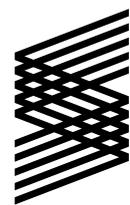


**The role of climate risk
in multiple-purpose dam
finance in East Africa**
Small Grants Programme



PRISE

Pathways to resilience
in semi-arid economies

Research for climate-resilient futures

The role of climate risk in multiple-purpose dam finance in East Africa

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This report has been produced as part of a series of papers to guide the long-term research agenda of the Pathways to Resilience in Semi-arid Economies (PRISE) project. PRISE is a five-year, multi-country research project that generates new knowledge about how economic development in semi-arid regions can be made more equitable and resilient to climate change.

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Acronyms

AGWA	Alliance for Global Water Adaptation
ADLI	Agriculture Development Led Industrialisation
AfDB	African Development Bank
AIIB	Asian Infrastructure Investment Bank
CEFA	Comitato europeo per la formazione e l'agricoltura
EEPCO	Ethiopian Electric Power Corporation
EIB	European Investment Bank
ENDEV	Energising Development initiative by Australia, Germany, Netherlands, Norway, Sweden, Switzerland and United Kingdom
EU	European Union
EXIM (China)	Export-Import Bank of China
FINNIDA	Finnish Ministry of Foreign Affairs, Department for International Development Cooperation
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GTP	Growth and Transformation Plan
GWh	Gigawatt per hour
HSAP	Hydropower Sustainability Assessment Protocol
LAPSSET	Lamu Port Southern Sudan-Ethiopia Transport
MW	Megawatt
NDB	New Development Bank
NGO	Non-Government Organisation
NORAD	Norwegian Agency for Development Cooperation
NORFUND	A private equity company established by the Norwegian parliament in 1997 and owned by the Norwegian Ministry of Foreign Affairs
OECD	Organisation for Economic Co-operation and Development
SIDA	Swedish International Development Cooperation Agency
SIWI	Stockholm International Water Institute
TANESCO	Tanzania Electric Supply Company Limited
TARDA	Tana and Athi Rivers Development Authority
UNFCCC	United Nations Framework Convention on Climate Change
USA	United States of America
\$	United States Dollar

Executive summary

East Africa is major focus of ongoing and proposed investments in large-scale water infrastructure. Multi-purpose dams are being built or proposed to cater for the water, energy and food needs of growing populations in Ethiopia, Kenya and Tanzania. However, East Africa is also a hotspot for climate-related risks such as floods and droughts. These risks could have detrimental effects on the technical and economic performance of, and implicitly the business case for, dams.

This study analyses whether and how the economic dimension of climate risk is included in the dam funding agreements that are largely financed by external donors in East Africa. In this context it:

- provides an overview of the rationales of Ethiopian, Kenyan and Tanzanian decision-makers for building dams for economic development;
- presents perspectives gained from fieldwork in Ethiopia, Kenya, Tanzania and China on the current policies of traditional and non-traditional donors for managing climate risk;
- reviews the climate risk policies and approaches of donors through a political economy framework to assess reasons why traditional and non-traditional donors view climate risk differently.

Climate change implies business risk to investments in dams, especially in terms of operational and technical risks from floods and droughts. This could affect the commercial viability of dams, causing a default risk. Climate risk is addressed in environmental and social assessments of risks and impacts but has still not become an economic/financial issue on its own right. Traditional donors increasingly use strategies and specialized studies to incorporate climate risk in their investment strategies and project planning and design. This is still an emerging issue for non-traditional funders from China, who have not made this an element of their project appraisal and investment decision-making processes. Nevertheless, effectively managing climate risk will require national governments to address this issue in their development strategies and donors to harmonise their funding guidelines. This implies a need for better collaboration to make dam investments sustainable.

This study makes four key policy recommendations:

- Applied rules for climate risk need to be further developed.
- Climate risk has to be addressed in dam funding from the beginning of the projects.
- Traditional and non-traditional donors should harmonise their funding guidelines.
- Improve institutions in recipient countries to strengthen water and energy policy by incorporating climate risk screenings.

1. Introduction: climate risk and dam finance

East Africa is a major focus of ongoing and proposed investment in dam projects to meet demands for water, energy and food. A wave of single-purpose dams constructed in the 1960s, 70s and 80s provided water for hydroelectric purposes, irrigation or water storage for urban and rural populations. However, similar to the whole of Sub-Saharan Africa, the economic and engineering perspective is that the potential for hydropower in East Africa is under-exploited (WWAP, 2014). At the same time, extending irrigation and the provision of drinking water are also high on the agenda of decision-makers and are key elements of national development strategies. This leads to a perceived need for investment in multi-purpose dams providing water to two or more of the energy, agriculture and water supply sectors. However, this could prompt increased sectoral competition over water use by energy, urban and rural drinking water supply and agriculture. Higher demand for water due to population growth could favour one or the other sector. At the same time, climate change could negatively impact the supply side of water for domestic, agricultural and energy use due to uncertainties resulting from climate variability such as floods, droughts and potential damages to equipment (CRIDA, 2016). If planners and in particular funders of large-scale infrastructure fail to incorporate future risks from climate variability into their investment strategies and projects, it could have detrimental effects on water resources in the long-term.

Most of the existing and planned multipurpose dams in the three countries were or are financed through external loans and grants from both traditional and non-traditional sources. Multilateral development banks, such as the African Development Bank and World Bank and OECD donors, were the main financiers of dams until the early 2000s, since when a gradual shift has been evident in sources of dam finance. In particular, China has become a key actor in development finance for large-scale water infrastructure to provide an alternative option for governments in East Africa (Urban, 2015). Self-financing, especially in Ethiopia, has also become an increasing source of funding (Scholvin, 2016). This study argues that external funders of large-scale water infrastructure have a responsibility to address the changing climate variability as an element their appraisal of investments in dams from an economic, financial, technical, environmental and social perspective.

Using the semi-arid parts of Ethiopia, Kenya and Tanzania as case studies,

this study analyses whether and how the economic dimension of climate risk is included in the dam funding agreements that are largely financed by external donors in East Africa. In this context:

- The study first provides an overview of the rationale of Ethiopian, Kenyan and Tanzanian decision-makers to build dams for economic development.
- Second, perspectives gained from fieldwork in Ethiopia, Kenya, Tanzania and China, the current policies of traditional and non-traditional donors in relation to climate risk are presented.
- Third, climate risk policies and approaches of donors are reviewed through a political economy framework to provide reasons why traditional and the non-traditional donors view climate risk differently.

This paper draws on 30 semi-structured interviews conducted during November and December 2015 in Ethiopia, Kenya and Tanzania. Further three interviews were conducted in Beijing and Shanghai in January 2016 to obtain the Chinese perspective on climate risk, dam finance and the political economy of dams.

2. Background: Dams as a pathway to growth in Ethiopia, Kenya and Tanzania

East African governments see a clear opportunity to make use of dams to support economic growth by regulating water supply, generating hydroelectricity, and providing water for irrigation, industry, and domestic uses. This is particularly the case in semi-arid areas where water availability is highly variable and seasonal and where water storage is crucial (McCartney & Smakhtin, 2010).

Large-scale water infrastructure can offer mixed blessings. While dams can induce economic growth by providing energy for industrial and urban development, allow for the expansion of irrigated agriculture, and regulate water flows through storage and flood control, dams may also have detrimental environmental and social consequences (World Commission on Dams (WCD), 2000). Moreover, the most important concern for this study is that climate variability may affect the operations of multipurpose dams over their lifespans. If fundamental aspects of geography change, will dams remain economically robust when their positive and negative environmental and social externalities are considered? Answering such questions clearly entails considerable uncertainty, and the methods for doing so are still being developed, but these questions are often not sufficiently addressed in existing and future dam projects. However, the strategies differ between each country.

2.1. Ethiopia

International development organisations such as the World Bank regard Ethiopia as East Africa's economic power house (World Bank, 2015). Being one of the fastest-growing economies in the world, Ethiopia's economic strategy at large is defined and implemented by the Federal Government. It is based on agriculture development led industrialisation (ADLI) with high investments in infrastructure projects such as roads and multi-purpose dams (Anonymous, 2015c; World Bank, 2015). The development strategies of the government have been laid out in the Growth and Transformation Plans (GTP I and II) (see Box 1). Inspired by government-led Asian planning policies, GTP 1 commenced in 2010 and ended in 2015. GTP II was started in September 2015 and will continue until 2020. Economic development akin GTP is planned and executed by the Federal Government. Although the private sector exists, it is kept small by the government (Maasho, 2013) .

Table 1: Key features of GTP I and II for water, energy and food

GTP I 2010-2015	GTP II 2015 to 2020
Electricity service coverage has increased from 41% in 2009/10 to 54% in 2013/14	Electricity service coverage to increase to 90% by 2019/20
The Great Renaissance Hydro Electric Power Project (with 6000MW), Gilgel-Gibe III (1,870MW) and Genale-Dawa III (254MW) and other Wind Power Projects (Adama and Ashegoda) were key features of GTP I to increase power generating capacity from 2000 MW to 8000 MW.	Hydropower infrastructure projects such as Gibe IV and V as well as the Great Renaissance project will increase power generating capacity from 2267 MW in 2014/15 to 17346 MW by 2019/20
Water supply coverage to increase from 68.5 to 98%	Water supply coverage to increase from 58 to 83% by 2019/20
Developed irrigable land to increase from 2.5% to 15.6%	Area of land developed with high and medium irrigation schemes to increase from 658,340 ha to 954,000 ha.

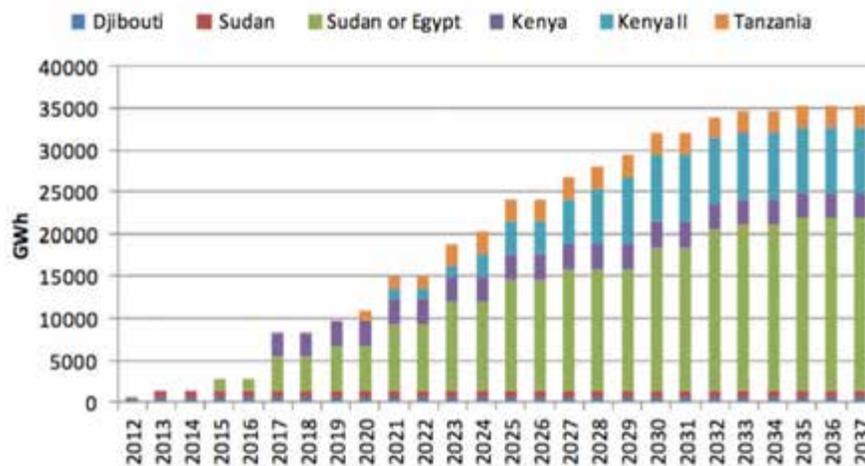
Source: Government of Ethiopia (2015).

Ethiopia has benefitted from grants and unconditional and low-cost conditional loans for investing in infrastructure. There has been significant external borrowing in recent years from emerging Asian economies. In particular, China has been an active investor in large-scale water infrastructure in Ethiopia since the early 2000s. The biggest dam projects such as Tekezé and Gibe III have all been partially funded by China providing Ethiopia with both capital and expertise from the second-biggest economy in the world. Traditional donors were more cautious, with the World Bank financing only one project in 2004 (Gibe I). Other important donors include the African Development Bank (AfDB) and the Italian government.

A substantial number of dams have been or will be built in the semi-arid part of the country to provide water for urban and rural settlers, farmers and industry. The Government of Ethiopia (GoE) expects industry, agriculture

(irrigation) and transport (electrical railways) to become the biggest consumers of energy during by 2020. Moreover, the GoE plans to increase its energy exports to other neighbouring economies such as Kenya (including an anticipated new power purchase agreement called Kenya II), Sudan, Egypt, Djibouti and Tanzania from 1,445 GWh in 2013 to 35,303 GWh by 2037 (EEPCO, 2013; See Figure 1). However, not only large dams will be built but also 105 small dams along smaller rivers, which provide up to 11MW for local energy supply and irrigation water for agriculture (Anonymous, 2016b).¹

Figure 1: Ethiopian electricity exports until 2037 (forecast)

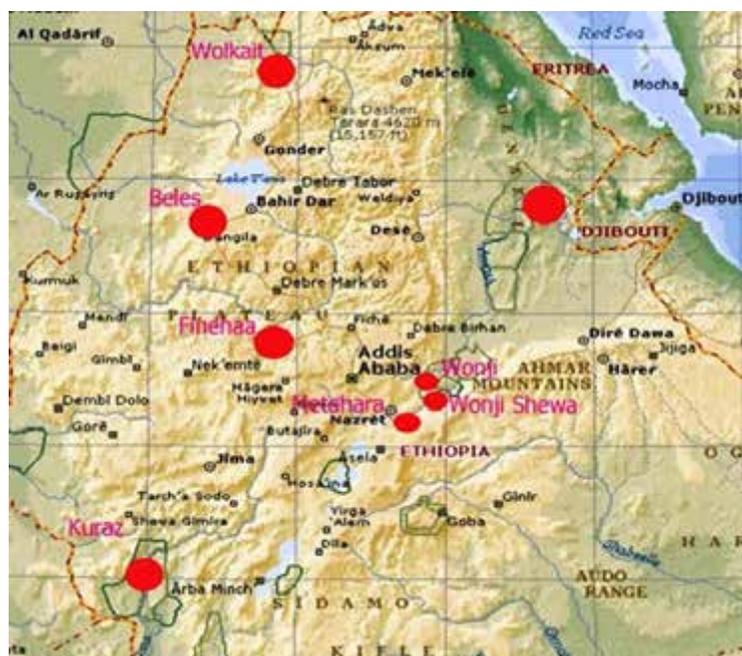


Source: EEPCO (2013).

As a second rationale, Ethiopia seeks to become a net exporter of electricity to other neighbouring countries in East Africa.² At the same time, Ethiopia has an ambitious food security strategy to produce food sufficient for the anticipated 140 million Ethiopians by the middle of the century. The agricultural sector is still and will remain the most important sector in the economy with an estimated share of 40% of GDP by 2020 (Federal Government of Ethiopia, 2015). The agricultural sector has also attracted substantial domestic and foreign direct investment to increase exports.

Sugar cane is a key crop in these agricultural strategies. In 2010, the Government of Ethiopia has launched a sugar development programme led by the Ethiopian Sugar Corporation to increase production through large-scale irrigation plantations (Ethiopian Sugar Corporation, 2012). A substantial amount of the sugar cane production will also be used for ethanol production for energy.

Figure 2: Ethiopian Sugar production strategies



Source: Ethiopian Sugar Corporations (2012).

¹ A large dam is defined by IUCN as one higher than 15 meters high and a major dam as higher than 150 meters (IUCN, 2007).

² Key-Informant 7, November 2015.

2.2. Kenya

Kenya serves as an example of a political economy that has undergone transition in recent years. As a response to historically centralised power, the new constitution adopted in 2010 has devolved power from the national to the county level, decreasing the role of government at the national level. In parallel, a younger business elite has also been able to influence the government's economic, social and political strategies in recent years (Booth, Cooksey, Golooba-Mutebi, & Kanyinga, 2014). The Government of Kenya (GoK) economic plan is set out in the Vision 2030 strategy – a development plan following five-year plans to transform Kenya into a middle-income economy by 2030 (Government of Kenya, 2008). It consists of three pillars (economic, social and political) in which energy is one important sub-part. However, the GoK's main focus in its energy strategy is to increase oil and gas extraction and to build more large and small dams including the High Grand Falls. Dams are particularly important for strategies for economic development, the agricultural sector, and water security. The GoK has announced the construction of 1000 small dams each year across the country at the community level to provide water for drinking and agricultural purposes to rural populations.³

While the future energy mix of Kenya is planned to be more diverse, large multiple-use dams will continue to play their part. Especially national public agencies such as the Tana and Athi Rivers Development Authority (TARDA) which advocates further dam construction. However, the political importance of national agencies may decrease as decentralisation shifts power to the county level.⁴ One of the national flagship projects advocated by both the national and county administrations is the Lamu Port Southern Sudan-Ethiopia Transport (LAPSSET) Corridor project, also known as the Lamu Corridor. This mega transport and infrastructure project is intended to become a new transport corridor for Ethiopia, South Sudan and Kenya. LAPSSET will also mitigate population pressures from the wet centre of Kenya by generating new cities in the Northeast's drylands.

In terms of finance, the public sector in Kenya has been shifting between traditional and non-traditional donors. After traditionally being closely aligned with traditional multilateral development banks and bilateral donors, a slogan 'Looking East' has captured Kenya's openness to China. China in particular has served as a key financier for infrastructure and energy projects (Booth et al., 2014). However, 'Looking East' is also influenced by perceived humiliations of the President and senior government ministers by Western governments including concerns raised about corruption. For example, some Kenyans were dismayed that President Obama did not visit until 2015, despite his Kenyan heritage. Similarly, there have been sensitivities in terms of the respect accorded to President Kenyatta by EU leaders. These perceptions partly explain why Kenya has begun to look for new partnerships with China and other Asian countries, although changes in availability of finance are also a crucial driver (Ibid).

The main potential for building large-scale water infrastructure providing water, energy and food for Kenya's drier areas is located along the Tana and Athi Rivers. However, this potential is already two thirds utilised, leaving limited scope to construct more dams. In 2014, the Thwake multi-purpose dam was opened by President Kenyatta funded by traditional donors such as the World Bank, the African Development Bank and Nordic donors (AfDB, 2013). The High Grand Falls dam would be the last dam on the Thani river before the hydropower potential of Kenya's longest river is fully utilised.⁵ Whether the High Grand Falls dam will be constructed depends on the ability of the GoK to mobilize from development partners US\$ 1.5bn to fund the project.

Although it is less active in Kenya than in Ethiopia, China is regarded as the key alternative to financial sources. The GoK hopes to attract capital from China or elsewhere in Asia to fund the High Grand Falls dam project that is intended to provide water to grow food and generate energy to support the Lamu port. The economic rationale behind this project is driven by population growth and domestic energy demand, not energy exports (as in Ethiopia). Kenya's population is projected to grow by 1 million annually from 40m in 2010 to 85m by 2050, and the government hopes to reduce population pressures by resettling people in the country's arid and semi-arid areas. This proposed mega project for water, energy and food security will therefore provide a basis for new settlements.⁶

³ Key Informant 19, December 2015.

⁴ Key Informant 19, December 2015; Key Informant 21, December 2015.

⁵ Key Informant 21, December 2015.

⁶ Key Informant 18, December 2015; Key Informant 19, December 2015.

2.3. Tanzania

Tanzania has been transitioning from a socialist to a market economy since the 1990s (Booth et al., 2014). In recent years, the energy sector has seen a number of political reforms toward privatisation. The public utility Tanzania Electric Supply Company Limited (TANESCO) has seen a number of management changes aimed to support privatising the company in the coming years. The Government of Tanzania (GoT) has set the target to increase energy production from currently 1,400MW to 10,000MW by 2025 (Tairo, 2016). The GoT has invited local investors to invest in gas, hydro, coal, oil, gas, wind, solar etc. to generate power. However, hydropower in Tanzania has already developed a mixed reputation among donors and energy analysts. In particular, since the 2015 drought has caused older hydroelectric plants to be shut down due to a lack of water for generation (Anonymous, 2015b). Investment advisors and donors therefore see other sources of energy as potentially more commercially attractive than hydropower given the risk of droughts⁷. Against this backdrop, the energy sector in Tanzania is characterised by having significant room for projects by supported bilateral and multilateral donors and NGOs.⁷ Yet, the pursued projects are targeted toward small, decentralised energy solutions such as small hydropower and small storage dam facilities in the range of 4-8MW (Anonymous, 2015a).

The Ministry of Water has envisaged larger hydro power projects in the Southern part of the country in the bordering area to Malawi. However, whether these projects will be built depends on the willingness of donors to provide capital for new dam developments. Since the Lake Malawi region of Tanzania is not located in semi-arid areas, the study will not focus on these proposed developments in Tanzania, which are aimed at making use of the hydro potential in wetter southern-western areas of Tanzania. Instead, it will look at dams in semi-arid regions. Respondents in Tanzania from both government and donor circles did not rule out further investment in large-scale water infrastructure in semi-arid regions.⁸ However, the vast majority of Tanzania's estimated 3,800 MW economic hydro potential capacity is located in small hydro, which includes drier and wetter parts of the country. It is estimated that 100 GWh/yr could be produced from micro/mini systems. A small hydropower project produces energy in the range of 1 to 20 MW; a mini hydro is defined as 100 to 1,000 kW, and a micro hydro can generate from 5 to 100 kW (Small Hydro, 2016). Presently only one third of this potential is produced from these smaller systems (UNDP, 2015b). It is important to note that small hydro does not alter the river flow but makes use of natural water movement. Tanzania's multipurpose water infrastructure is already affected by the consequences of droughts. The GoT gives water for urban and rural consumption priority over water for irrigation, water for the ecosystem and water for energy.⁹ Donors have also voiced their doubts large-scale water infrastructure would receive funding in a business climate favouring small systems.¹⁰

Yet, in this climate of political strategies aimed at economic growth, the crucial question is who funds those very ambitious plans of large-scale water infrastructure East Africa?

2.4. The donors: traditional and non-traditional funders of large-scale water infrastructure

Figure 3: Waves of dam finance in East Africa



Source: Keulertz (2017).

⁷ Key Informant 12, December 2015; Key Informant 13, December 2015.

⁸ Key Informant 18, December 2015; Key Informant 13, December 2015.

⁹ Key Informant 10, December 2015; Key Informant 11, December 2015; Key Informant 17.

¹⁰ Key Informant 14, December 2015;

There have been several waves of finance for large-scale water infrastructure in East Africa, reflecting changes in global economic power relations. The first - small - dam constructions took place in the late colonial period, capitalised by the colonial powers. Before and after independence, financial support for large-scale water infrastructure traditionally came from multilateral development banks such as the World Bank and bilateral donors from Europe and North America. However, during the 1990s criticisms of environmental and social impacts of dams, and increasing risks to their reputations, prompted several European and North American donors to withdraw or reduce their bilateral support for dam finance.¹¹ Large bilateral donors such as the Germany, United Kingdom and United States have all withdrawn from large-scale dam finance. Instead, the task of dam finance has been channelled to both the African Development Bank and the World Bank since the late 1990s and early 2000s.

Only a limited number of European countries actively supported large-scale water infrastructure in East Africa during the 1990s and 2000s. In particular, three Nordic governments became very active in planning and funding dams in East Africa. During this period NORAD (Norway), SIDA (Sweden) and FINNIDA (Finland) also emerged as significant players in East African large-scale water infrastructure during this period. The Nordic donors and the World Bank were particularly concerned about environmental and social impacts of dam infrastructure, which led to an increase focus in the design of projects and inclusion of conditionality of grants and loans to ensure environmental and social safeguards were addressed in project design, construction and operation.¹²

Currently, however, Nordic donors face budget restrictions. As these countries reprioritise budgets to meet the current humanitarian and refugee crisis in Syria and Europe, budgets for international development have been cut by up to 80% in Finland, Norway and Sweden.¹³ However, as the European Investment Bank (EIB) has recently opened new offices in East Africa and has expressed interest in dam finance, a new European donor may be positioned to fill the gap left by reductions in Nordic finance.¹⁴

Italy is another significant financier of dams, particularly in Ethiopia due to relationships that are a legacy of their historic relationship. Another reason for the involvement of the European countries is the objective of funding their home industries. For example, Salini Impregilo S.p.A. is one of the largest construction and civil engineering companies in the world specialised in the construction of dams. Salini Impregilo has established itself as the market leader for planning and construction of dams in Ethiopia. In some cases, Salini Impregilo which uses a “fast track” approach to planning, construction and mobilisation of funds and has been contracted directly by Ethiopia for dam construction projects without having to go through a competitive bidding process.

The political economic importance becomes further evident when describing the role of Chinese companies and lenders in East African dam finance. China is a highly successful alternative to Western sources of finance. Since the 2000s, China has become the one of the largest funders of dams in East Africa and the world (McDonald, Bosshard, & Brewer, 2009; Shifflett, Turner, Dong, Mazzocco, & Yunwen, 2015). Part of the objective of the Chinese is to establish an alternative to Western donors. The other important reason is to support Chinese construction and engineering companies such as Gezhouba and Sinohydro to enter the global dam market and other forms of engineering projects. At present, the parastatal Export-Import Bank (EXIM - China) is the main source of Chinese investments in large-scale water infrastructure in East Africa. The usual loan agreement between China and developing countries includes 25% grant payment. The remainder is provided as an unconditional loan by a state-owned bank such as EXIM (China). China has become a favourite among the political elites in Ethiopia, Kenya and Tanzania given its laissez-faire approach to conditionality, its generous grant funding and the fast delivery of large-scale water infrastructure by Chinese engineers, equipment suppliers and construction contractors.¹⁶

Finally, private sector banks and capital investment funds are increasingly financing East African energy infrastructure, and have been described as the ‘people to watch in the future’ in the wider energy sector.¹⁷ However, funding for large-scale water infrastructure is almost entirely in the hands of the public sector because of the amount of funding required for projects, risks of cost over runs and the long-term period for

¹¹ Key Informant 1, November 2015.

¹² Key Informant 24, January 2016.

¹³ Key Informant 4, November 2015.

¹⁴ Key Informant 2, November 2015; Key Informant 3, November 2015.

¹⁵ Key Informant 5, November 2015; Key Informant 27, January 2016.

¹⁶ Key Informant 7, November 2015; Key Informant 8, November 2016.

¹⁷ Key Informant 1, November 2015; Key Informant 2, November 2015; Key Informant 3, November 2015.

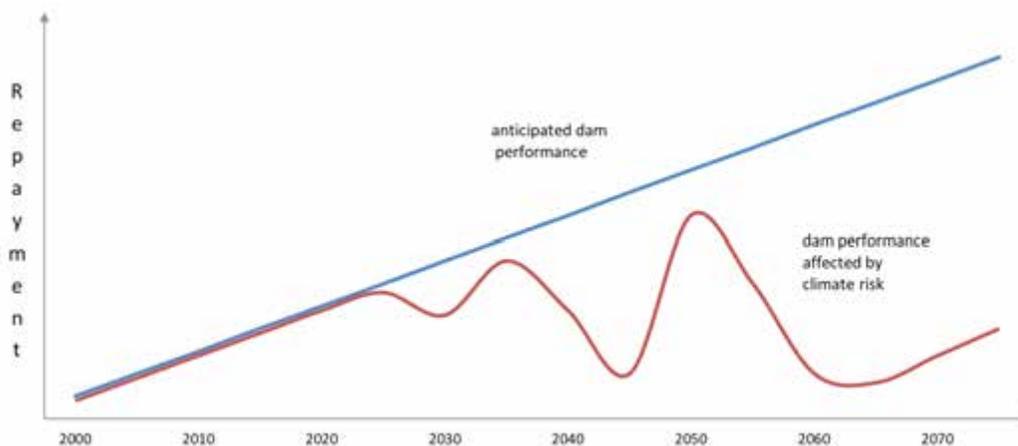
repayment of loans, and to date private sector dam finance has been marginal. Although JP Morgan was reportedly considering Gibe III dam in Ethiopia, public pressure from the NGO International Rivers contributed to an eventual decision against involvement (International Rivers, 2008). Other private sector investors such as Black Rhino (a subsidiary of the world's largest infrastructure investor Black Rock) have recently entered the Ethiopian market interested in geothermal power. At the same time, the strength of the private sector in Kenya and Tanzania attracts private capital from other parts of the world. Private sector involvement could, however, make hydropower less attractive if other energy sources such as geothermal or gas extraction are being considered.

Key to investment is the role of risk management as lenders are predominantly concerned about repayment of the loans. Climate risk could have very detrimental effects on repayment ability of creditors (Stenek, Amado, & Connell, 2010). If extreme weather events occur, dams may not be able to store sufficient water for energy or food production, hence contracts with neighbouring countries about energy deliveries may have to be breached at times. Moreover, dams can also be at risk of damage from floods and their long-term performance affected by siltation of reservoirs. Dealing with nature involves a number of uncertainties. In the twenty-first century, climate risk is one of the key unknown environmental and economic variabilities in dam planning and operation. The next section will provide an indication of climate trends in East Africa to illustrate the climate risk to existing and planned dam developments in East Africa.

3. Climate risk to dams in East Africa

Dams are long-term investments, with lifecycles measured in decades. In a changing climate, this longevity means that dams will be subject to hydro-climatic changes over their lifespan (see Figure 11). These changes might positively or negatively affect feasibility, performance, and cost/benefit ratios of dams. For example, in areas of drying and drought the ability of dams to store water may be more valuable, while hydropower generation may be less reliable and profitable. Similarly, in areas exposed to increasing flood extremes, siltation from higher sediment flows could reduce the effective lifespan of dams if not managed properly. In short, the economic effectiveness of investments in dams could be severely affected by climate risks.

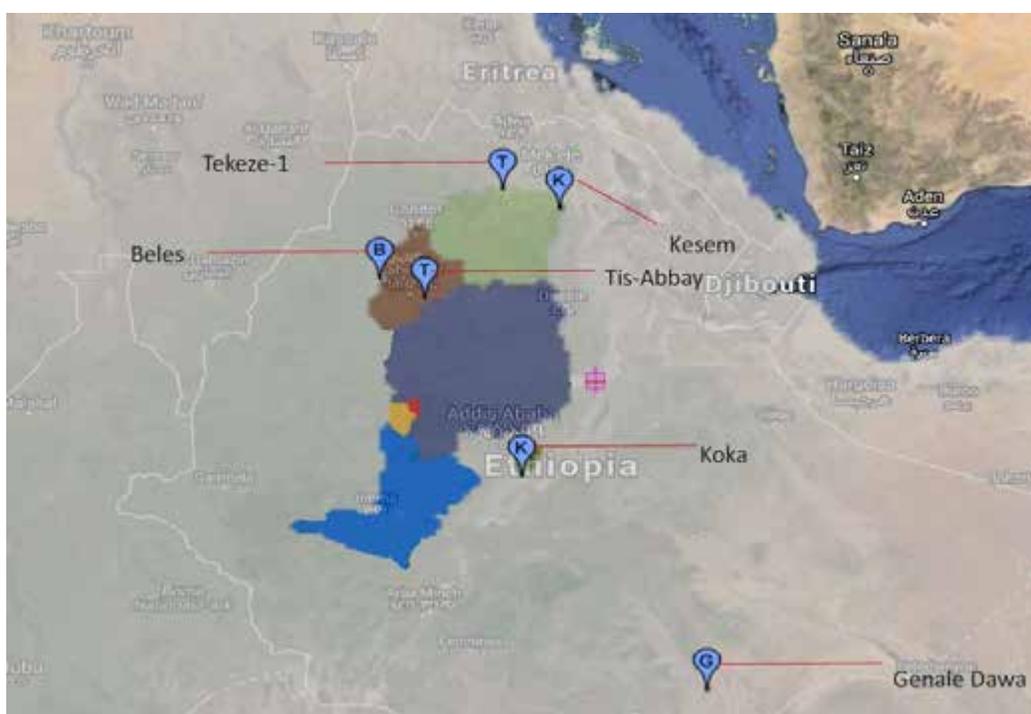
Figure 4: Possible impact of climate risk on dam performance and repayment



Source: Keulertz (2017).

Several dams in Ethiopia, Kenya and Tanzania are either already or going to be located in areas with semi-arid climatic conditions. Figures 5 and 6 show the dams in all three studied countries in watersheds subject to semi-arid climate (see Annex for further details).

Figure 5: Existing and proposed dams and catchment areas in Ethiopia



Source: Polycysupport.org (2016).

Figure 6: Existing and proposed multi-purpose dams in semi-arid areas in Kenya and Tanzania



Source: Polycsupport.org (2016).

There may be a risk to dam performance in those areas resulting from future extreme weather events such as droughts or flooding. In some cases, extreme flooding events could also affect dam safety depending on the design and operation of the specific investment. On the other hand, multipurpose dams could provide climate adaptation options by storing more water to prepare for prolonged droughts or absorb inundation of flooding giving greater flexibility for the management of climate change. Both scenarios could however lead to periodic changes in the nature and reliability of operation of dams resulting in a reduction in energy generation capacity and provision of water for agricultural, domestic and industrial uses. This raises the question whether dam finance deals with these specific climate risks from an economic perspective. In their 2015 climate report, Mercer attributed climate change to 'a new return variable' (Mercer, 2015). However, how is this economic variable viewed by funders of current and potential large-scale water infrastructure in East Africa?

4. How is climate risk dealt with in dam finance and what are the potential shortcomings and emerging trends?

Climate risk is an increasingly important topic for infrastructure finance managers. Yet adaptation to extreme weather events, such as droughts and floods, is not systematically included in feasibility studies for dams or taken into account by planners. The Hydropower Sustainability Assessment Protocol (HSAP), is a tool developed by a group of international hydropower experts under the roof of the International Hydropower Association to promote and guide more sustainable hydropower projects. It regards climate risk as an emerging cross-cutting issue for dam planners. The ‘basic good practice’ entails identifying ‘issues which may impact on water availability or reliability’, while ‘best practice’ requires carrying out a specific assessment of climate change (International Hydropower Association, 2010).

In other words, climate change impacts are on the HSAP agenda, although not a central issue. However, it especially affects dam planners and building companies, who are more sensitive to sustainable construction and planning (International Hydropower Association, 2010). In contrast to the recommendations of HSAP, one key informant interviewees said that for a long time, climate risk was treated as another ‘tick the box issue, similar to gender’. However, it has been given significantly higher attention in the past decade. Traditional donors and non-traditional donors such as China take different approaches. The study examined donor approaches to this issue and it became evident that traditional and non-traditional donors take different approaches on environmental impact associated with climate change on economic performance of dams. The new multilateral development banks that have been developed over the last two years have adopted approaches to climate change that are aligned with the approaches used by the older banks.

4.1. Traditional donors

4.1.1. The World Bank

The World Bank investments decisions are made in the context of country development strategies that are often complemented by specific strategies for the water, energy and agricultural sectors. In some cases, these decisions are also informed by larger multi-country and multi-donor processes such as the Nile Basin Initiative (NBI). For example, under the NBI a Strategic Environmental Assessment, which included significant work on climate change, was prepared for the Equatorial Nile with specific reference to investments in hydropower. The World Bank also has a major program on climate change mitigation and adaptation which supports studies and investments at the country level.

The World Bank makes decision processes on dams as transparent and accountable as possible, which includes making studies publically available. The World Bank sees its primary concerns whether a multipurpose dam will remain fit-for-purpose over its lifespan and whether it will remain economically robust. The preparation process used by the World Bank for dams includes economic and financial analysis, environmental and social assessments and dam safety plans. These concerns are basic principles of the Bank’s engagement rather than terms of finance per se. Moreover, the Bank would ‘ideally be helping our client countries operationalise climate risk management across multiple scales (basin optimization; project selectivity; project design, etc.)’.¹⁸ Climate risks such as droughts and floods are increasingly addressed in the environmental, social and economic assessment studies by the World Bank. For example, the planning of the Tarbela Dam Extension 4 (Additional Financing) Project in Pakistan which was approved in mid-2016 included extensive analysis of climate change.

In order to address climate risk, the World Bank has in the past five years led the development of tools that screen climate and water risk in line with wider social, economic and political goals of a country (World Bank, 2016). More importantly, it has established multi-stakeholder dialogues with NGOs and government organisations. These have included forming the informal Alliance for Global Water Adaptation (AGWA), which governed by a steering committee composed of a World Bank and a Stockholm International Water Institute (SIWI) representative (AGWA, 2016).

¹⁸ Key Informant 29, October 2015.

AGWA's main focus is to provide solutions for water engineers and the agencies that employ or finance them. The main impetus comes from Rijkswaterstaat (in the Netherlands) and the Institute of Water Resources for the US Army Corps of Engineers.¹⁹ The latter is also a major funder of AGWA. The technical guidance document 'Climate Risk-Informed Decision Analysis' for water and infrastructure managers is provided on the AGWA website for the second quarter of 2016. It describes itself as a practical guidance document beyond the emphasis on climate modelling. 'The target for the CRIDA technical guidance are water resources engineers and practitioners seeking practical, stepwise guidance to assist in design and planning for climate change resilience in international development. The scope is for practitioners working on site specific problem solving, such as water shortages and drought at a specific geographical locations in developing and highly vulnerable regions of the world. Future versions will include basin level strategy development, which will require more thought into governance and institutions' (CRIDA, 2016). The informality of the AGWA network provides the group with an important degree of independence to achieve impact. Yet, the network will have to prove its ability to impact infrastructure finance in the coming years.

4.1.2. European Investment Bank

Another traditional donor described as highly interested to fund dams is the European Investment Bank (EIB).²⁰ The EIB recently opened an office in Addis Ababa to increase its involvement in Ethiopian infrastructure finance. The EIB does not yet have a systematic approach to which climate models used. However, a system is presently tested that automatically runs 16 models and 'thus gives us confidence if at least 13 of the 16 models agree on the likely scenario/outcome'.²¹ For more specific modelling, the World Bank climate portal is applied in the decision-making process using CMIP 3 and 5 as models for future temperature and rainfall, which the EIB views as robust enough. The EIB expects that systematic climate risk screening will result in the need for more capital investment for adaptation such as increasing dam storage. Climate risk could also lead to a negative funding decision for dams.

4.1.3. African Development Bank

AfDB has developed a Climate Risk Management and Adaptation Strategy aimed at reducing climate vulnerability within the regional member countries of AfDB. Climate resilience is promoted in past and future bank-financed investments including capacity building within regional member countries on climate change adaptation. The strategy focuses on three key areas of intervention: "climate-proofing" investments, policy, legal and regulatory reforms and knowledge generation and capacity building. All of AfDB's due diligence procedures will be revised to incorporate climate risks. As part of the due diligence process in each department, task managers will carry out a quick screening of project and program proposals to identify country-, region-, and sector-specific climate risks during project design (Stenek et al., 2010).

4.1.4. Bilateral donors

The three traditional donor countries most active in East African dam finance are Finland, Norway and Sweden. In particular Norway has been a key country of finance to East African governments through Norfund – the Norwegian Investment Fund for Developing Countries. In the past, Norfund has played a significant role in both Ethiopia and Tanzania to provide loans for feasibility studies of dams and eventually dam finance. Together with Finland and Sweden, it has funded Pangani Falls dam in Tanzania and provided finance for upgrading Kindaruma dam in Kenya in 2013 (see Table 1). Since the inclusion of climate risk is a relatively new topic, it played no role in the environmental and social impact assessments of the three Nordic donor countries when they assessed their involvement in Kenya and Tanzania.²² As mentioned in section 2.4), future dam finance from Nordic donors may be 'uncertain' due to severe funding cuts in development budgets.²³ No data has been available for Italian development finance.

¹⁹ Key Informant 26, February 2016.

²⁰ Key Informant 1, November 2015.

²¹ Key Informant 30, October 2015.

²² Key Informant 4, November 2015.

²³ Key Informant 14, November 2015.

4.2. Non-traditional donors

4.2.1. China

China has become most important financier of dams in East Africa since the early 2000s. However, Chinese financiers have only recently begun to take climate risk into account. Although external analysts have described Chinese financiers as ‘benevolent’²⁴ and Chinese experts have emphasised the importance of environmental risk assessments,²⁵ other experts have reported of low levels of interest by Chinese funders in rigorously assessing environmental and social questions. Oftentimes, Chinese financiers are unaware of the specific environmental and social risks involved in dams they are considering for funding. In line with China’s policy of non-interference in other countries’ political systems, the task of conducting environmental and social impact assessments is usually delegated to the host government. According to a study carried out by researchers based at the School of Oriental and African Studies (SOAS) in London, Chinese supported dams are built in compliance with national legislation, policies and practices defined by the national governments in Africa (Urban, 2015). This leads to a situation that ‘no questions being asked’ by Chinese financiers such as the EXIM (China) prior to the loan agreement.²⁶

4.2.1. New Multilateral Development Banks

The Asian Infrastructure Investment Bank (AIIB), founded in 2015 and based in Beijing, includes climate change as an element of its Environmental and Social Framework which was approved in early 2016. The Vision Statement of the Framework recognizes the overarching importance of addressing climate change mitigation and adaptation in the work of the Bank and specifically links this to the provisions of the Paris Agreement of 2015. The complementary Environmental and Social Policy provides for examination of climate change as an element of environmental and social assessment of risks and impacts of projects.

The recently established New Development Bank (NDB), which started in 2015 and is based in Shanghai, actively considers taking climate risk into account in their yet to be defined lending strategies. Climate risk may not be included in terms of interest rates but in terms of tenor (term length of a loan), in the amount of Debt Service Reserve Account and restricted payment test conditions for dividend pay-outs.²⁷ The Environmental and Social Framework of the NDB (2016), which was made available in mid-2016, notes in both the core principles and guidance on environmental and social assessment the need to address climate change and encourages climate proofing of its infrastructure financing and investments to build resilience to climate change.

²⁴ Key Informant 28, October 2015.

²⁵ Key Informant 5, November 2015; Key Informant 25, January 2016.

²⁶ Key Informant 1, November 2015.

²⁷ Key Informant 27, January 2016.

5. What needs to be done to comprehensively address climate risk in dam finance?

Climate risk in dam finance is an emerging issue that is approached differently by donors, which reflects their differing mandates. While traditional donors multilateral and bilateral donors have a mandate to support economic development and political stability, non-traditional donors such as China seek to utilise commercial opportunities in East Africa. Following these mandates, donors have different approaches to climate risk in dam finance. Multilaterals have begun to actively address this issue through international fora such as AGWA. The new multilateral development banks, AIIB and NDB, have broadly aligned their approach to climate change with that of the older institutions such as the AfDB, EIB and World Bank. Given the mandate of bilateral traditional donors to support development and stability, their approaches have yet to be harmonised with the approach of multilaterals. The same applies to the non-traditional donor China, which still applies a commercial interest strategy. A key first recommendation of this study is to increase efforts to harmonise policies and approaches for addressing climate risk in dam funding. However, a key obstacle for this is the inherent challenges of the political economies in East Africa. The study will present three key challenges to overcome.

5.1. Political stability concerns

As shown in Section 2, the main recipient of donor funds for multipurpose dams is Ethiopia due to its position as the ‘water tower’ of East Africa’. Tanzania and Kenya receive much smaller amounts of funding and attention due to their less promising hydro-potential. Ethiopia has also in the past few years acted as a stabilising factor in a highly volatile region with several failed or near-failed states in its immediate neighbourhood. Conflicts in Darfur, South Sudan, Somalia and Eritrea have given rise to Ethiopia’s regional role as a ‘hegemon’ (Verhoeven, 2015). At the same time, the recent political developments in Egypt has further strengthened Ethiopia’s regional role. A failed state in Ethiopia could lead to major regional instability that may not be confined to East Africa but which could affect the Middle East. Hence, there is an interest among bilateral donors to provide social and economic support for keeping the country stable.

In recent years, donors have queued up in Ethiopia to provide support to the government.²⁸ Water, energy and food are crucial underlying elements for political and social stability and economic development, and so Ethiopia’s water sector has received approximately \$ 5bn from traditional and non-traditional donors since the 2000s.²⁹ Due to its multi-ethnic population, Ethiopia is regarded as a fragile state (Stewart, Brown, & Ukiwo, 2009). It is feared that conflict between the 80 ethnic groups could occur in times of economic problems. Bilateral donors have invested significant amounts into Ethiopia’s economy in recent years to provide aid for social and economic development. Led by the United States (\$ 800m per year), Europe (\$ 300m a year) and China (unknown amount), Ethiopia has become one of the fastest growing economies in the world with 7-10% growth rates.

Due to high donor interest from both traditional (bilateral and multilateral) and non-traditional sources, vast amounts of capital have been made available to the Ethiopian government. Ethiopia’s water infrastructure has partly benefitted from this major increase in funding. Especially Chinese investors have played an important role in investments in large-scale water infrastructure lest not because Ethiopia is following the Chinese model of state-led economic development.

Ethiopia’s economic success aided by foreign capital has also generated economic expectations. Especially, Chinese banks have viewed Ethiopia as a highly profitable playing field for investment in the energy sector. The rationale of these investments has been to generate large returns; however, they risk ensuring financial sustainability. Ethiopia’s increasing foreign debt of 23% in 2014 has recently led to Chinese concerns over the sustainability of fiscal policy. Increasing caution on credit risk by the Chinese side has therefore been noted.³⁰ Hence, sustainability in the political economy of Ethiopia is not confined to the environment but spans across several levels.

²⁸ Key Informant 2, November 2015.

²⁹ Key Informant 9, November 2015.

³⁰ Key Informant 1, November 2015

5.2. Competition among donors

A further emerging problem is the increasing competition between traditional and non-traditional sources of development finances, which leads to low or no levels of harmonisation of funding policies and approaches for dams. While until the early 2000s development was dominated by long established multilateral development banks and OECD bilateral donors, the past 15 years have seen increasing competition between two different models for development support. Government perceived Western interference in domestic politics through policy dialogue and conditional grants and loans was contradicted by China's approach of political of non-interference. This has also played out in dam finance. During the negotiations over the potential financing of Gibe III dam in Ethiopia, the EIB and World Bank asked for supplemental environmental and social studies and mitigation and monitoring measures to be adopted in order to fund the project. The Meles government turned to China instead for funding of the project. As one involved Western expert recalled "No questions were asked by the Chinese". Chinese companies were awarded the tender.³¹

Questions about their development strategies are also not liked by government officials in East Africa. As one Ethiopian government advisor put it bluntly: 'The international community can go to hell. We are going to develop as we like.'³² Thorough analyses and tough questions could turn off governments in East Africa, which leaves less opportunities for traditional donors and their contractors.

Countries with a stronger private sector such as Kenya and Tanzania have limited dam developments despite a hydropower potential and similar needs to ensure food and water security. The strong role of the private sector in both economies has led to investments in other forms of energy than multipurpose dams. Only government agencies such as TARDA or LAPSSSET still seek to expand dams in Kenya. Yet, due to the new constitution and the strength of the private sector, the government agencies in Kenya have found significant competitors in the energy sector, who increasingly diversify their investments. It is therefore no surprise that future plans to fully utilise the hydropower potential in Kenya are not rigorously pursued. In Tanzania, large-scale water infrastructure has almost no importance in the development strategies of the government. Instead, investment in small dams is pursued, which development is almost entirely in the hands of donors and the Tanzanian private sector. China is also not a strong player in the Tanzanian energy sector. Due to the active involvement of the private sector, the focus is more placed on a diversified energy mix of renewables and fossil energy sources.³³

5.3. New institutions to address climate change

Although the financial sector has understood the risks derived from climate change, the discourse is largely focussed on the analytical side. Economic risks are well-understood by the financial sector (Stenek et al., 2010). However, no bank, no financial institution has a long-term planning horizon as required for managing climate risk. As Conca rightly points out, the institutions to deal with climate change and climate risk are missing. The uncertainty surrounding the precise 'when, where, and how much' of climate change also makes it difficult to allocate resources efficiently in response to the anticipated problems by financial agents (Conca, 2015). Political objectives trump long-term economic reasoning in a global political economy that is only gradually begin to address climate risks. The Paris Agreement has however introduced measures for climate adaptation and mitigation, which has been ratified by the governments of traditional bilateral donors and also China (UNFCCC, 2016).

Alleviating poverty and providing a political-economic climate that keeps economies and societies stable in the greater Horn of Africa region are two major objectives of traditional bilateral donors. The recent flow of migrants to Europe has reaffirmed the necessity to stabilise Ethiopia, Kenya and Tanzania. Non-traditional donors seek to tap into the availability of natural resources to provide funding for future economic links between East Asia and East Africa.

Climate risk is currently an emerging issue a financial sector that nevertheless is industriously developing new tools for assessment. The long-term thinking required for climate risk management is difficult given existing

³¹ Key Informant 3, November, 2015.

³² Key Informant 7, November 2015.

³³ Key Informant 15, November 2015; Key Informant 16, November 2015; Key Informant 17; Key Informant 22, December 2015; Key Informant 23, December 2015.

incentive and institutional structures. Part of the problem is the uncertainty of currently available data required to make long-term decisions such as on climate risk. The AGWA seeks to tackle this gap by suggesting ways forward aimed at institution building for climate risk beyond mere technical tools. However, these initiatives are under way in 2016, yet not well harmonised at the moment. Climate institutions are however developed both globally and locally by introducing completely new rules of the game to govern the global commons. An example for this is the Green Climate Fund whose objective is to provide infrastructure funding only if climate mitigation and adaptation standards are included (UNFCCC, 2016).

6. Conclusions

Dam finance is presently in a transitional stage of internalising the future externality of climate risk. Although more extreme weather events could affect dam performance over the life span of dams, the political economy of dams still has a long way to go to take this externality into account. Climate risk addressed as an element of the environmental and social assessment of risks and impacts by multilateral traditional donors. However, these approaches have not trickled down to non-traditional lenders from China yet, which take a commercial perspective on dam finance. Nevertheless, donors do understand the challenges derived from climate risk. Especially the multilateral development banks which are currently working on ways to address climate risk in dam finance.

The risk of extreme weather events can only be internalised if climate risk is addressed from the very beginning of a dam project idea. It needs to be incorporated in the economic feasibility studies to account for the potential future business risks of dams in vulnerable climatic regions. Donors need to establish jointly agreed policies and approaches for financial managers on how to deal with climate risk. If models estimating future water availability were part of a mandatory screening exercise during the economic feasibility studies, performance and dam safety could greatly benefit as planners would be provided with space to increase the climate risk preparedness of dams. However, at this moment, climate risk is still an emerging topic on the agenda of the international community, which is now in the process of defining a clear agenda on how to internalise economic and environmental and social costs derived from a changing climate.

A key factor that stands in the way to address climate risk more comprehensively is the greater need for harmonisation of financing policies and approaches for dams among funders. Dams can provide very important political economic returns to alleviate pressing political objectives such as water management, energy generation, food security and poverty reduction. However, dams may also cause political-economic problems if extreme weather events may bring about disruption of services provided by multi-purpose dams. It is not in the interest of traditional bilateral or Chinese donors not to take adequate measures in their funding agreements to screen climate risk for sustainability of dams. Greater policy harmonisation of funders could also strengthen institutions in recipient countries making it a very useful objective to pursue in the coming years. Competition of donors provides no answer to the environmental and social challenges of the twenty-first century, which will be significantly defined by the ability of governments, the private sector and civil society to adapt to and to mitigate climate risk.

This study makes four key policy recommendations:

- Applied rules for climate risk need to be further developed.
- Climate risk has to be addressed in dam funding from the beginning of the projects.
- Traditional and non-traditional donors should harmonise their funding guidelines.
- Improve institutions in recipient countries to strengthen water and energy policy by incorporating climate risk screenings.

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Annex

Annex 1: Interviews

30 semi-structured interviews with representatives from governments, international organisations, financial institutions, energy companies, bilateral donors, NGOs, the private sector and academics were conducted from November 2015 to February 2016 in Ethiopia, Kenya, Tanzania, China and by email.

Table A1: List of key-informant interviewees

Name	Institution/position
Key Informant 1	Programme Manager at a European donor to Ethiopia
Key Informant 2	Programme Manager at a European donor to Ethiopia
Key Informant 3	Senior Advisor at an international organization in Ethiopia
Key Informant 4	Climate Change and Energy expert at a European donor to Ethiopia
Key Informant 5	Expert at a Chinese joint venture in Ethiopia
Key Informant 6	International hydrological modeler in Ethiopia
Key Informant 7	Senior expert at an Ethiopian Federal Ministry
Key Informant 8	Senior expert at an Ethiopian utility company
Key Informant 9	Power plant manager
Key Informant 10	Senior expert at an Ethiopian Federal Ministry
Key Informant 11	Programme Manager at a European donor to Ethiopia
Key Informant 12	Energy Coordinator at an NGO in Tanzania
Key Informant 13	Programme Manager at a European donor in Tanzania
Key Informant 14	Senior expert at a European donor to Tanzania
Key Informant 15	Senior expert at a Tanzanian utility company
Key Informant 16	Senior expert for dam planning in Tanzania
Key Informant 17	Senior expert at a Tanzanian ministry
Key Informant 18	Private sector consultant in Kenya
Key Informant 19	Water Consultant in Kenya
Key Informant 20	Senior expert at a Kenyan ministry
Key Informant 21	Senior technical manager at a river basin authority
Key Informant 22	Programme manager at a European donor in Kenya
Key Informant 23	Planning manager at a construction office
Key Informant 24	International development expert
Key Informant 25	Senior academic at a Chinese university
Key Informant 26	Senior expert at AGWA
Key Informant 27	Senior advisor to an Asian development bank
Key Informant 28	Senior academic at a UK university
Key Informant 29	Senior expert at an international development bank
Key Informant 30	Financial advisor at a European development bank

Annex 2: Existing and planned multi-purpose dams in semi-arid areas in Ethiopia, Kenya and Tanzania

The table below outlines existing and planned multi-purpose dams in semi-arid areas in Ethiopia, Kenya and Tanzania. While data on financial sources and loan agreements is available for existing dams, data for planned projects is both scarce and uncertain. This is unsurprising, as agreements for proposed projects are either not yet public or still under negotiation.

Table A2: Existing multi-purpose dams in the semi-arid areas of Ethiopia, Kenya and Tanzania

	Name of plant	River basin	Region	Capacity (mw)	Year of operation	Main funder	Estimated costs
Ethiopia	Fincha	Abbay	Oromya	134	1973	World Bank	81m ETB
	Tis-Abbay II	Abbay	Amhara	85	2001	French Development Cooperation	190m \$
	Amerti Neshi	Abbay	Oromya	97	2011	Chinese Export-Import Bank (EXIM)	276m \$
	Koka	Awash	Addis Ababa	43.2	1960	Italy, Norway	30m ETB
	Tekeze-1	Tekaze	Tigray	300	2009	Chinese Export-Import Bank (EXIM)	360m \$
	Beles	Abbay	Amhara	460	2012	Government of Ethiopia	500m \$
Kenya	Masinga	Tana River	-	40	1981	World Bank	175m \$
	Kindaruma	Tana River	-	72	1968 upgraded in 2013	upgrade partially funded by Norway and KfW (Germany)	62m \$
	Kamburu	Tana River	-	93	1975	World Bank	47m \$
	Kiambere	Tana River	-	165	1987 upgraded in 2009	World Bank	95m \$
	Mutonga	Tana River	-	300	2009	Chinese Export-Import Bank (EXIM)	360m \$
Tanzania	Pangani Falls dam	Pangani	-	68	1994	Norway, Finland, Sweden	126m \$
	Nyumba ya Mungu	Pangani	-	8	1965	Government of Tanzania	30m \$

Table A3: Planned/proposed multi-purpose dams in the semi-arid areas of Ethiopia, Kenya and Tanzania

	Name of plant	River basin	Region	Capacity (mw)	Year of operation	Main funder	Estimated costs
Ethiopia	Kesem	Awash	Afar/Oromia	20	2016	to be determined	125m \$
	Gilgel Gibe III	Omo Gibe	Oromya	1870	2016	Chinese Export-Import Bank (EXIM)	1.8bn \$
	Genale Dawa 3	Genale Dawa	Somali/Oromya	254	2017	Chinese Export-Import Bank (EXIM), AfDB	408m \$
	Gojeb	Omo Gibe	Oromya	153	to be determined	to be determined	to be determined
	Karadobi	Abbay	Oromya	1600	to be determined	to be determined	to be determined
Kenya	Twake-Athi Dam	Athi River	-	23	to be determined	partially funded by AfDB	410m \$
	High Grand Falls	Tana River	-	460	to be determined	to be determined	500m \$

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