure 4 - Locations of current and planned hydropower dams

#### Access to water

The Universal Access Plan sets out the government's plans to achieve universal coverage of water and sanitation by 2020. Together with development partners, the government has established the One WASH National Program (OWNP), a sector-wide approach that co-ordinates all donors behind a single plan. The OWNP emphasises self-supply, which tends towards more basic technologies that are more exposed to changes in rainfall. Currently the program has a 32% funding gap (around \$778m).

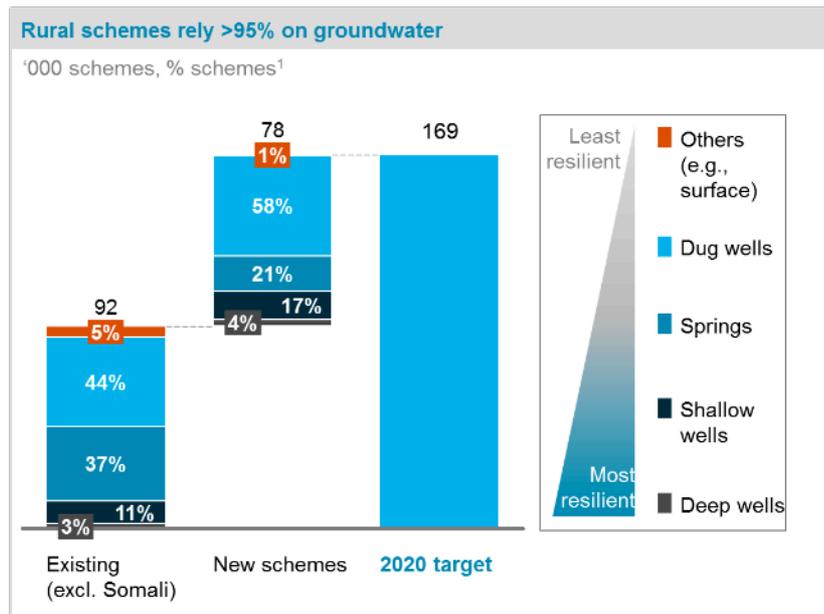


Figure 5 - Planned WASH technologies

### Pastoral Development

Policy for drylands in Ethiopia is hard to separate from pastoralism policy, which adds a further dimension of complexity and politics. The Ministry of Federal Affairs (MoFA) is responsible for ensuring that the needs of ‘historically disadvantaged and underserved communities’ are addressed<sup>6</sup>. Since coming to power, the EPRDF have introduced a raft of programs to support pastoral development that has led to improvements in access to veterinary care, drought management and livelihood security. The Pastoral Community Development Project (PCDP) and the Regional Pastoral Livelihood Resilience Project (RPLRP) are the two most recent programs. The GTP emphasises a growth in meat and livestock exports as a key element of improving the balance of payments by securing foreign exchange.

However, significant data gaps in production practices and marketing decisions; trade information and domestic consumption mean that it is hard to get an accurate and complete picture of the pastoral economy. As a result, pastoralism’s official contribution to Ethiopia’s GDP could be significantly undervalued – the Future Agricultures Consortium<sup>7</sup> estimates that pastoralism’s contribution to GDP is closer to 16 percent rather than the stated figure of 9 percent. FAC also suggest that a stronger focus on domestic markets would be more beneficial and competitive than targeting exports. In addition, weak implementation and inconsistent strategies have held back progress. FAC conclude that “the complex interplay of written policies and what actually occurs in the pastoral lowlands often is contradictory, and results in increased livelihood insecurity and ecological problems as we have shown in the case of irrigation development.”

As in many countries, past and present, there is ongoing tension between the vision of a ‘modern Ethiopia’ and traditional pastoral lifestyles. This has led to some challenges over land use and allocation, and whilst there has been much progress, land is a very live issue in Ethiopia.

### Signs of complexity

A complicated institutional landscape, combined with a complex climate and diverse social issues creates an incredibly challenging policy environment. Addressing the ‘Nexus’ needs to be grounded in this. The following examples illustrate the scale of the challenge.

### Hydropolitics Part 1: Maintaining legitimacy

Ethiopia has significant untapped water resources. The country uses less than 5% of its total available renewable water resources. A strong and clear policy direction has been set – with a

<sup>6</sup> Constitution of the Federal Democratic Republic of Ethiopia, Proclamation No. 1/1995

<sup>7</sup> Little, D., Behnke, R., McPeak, J., Gebru, G. (2010) Retrospective Assessment of Pastoral Policies in Ethiopia, 1991-2008. Future Agricultures Consortium

focus on development of capital-intensive infrastructure for hydropower and irrigation. This decision has implicit consequences for parts of the population who will have to be relocated and reimbursed. Whilst there is a clear resettlement policy, in practice, its implementation has not always been well handled. In the Omo basin, minority ethnic groups have faced resettlement – many have benefited significantly from improved services, but there are claims that some have been forcibly resettled. International lobby groups, such as International Rivers and Survival International, have taken up the issue and elevated its profile, putting pressure on development partners such as the UK's Department for International Development (DFID). Combined with tensions around pastoralism in drylands, this has led to sensitivity around these policies from all donors. This means that Official Development Assistance and technical support is not always forthcoming as a means of financing and implementing dams or irrigation.

This example illustrates the challenging context in which complex decisions need to be made. The Government is trying to do what it believes is right for the country by investing in economic infrastructure, but this can clash with traditional lifestyles. There are emotionally charged trade-offs here and differing values are at play. This situation is easy to characterise as one of economic growth versus poverty eradication and rural well-being. However, it is more complex than this – the government's model is to address poverty by growing economically, thereby providing sufficient domestic resources. Conversely, the donor and international development community is largely focussed on poverty and social programs rather than economic growth and development (although this is changing).

#### No 'right' answers

The vast majority of domestic energy needs in Ethiopia are met through traditional fuels – principally firewood. Biomass is currently the largest fuel source to meet energy needs and even with increased access to electricity, will still account for 72% of total final energy consumption by 2030. About 81% of the estimated 16 million households use firewood, 11.5% use leaves and dung cakes while only 2.4% use kerosene for cooking<sup>8</sup>.

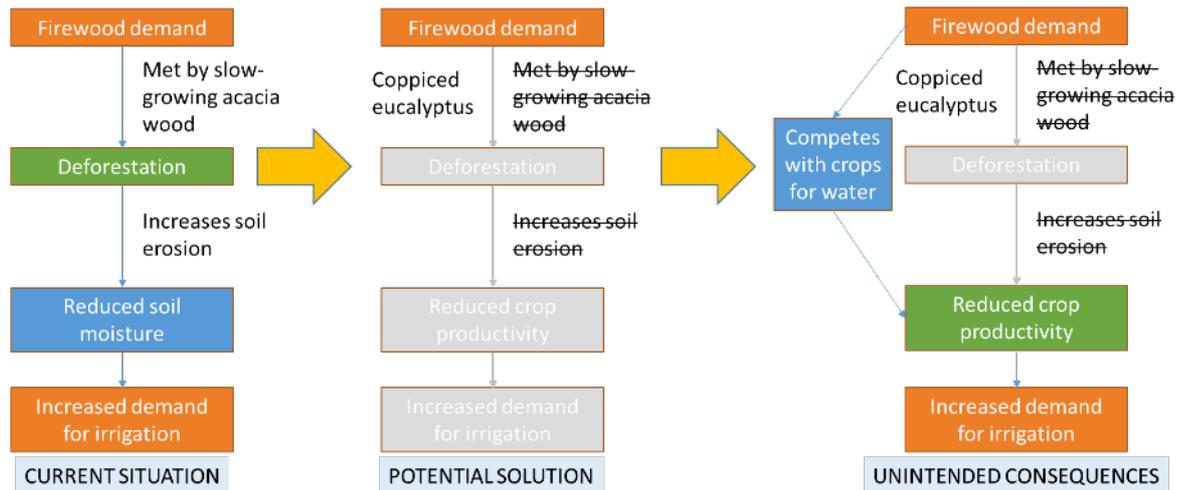
In parts of Tigray, in the northern highland of Ethiopia, households rely upon the native acacia tree for firewood. The slow growth of acacia coupled with growing demand for firewood leads to deforestation and exposed soil – which in turn impacts rainfall infiltration and soil moisture. Lack of soil moisture drives demand for household irrigation for food security – which is heavily promoted by regional governments. However, there is insufficient regulation of household irrigation and no clear picture of the availability of groundwater resources – leading to a significant risk of over-abstraction.

A potential solution is the use of coppiced eucalyptus. The introduction of fast-growing eucalyptus is credited with saving Addis Ababa from abandonment after severe deforestation, and it is now hard to imagine Ethiopia's landscape without the distinctive blue gum plantations. However, eucalyptus has not been adopted as fuelwood source in parts of Tigray because it is seen as a water-intensive tree that competes with crops (although it is not entirely clear if this is true) and because its sap affects soil fertility.

This degree of linkage between issues, coupled with a heavily decentralised administrative structure, highlights how challenging it is to make 'good' policy.

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<sup>8</sup> Biomass Energy Strategy



**How do you make good policy for this level of complexity?**

*Figure 6 - Complexity at landscape scale*

### Hydropolitics Part 2: Regional relationships

The Grand Ethiopian Renaissance Dam (GERD) has become an icon for Ethiopia's future and a collective expression of the country's ambition. The 6,000MW dam will double Ethiopia's energy generation and creates benefits throughout the Eastern Nile Basin.

Firstly, regulating the highly seasonal flow throughout the year will enable a significant boost in power production in Sudan – as water that would have over-topped the dams can be better managed so that it produces electricity throughout the year. More even flow through the year will increase Sudanese power production by 2,600 GWh/year – worth up to \$156m. Flow regulation can also help to manage floods and reduce siltation of dams. Better flow regulation will also allow the Aswan dam to be maintained at a lower water level (as less of a buffer will be needed). Although the GERD's reservoir is large, its profile and climate mean that it will have significantly less evaporation than the Aswan dam. The net result is up to a 12% decrease in evaporation in the Nile – actually increasing downstream water supply by up to 5%. Lastly, the GERD allows lower cost and more reliable energy for the region. Several planned interconnects between Ethiopia, Sudan and Egypt would facilitate a more stable grid throughout the region.

However, things aren't all rosy – the Nile is an intensely emotive and political issue. Egypt in particular has a lot at stake. Egypt perceives there to be a significant impact on the flow that it receives and in particular refuses to let go of its historic claim to 55.5bcm of the annual flow, which dates back to the 1929 treaty between Egypt and the UK. This has led to fractured progress on a Co-operative Framework Agreement between the Nile nations, with Egypt and Sudan refusing to sign. Regardless of the state of the CFA, Egypt, Sudan and Ethiopia had been co-operating on the GERD – this recently broke down, with Egypt walking out on talks and a media war breaking out – but since Egyptian elections in 2014, discussions have resumed with a far more constructive and collaborative tone. There are many issues at play here, but four stand out as central:

1. **The filling regime** – the GERD is designed to be filled only in the rainy season, over 5-7 years, with minimal lasting impact on Egypt. However, given the rainfall variability in the Nile, extreme drought years (such as the early 1980s) could severely stress this plan and expose Egypt to reduced hydropower production, unless filling is halted.
2. **Dam operation** – Once the dam is operational, then who decides how the flow will be regulated? Ultimately Ethiopia will have physical control, which will take power away from Egypt. This issue depends on trust and confidence building.
3. **Egyptian domestic perception** – “The Nile is Egypt and Egypt is the Nile” is a popular saying in Egypt. Given the current domestic political instability that the country is facing, the Government must be seen to be strong on the Nile. The dispute with Ethiopia may also serve to provide a common cause for the Egyptian public. However, the al-Sisi government has been much more positive on this front.

4. **Ethiopian national pride** – The GERD is a symbol of Ethiopia’s, and Africa’s, rise – and an icon of independence. Therefore, the government will resist international control and prefer resolving the challenges among the three nations.

Although there has been over a decade of trust building between riparians and a tripartite Ministerial committee, these complex issues still remain unresolved. Shared analysis can help build trust, but politics matter – science can only take you so far.

**Using evidence-based assumptions to make decisions in the face of uncertainty**

Climate change has become the dominant issue in many circles. Temperatures are steadily increasing in Ethiopia and models indicate that they will continue to do so. However, rainfall is a much trickier issue. Ethiopia’s climate is one of the most complex in the world – as it is driven by erratic movement of the Inter-tropical Convergence Zone, coupled with other climate systems. The common narrative is that climate change will reduce rainfall in Ethiopia. But the science provides a much more complex view – an ensemble of 10 climate models is inconclusive about long-term rainfall trends for Ethiopia<sup>9</sup>. The current emphasis on anthropogenic climate change and the emotional narratives used draw attention away from the real issue for Ethiopia, which is the degree of *existing* climatic variability – particularly around rainfall. There are uncertainties about future climate change, but there is a much higher degree of certainty about existing variability – and its significance in relation to future potential changes.

There is more work to be done to provide a clearer picture. However, to take account of uncertainty without dismissing it, the government has chosen to adopt high level assumptions about climate. Their ‘climate planning assumptions’ are used in its recent Climate Resilience Strategy for Water and Energy to provide a datum to inform policy making. They are evidence-based but deliberately concentrate on the key messages of the latest science and will be regularly updated as the science evolves. Whilst they are not perfect, they do allow forward momentum and real policy decisions to be taken by providing simple and digestible information that is based on evidence.

	Month-to-month variability	Year-to-year variability	Long-term change
<b>Temperatures</b> 	<ul style="list-style-type: none"> <li>Limited change to current seasonal patterns</li> </ul>	<ul style="list-style-type: none"> <li>Marginally less year-to-year variability</li> </ul>	<ul style="list-style-type: none"> <li><b>Higher temperatures across all regions (+0.8 to +2.7°C)</b></li> </ul>
<b>Rainfall</b> 	<ul style="list-style-type: none"> <li>Potential drying or shifting of <i>belg</i> and <i>gu</i> seasons in CE and SSE regions</li> </ul>	<ul style="list-style-type: none"> <li>Increased year-to-year variability with an increase in extremes</li> </ul>	<ul style="list-style-type: none"> <li>Uncertain in West, both drier and wetter outcomes possible</li> </ul>

Figure 7 - Ethiopia's Climate Planning Assumptions

<sup>9</sup> Ministry of Water, Irrigation and Energy (2014) Climate Resilience Strategy for Energy and Water

### 3. Implications for practice

The previous sections serve to illustrate the complexity of policy-making for 'the Nexus'. It highlights the limitations and imperfections of policies – although they are still arguably 'good enough' – and the need to take account of complexity to improve decision-making. The above examples also indicate that many of the basic building blocks of public administration are lacking – even without taking into account complexity. Often what is lacking is delivery and implementation, not more science or analysis. There is a tendency in academia and think tanks to focus on critiquing up-front decision making – seeking a perfect solution before any implementation happens.

However, there is insufficient attention to getting to real world delivery. This should not negate the need to assess and scrutinise decision-making, but there needs to be a shift towards supporting 'good enough' decision making and practical action. There are three implications of this view.

- **Improve 'good enough' decision-making** – governments need support in exposing complexity and unintended consequences, but need to take tough decisions. Ultimately it is the political systems in sovereign countries that must make policy decisions – imposing external agendas is at best unhelpful and at worst counter-productive. However, external agents and development partners can help to expose trade-offs and aid decision making through more focussed analysis.
- **Address systemic bottlenecks to delivery** – more attention needs to be paid to the systemic bottlenecks to delivery. Institutional structures, static delivery models and financing vehicles need to be analysed more thoroughly. What's really holding back progress? What are the root causes? This in turn should lead to targeted interventions rather than generic 'capacity building' efforts.
- **Build responsive delivery systems to enable ongoing decision-making in response to circumstances** – given that it is impossible to make perfect up-front decisions, delivery systems need to provide feedback and have the flexibility to tweak and improve decisions whilst they are being implemented. Andrews et al (2012) propose Problem Driven Iterative Adaptation (PDIA) as a way to build state capability, based on four principles:
  - Aim to solve particular problems in local contexts (as opposed to transplanting 'best practice')
  - Through the creation of an 'authorizing environment' for decision-making that allows 'positive deviation' and experimentation (as opposed to designing projects and programs and requiring agents to implement them as designed).
  - Involving active, ongoing and experiential learning and the iterative feedback of lessons into new solutions (as opposed to long time lags from evaluation)
  - Engaging broad sets of agents to ensure that reforms are viable, legitimate and relevant (as opposed to a narrow set of external experts).

Adopting the approach set out above requires people and organisations who can understand the science and translate it into policy implications. This needs public administrators who understand the science and art of public policy development and delivery.

#### Responding to complexity – reflections from GGGI

The Global Green Growth Institute is an inter-governmental organisation founded by 18 member countries. GGGI works with countries that have strong political leadership committed to demonstrating green growth. Our role is to help them to deliver this, however it is defined – we are agnostic about models and pathways. GGGI is a membership organisation, so enjoys trusted relationships with the governments with which it works. The organisation is still relatively young and 'green growth' is even younger. Therefore GGGI teams adopt a 'learning-by-doing' model that is informed by practice and feedback from member countries. GGGI's model of operation differs depending on the context of the country - however, the following are some reflections and learning to date from the Ethiopia program.

Through GGGI's support to the Government of Ethiopia on water and energy we are trying to put some of the above into action, grouped into two areas – supporting the government to: 'Do Better Things' and 'Do Things Better'.

#### Do Better Things

- **Helping expose complexity** by identifying *policy* choices to be made. For example, we supported the Climate Resilience analysis of the energy sector and identified the key policy decisions that need to be taken now and in the future.
- **Providing decision-support** by 'translating' technical analysis into policy choices and implication. For example, supporting the development of 'climate planning assumptions' to facilitate decision-making.

#### Do Things Better

- **Unblock delivery** by identifying bottlenecks. For example, the water resources sector has been neglected and lacks a clear agenda. We are supporting the Water Sector Working Group to develop focussed policy objectives to provide greater clarity to sector actors.
- **Work with the grain.** For example, on watershed management we plan to build on existing programs and practice outside of MoWIE (e.g. the Sustainable Land Management Program) to strengthen co-ordination and impact, rather than develop new initiatives.
- **Iterative policy making.** We plan to support experimentation with iterative policy approaches – beginning by strengthening feedback loops on performance.

With limited resource, it is impossible for GGGI to do everything, so we will agree priorities with the relevant Ministers and focus where we have comparative advantage. We also try to act as a 'force multiplier' by encouraging other actors to focus on these key issues and leverage the impact of others' work by helping to ground it in the context of government in Ethiopia.

The term 'Nexus' is not in current use in government circles in Ethiopia, but the issues are very relevant. Rather than expend energy on promulgating a term and common language, a concerted focus on enabling better decision making and accelerating delivery is the best way to addressing the issues raised by 'the Nexus' and actually implementing change.

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