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Costs and values analysis of TAMD in Kenya

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The Climate Change Group works with partners to help secure fair and equitable solutions to climate change by combining appropriate support for adaptation by the poor in low- and middle-income countries, with ambitious and practical mitigation targets.

The work of the Climate Change Group focuses on achieving the following objectives:

- Supporting public planning processes in delivering climate resilient development outcomes for the poorest.
- Supporting climate change negotiators from poor and vulnerable countries for equitable, balanced and multilateral solutions to climate change.
- Building capacity to act on the implications of changing ecology and economics for equitable and climate resilient development in the drylands.

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Implementing the tracking adaptation and measuring development (TAMD) monitoring and evaluation (M&E) framework allows public authorities to assess climate risk management processes and contributions from adaptation or development policy. In Kenya, TAMD is used to introduce climate risk management into institutional decision making and to plan, manage and evaluate local policy. Yet we know little about the costs and benefits of applying TAMD – in Kenya or elsewhere. This study demonstrates the additional costs and benefits of implementing TAMD, providing a complete costing of TAMD operations and a range of benefit valuations (avoided losses, expenditures and investment requirements) associated with greater climate resilience.

Contents

Acronyms

adj	adjusted values
ALRMP	Arid Lands Resource Management Project
ASAL	arid and semi-arid land
CAPC	County Adaptation Planning Committee
CDC	community development committee
CIDP	County Integrated Development Plan
CRED	Centre for Research on the Epidemiology of Disasters
DCU	district coordinating units
DDC	district development committee
DRR	disaster risk reduction
DSG	District Steering Group
GFDRR	Global Facility for Disaster Reduction and Recovery
GoK	government of Kenya
HumCap	human capital
ILRI	International Livestock Research Institute
IPCC	Intergovernmental Panel on Climate Change
LTS	LTS Africa Consulting
M&E	monitoring and evaluation
MET	mobile extension teams
MRV+	monitoring, verification and reporting system
NDMA	National Drought Management Authority
NDMP	National Drought Management Plan
NGO	non-governmental organisation
NPV	net present values
ODA	official development assistance
OECD	Organisation for Economic Cooperation and Development
PICD	participatory integrated community development
SEI	Stockholm Environmental Institute
TAMD	tracking adaptation and measuring development
ToC	theory of change
UNFCCC	United Nations Framework Convention for Climate Change
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs
WAPC	Ward Adaptation Planning Committees

Executive summary

Kenya already experiences significant economic welfare losses from climate variability and change. Such costs will rise over the coming decades, as the number of vulnerable assets – and the frequency and intensity of climate hazards – increase.

Effective mainstreaming of climate resilience offers development processes and practices protection from the detrimental effects of climate hazards. Nevertheless, policy effectiveness requires evidence-based learning about management, planning and governance performance through monitoring and evaluation (M&E). Kenyan public authorities have limited capacity for M&E, especially for climate-focused policy.

The tracking adaptation and measuring development (TAMD) framework is being implemented in Kenya to raise public authorities' capacity to deliver effective adaptation/resilient development policy. TAMD is a twin-track approach that evaluates adaptation success. Track 1 assesses how widely and how well countries or institutions manage climate risks at all levels, while Track 2 measures the success of adaptation interventions in reducing climate vulnerability and in keeping development on course.

This study provides an economic valuation of TAMD. Analysing the costs and benefits of complex policy governance programmes is challenging, due to their multi-faceted benefits structure. Policy-based cost-benefit analyses typically use an observable and simplistic link between inputs, outputs and economic outcomes. Our objective here is therefore to provide a sense of the monetary value of TAMD under different scenarios of effectiveness by observing indicators of avoided losses, expenditures and investment requirements – rather than an encompassing valuation of the whole system of benefits associated with TAMD implementation.

Methodology

This study assesses the economic viability of implementing TAMD in Kenya through in-country interviews and primary data, using M&E from the Arid Lands Resource Management Project (ALRMP) as the counterfactual to show the additional costs and benefits of TAMD and thus calculate the net present values (NPVs). These provide a sense of the additional monetary benefits associated with introducing and combining evidence-based learning and climate risk management.

The analysis works through the following steps to arrive at additional costs and benefits:

Step 1: Operational costs. This estimates the costs of setting up and maintaining ALRMP's M&E capacity as a baseline, to show the additional costs of TAMD. First year establishment and annual maintenance costs provide the basis for further up-scaling and analysis. The comparison illustrates the additional investment needed to gain TAMD's qualitative and quantitative benefits.

Step 2: Qualitative benefits. This outlines the additional qualitative benefits of investing in TAMD, relative to ALRMP. It demonstrates the planning, management and M&E benefits of using TAMD – for example, proactive planning, contextualisation, participatory monitoring and institutionalised capacity to learn and improve policy effectiveness – and sets out the qualitative benefits in matrix form by scale (county, national) and time (short-, medium- and long-term).

Step 3: Pathways to monetary benefits. This links the qualitative benefits identified in Step 2 to monetary values. These values relate to the introduction of climate risk management capacity, the climate-related losses that are avoided as a result, and the expenditure and investments that equate to a public authority's willingness to pay for climate-resilient development. Crucially, the values associated with a low capacity to govern climate risk – such as contingency-focused strategies, the omission of climate in development policy and a general under-capacity to establish resilience – provide a baseline indicator for the public authorities' ability to address climate risk in the ALRMP years. This, in turn, provides reference points to anticipate the additional benefits of introducing climate risk management through TAMD and the subsequent increases in resilience.

Step 4: Monetary benefits. Climate-resilient development involves decoupling economic productivity from adverse climate events, significant avoided losses, expenditure and investment requirements. TAMD institutionalises climate risk management in Kenya: an essential governance component in climate-resilient development. But additional factors – levels of investment, developmental capacity and human capital – also contribute to this same objective. The study

therefore assesses the discrete proportional weight of good governance in climate-resilient development processes while simultaneously considering other factors. It adapts a simple economic growth model of African economies to climate-resilient development, by focusing on the economic growth that occurs despite climate events. The analysis selects some of the drought expenditure, flood-related losses and adaptation investments that will be avoided, to provide a sense of the monetary value of implementing TAMD.

Analysis

After up-scaling costs to assume implementation across Kenya's arid and semi-arid land (ASAL) areas over 20 years, the analysis calculates the total additional costs of implementing TAMD at 778m Ksh (£5.5m, or £277,000 a year for a population of 13.2m). This is an indication of the resources needed to establish and maintain climate risk management capacity within institutions.

The analysis then compares these costs with the benefits of TAMD, under a range of assumptions and scenarios, scaling costs up based on population to calculate drought expenditure, and down based on relative measures of climate vulnerability, to calculate avoided adaptation investment and flood losses.

Benefits may incrementally increase on a linear scale and not fully materialise until the final year – for example, 5 per cent in year 1, leading up to 100 per cent in year 20. Primary evidence from Isiolo county, where the introduction of climate risk management has led to a gradual move away from contingency-based climate event management, suggests this is credible. Under this assumption, NPVs are positive, and indicate significant returns for investing in TAMD. Avoided adaptation investments represent the highest benefit – at 2.27bn Ksh (£16.2m) – and avoided drought expenditure the lowest, at 1.51bn Ksh (£10.7m), but margins are consistently large across benefit types.

A more stringent assumption is that implementing TAMD captures only half of the avoided losses attributable to governance, increasing on a linear scale – so, 2.5 per cent in year 1, leading to 50 per cent in year 20. This addresses the possibility that other governance processes contribute to climate-resilient development, or that efforts only manage half the assumed effect. Even under such circumstances, TAMD remains a viable investment, returning between 362m Ksh (£2.58m) for avoided drought expenditure and 742m Ksh (£5.3m) for avoided adaptation investments.

To further address uncertainty, the analysis uses the Stockholm Environmental Institute's 37.5 per cent upper and lower bounds for adjusted benefits to calculate values for benefit types depending on Kenya's different economic climate change impact scenarios. This results in a range of benefit valuations, with all the lower-bound estimates bar one showing positive NPVs – the basic benchmark of economic viability. Even if climate variability and climate change have the least expected effect, there are significant benefits to implementing TAMD in nearly all scenarios.

Break-even analysis shows the point at which TAMD generates positive returns: the intersection where accumulative costs and benefits meet. So, once investors cover the initial costs, maintaining the implementation of TAMD thereon generates positive revenue. Using the scenarios above, and looking only at individual indicators, investors would cover the costs of implementing the framework within 4–11 years, depending on the level of TAMD effectiveness.

Overall, our findings indicate that returns from TAMD are likely to be considerable, despite uncertainty. This is based only on individual indicators of avoided losses, expenditures and investment requirements: in reality, TAMD will have a system-wide impact, causing many costs to fall simultaneously and generating greater investment returns. Further, avoided costs rise as development increases. Our analysis does not factor in future escalation of climate change effects, suggesting the likelihood of even higher NPVs in the future.

1 Introduction

Kenya experiences significant economic welfare losses from climate variability and change, especially in agricultural and livestock sectors. The drought of 1998–2000 cost US$2.8bn in lost crop production, livestock, fisheries, reductions in hydro-electric power generation, and falling industrial production (SEI, 2009). More recently, the drought of 2008–2011 resulted in approximately 968bn Ksh (£6.45bn) in asset depletion and reductions in economic activity, while reconstruction and rehabilitation cost a further 156bn Ksh (£1.4bn) (Government of Kenya, 2012).

To reduce economic costs, the government of Kenya (GoK) and international donors implement adaptation and development policies for water, livestock, farming and infrastructure among others. Policy effectiveness requires an evidence base to learn[1] about management, planning and governance performance through monitoring and evaluation (M&E) (Dinshaw *et al*., 2014). The GoK's National Integrated Monitoring and Evaluation System coordinates the Monitoring and Evaluation Directorate to measure development policy performance. Other M&E mechanisms are specific to individual projects. For example, the M&E of the Arid Lands Resource Management Project (ALRMP) was designed to assess progress and performance of project components and activities (ALRMP, 2003) in relation to natural resource management, drought response, and development planning processes in arid and semi-arid lands (ASAL) (National Drought Management Authority, 2013; International Livestock Research Institute, 2010). Drought management M&E is conceptualised in terms of the timeliness of response and contingency efforts to reduce costs and so omits more systematic governance of risk.

TAMD is used to support the delivery of effective adaptation/resilient development policy in Kenya (Karani *et al*., 2014), as part of a broader strategy to raise climate risk management capacity within public authorities and achieve climate-resilient development[2] (Hesse and Pattison, 2013; National Drought Management Authority, 2014). TAMD: a) assesses the integration of climate into multiple levels of policy implementation by public authorities (national, county and ward); and b) institutionalises bottom-up (ward-county) and contextualised planning, management and evaluation processes that assess contributions of adaptation and development policy.[3] The TAMD framework provides the means to systematically address climate risk by incorporating information about climate events, trends and specific vulnerabilities into planning and decision-making practices (Brooks *et al*., 2013), which foster climate-resilient economies through evidence-based learning (Anderson *et al*., 2014).

Climate-resilient pathways require governance structures to formalise inclusion of local institutions (Lebel, 2006; IPCC, 2014); and all institutions planning for, and governing, climate impacts need information from past outputs to improve adaptation/resilience measures (UNFCCC Secretariat, 2006) and avoid losses/minimise societal impacts (Bresch and Spiegel, 2011). TAMD supports climate risk management of

[1] See 'Payback Framework' (Donovan and Hanney, 2011)

[2] Climate-resilient development is defined as development that ensures systems on which human populations depend exhibit resilience in the face of climate change (Brooks *et al*., 2011)

[3] The Kenyan Government's National Climate Change Action Plan (NCCAP) (2013-17) establishes TAMD as the basis for the monitoring, verification and reporting system (MRV+) for adaptation policy and will soon be implemented as the basis of the National Performance and Benefit Measurement Framework.

public authorities by providing tools and information to improve understanding, planning and management of adaptation policy at the appropriate institutional scale.

Yet little is known about the economic value of TAMD in relation to other M&E mechanisms. The analysis of complex policy implementation scenarios, such as governance programmes, is challenging. Policy-based cost-benefit analyses typically happen in contexts with an observable and simplistic link between inputs, outputs and economic outcomes (Bert *et al*., 2006), or where monetary valuation of a single benefit is achievable (Tol, 2012). As examples, proximate research quantifies benefits of governance strategies in relation to comparative total stock returns (OECD, 2009), quality management mechanisms (Sedevich Fons, 2011) and planning systems (Cheshire, 2012; Adams and Watkins, 2014). Documentation exists about cost effectiveness of adaptation/disaster risk reduction (DRR)/development policy, or the benefits of adaptation in agriculture (Agrawala and Fankhauser, 2008), but case selection typically establishes clear and demarcated units of analysis (Kull, *et al*., 2013; Moench *et al*., 2014; Gregersen *et al*., 2013).

This study uses in-country interviews/data collection to assess the economic viability of implementing TAMD in Kenya. This depends on the present value of additional benefits exceeding additional costs. The ALRMP provides the baseline, or 'do nothing' counterfactual, upon which additional costs and benefits of TAMD are analysed. This paper outline the additional costs and benefits of implementing TAMD across the ASAL areas of northern and eastern Kenya, relative to the ALRMP M&E system, and a calculation of net present values (NPV) for the proposed project cycle of 20 years.[4]

After some initial background of TAMD and the ALRMP, Section 3 outlines the methodology to assess additional costs and benefits of TAMD. Section 4 costs operations of key institutions conducting M&E under the ALRMP and TAMD. Section 5 develops the benefits of investing in TAMD through several steps. Qualitative benefits link to monetary benefits of climate-resilient development – avoided losses, expenditures and investment requirements present the "willingness to pay" for climate resilience. This suggests value pathways to the proportional benefits of TAMD as one of several policy processes working towards climate-resilient development. Section 6 expands figures across Kenya's ASALs to establish a range of NPVs.

[4] The analysis focuses on county and ward level M&E and omits the costs and benefits of national level implementation. This is so as to maximise comparability with the ALRMP, which is not designed to monitor or evaluate other policy measures.

2 Context

This section describes the work of the ALRMP and the M&E system used in this programme and compares it with TAMD being applied in a similar context. The ALRMP sought to improve responsiveness to droughts and the M&E was designed to assess these programme outcomes. In contrast, TAMD monitors and evaluates the institutionalisation of climate risk management and incorporates county and ward-level administrations in proactive participatory planning and management of results.

2.1 ALRMP

Until recently, the primary drylands project in operation in Kenya was the ALRMP, a community-based natural resource and drought management initiative funded by the World Bank's International Development Association, the European Union and the Ministry for Northern Kenya and other Arid Lands (Johnson and Wambile, 2011). Total financing amounts to US$220m over the 14 years (Wanguhu *et al*., 2012) with most allocation towards the latter of two phases: Phase I (1996–2003) focused on capacity building and community development for drought management in arid districts such as Baringo, Mandera, Turkana and Wajir; Phase II (2003–2010) continued with drought management and increases emphasis on community-driven objectives (Wanguhu *et al*., 2013), including natural resource management and local development to improve food security and livelihood vulnerability in 28 ASAL districts (GoK, 2008; Ministry of State for Development of Northern Kenya and Other Arid Lands, 2011). Activities included the publication of drought bulletins, institutionalised early response mechanisms, improvements in response capacity, maintenance of grazing areas, infrastructure for livestock production and funded contingency plans (ALRMP, 2003a; World Bank, 2012).

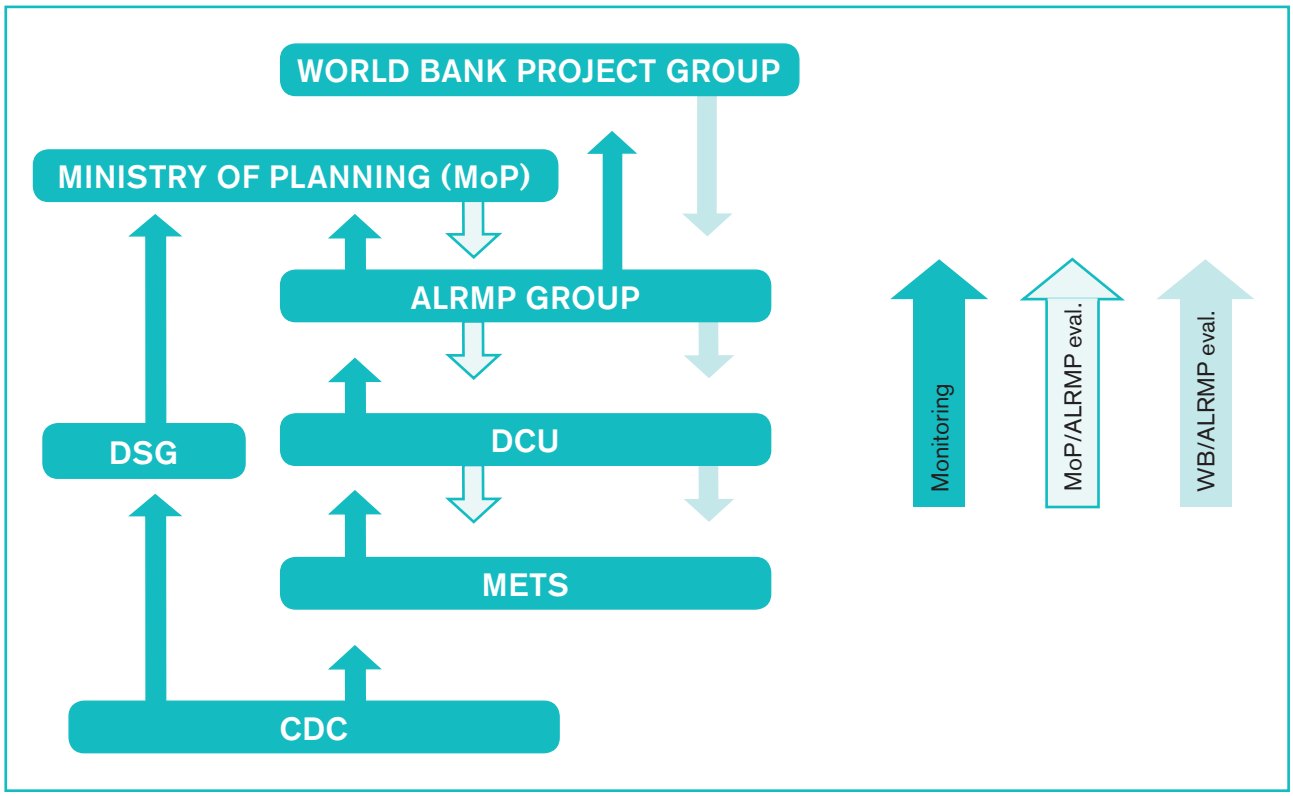
The M&E of the ALRMP was undertaken by different mechanisms: a) annual and bi-annual evaluation missions by World Bank representatives and World Bank-funded district coordinating units (DCU) (right side of Figure 1); and b) district-level M&E Sub-Group Steering Committee supported by Community Development Committee (CDC)[5] M&E sub-committees (left side of Figure 1). Essentially, World Bank M&E institutions evaluated, while district-level M&E committees monitored implementation. ALRMP assessments were framed using the 'poverty traps' perspective, which prioritised maintenance of household assets through the following indicators:

1. Proportion of people in need of food aid, normalised by severity of drought
2. Time lapse between reported stress and response, including recovery time
3. Child nutritional status over time, normalised by severity of drought
4. Number of people with access to social services

The emphasis on reaction time and response effectiveness omits proactive risk reduction and longer-term perspectives to address changing climate. In ALRMP projects, climate resilience was conceptualised as service access and reductions in assistance requirements, without systematic recognition of climate (World Bank, 2012). Crucially, information/learning had no institutionalised link back to planning systems.

[5] In theory, CDCs were elected by community members, but in practice were selected by village elders and associates.

Figure 1: ALRMP M&E institutions



The final evaluation (2008–2009) describes some of the problems with the ALRMP approach to risk management (Zwaagstra *et al*., 2010): systems become static, inhibiting learning for institutions and populations; response-focus bore unnecessary losses; low quality climate information services, and insufficient use of early warning; and centralised management of drought response that lacks contextual understanding/timing.

2.2 TAMD application in Kenya

TAMD is an M&E framework that monitors and evaluates adaptation-relevant interventions in multiple contexts and scales (Brooks *et al.,* 2013). It has two tracks: Track 1 focuses on climate risk management processes; Track 2 concentrates on development and adaptation outcomes, understood through changes in resilience and wellbeing. The tracks are linked through a theory of change. Both tracks contribute to climate risk management, through either the institutionalisation/assessment of risk management processes, or via the use of population-based climate resilience assessments. In addition, information generated through Track 2 can be fed back into policy development and evaluation. TAMD can be applied in different ways, from guidance on design and policy evaluation, to simply providing a framework to analyse ex-post programme data.

In Kenya, TAMD has been applied as an ex-ante planning tool that provides support and data for management and evaluation. TAMD is assimilated into national, county and ward-level governing functions of adaptation and development policy (see Figure 2). Track 1 – a top-down climate risk management evaluation mechanism in national and county government ministries, departments and agencies – assesses integration of climate into adaptation and development policy using a scorecard system. Each level of administration designs its own theory of change (ToC) based on specific objectives, collects data according to aims, and analyses progress. Track 1 includes assessments of climate-oriented targeting of policy, resource allocation to vulnerable groups and assimilation of CIS in planning and diversification strategies (IIED, 2014).

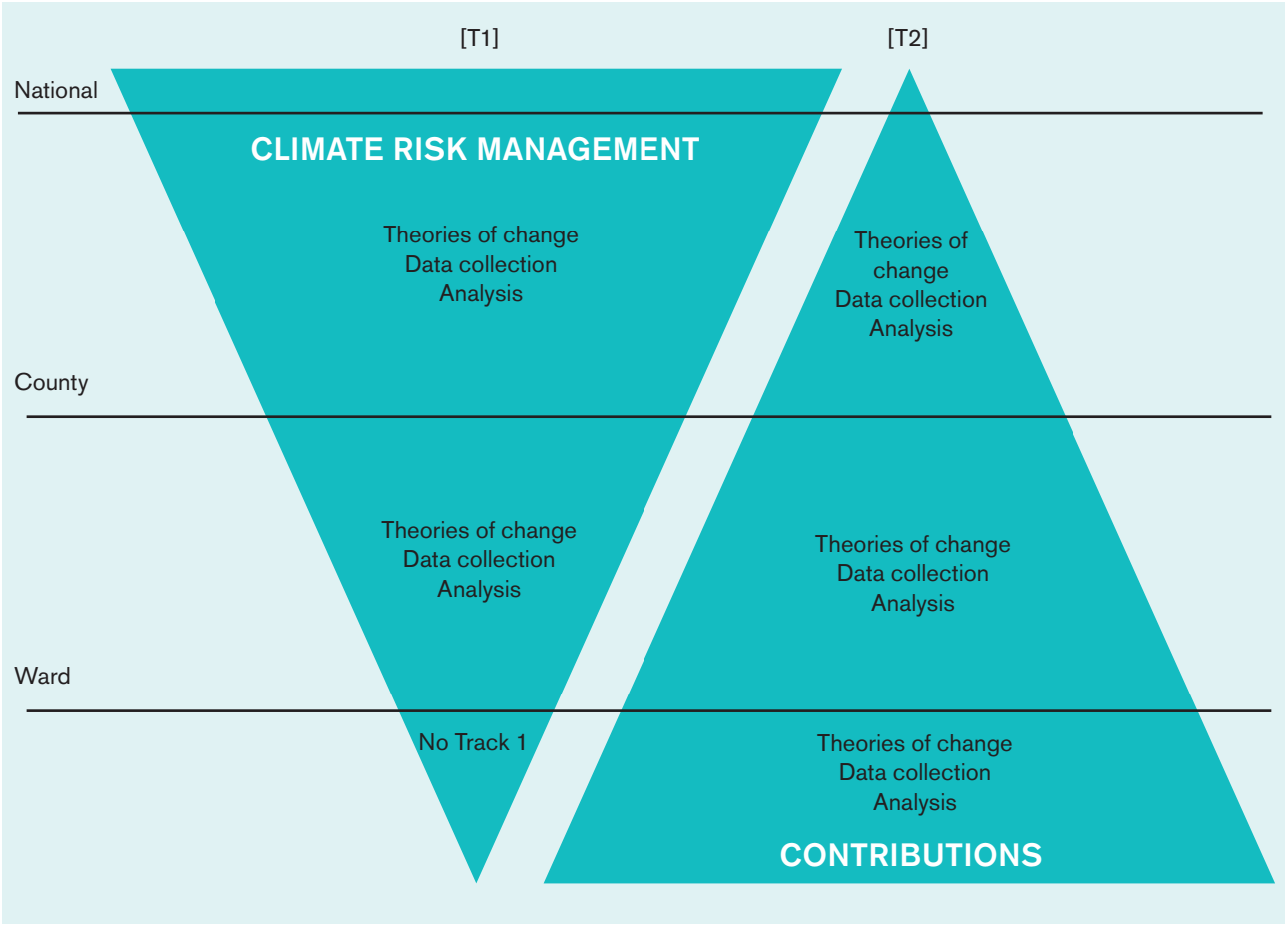
Track 2 assesses contributions of adaptation and development policy to building resilience and wellbeing. What differentiates TAMD implementation in Kenya from other contexts where it has been applied, is its application to the planning of adaptation/resilient development policy and on which M&E is ultimately conducted (National Drought Management Authority, 2013; 2014). For instance, TAMD application in Kenya guides the design, governance and final evaluation (using resilience assessments, theories of change, indicator selection and data collection) of the newly devolved funds at county level – [the Climate Adaptation

Fund (CAF), or more specifically, the Isiolo Climate Adaptation Fund (ICAF)]. The CAF operates through county and ward-level planning committees – the County Adaptation Planning Committee (CAPC), and the Ward Adaptation Planning Committee (WAPC) – that use the TAMD framing of climate risk management to plan, manage and evaluate successive waves of adaptation funding. Nevertheless, now this infrastructure is established, the institutions are in place apply the same approach to other funding streams at little extra cost

Learning occurs through routine iterations of Track 1 and 2 data collection and analysis (Anderson *et al.*, 2014). The institutionalisation of learning – facilitated in Kenya by the County Planning Unit – is in motion through public authorities using climate-related evidence from TAMD in the County Integrated Development Plan (CIDP) (Karani *et al.*, 2014; Karani and Kariuki, 2014). Ultimately, this improves recognition for climate resilience policy inside prominent institutions, such as the Executive Finance Committee.

In summation, the ALRMP M&E was primarily a system operating in parallel to the GoK. Monitoring of implementation was conducted by mobile extension teams (METs) and CDCs, but project evaluation is the task of large-scale World Bank missions involving some national government ministries, but mostly DCUs and other World Bank institutions. In addition, the World Bank chose indicators that set the boundaries for the type of information collected. Conversely, TAMD focuses on raising capacity of public authorities. Resilience assessments and ToC define climate risk within particular contexts, and ward representatives collect data on indicators.

Figure 2: TAMD implementation: Kenya



3

Overview of methodology to assess net present values

This section follows several steps to establish additional costs and benefits of TAMD. In particular, extracting additional benefits requires addressing two analytical issues: a) developing a meaningful selection of benefits from a complex and multi-faceted setting, such as a governance framework; and b) the issue of confounding factors, and more specifically, the role of TAMD relative to other policy processes in place to achieve climate-resilient development.

Step 1: Operational costs

The study first estimates the costs of ALRMP M&E capacity as a baseline and develops corresponding costs for TAMD – using district and county-level implementation in Wajir and Isiolo respectively, and adjusting for inflation and population size to achieve comparability. First year establishment and annual maintenance costs provide the basis for further up-scaling and analysis. The comparison illustrates the requisite *additional* investment to avail of the qualitative and quantitative benefits of TAMD.

Step 2: Qualitative benefits

The study outlines additional qualitative benefits of investing in TAMD relative to the ALRMP counterfactual. This illustrates planning, management, monitoring and evaluation benefits of using TAMD instead of the ALRMP. These include proactive planning, contextualisation of climate risk, participatory monitoring, and an institutionalised capacity to learn and improve policy effectiveness. Qualitative benefits are set out in matrix form according to institutional scale (county, national) and time (short-, medium- and long-term).

Step 3: Pathways to monetary benefits

The next step identifies monetary values associated with qualitative benefits. Values relate to the introduction of climate risk management capacity,[6] and resultant avoided climate related losses, expenditures and investment requirements (see Table 1) that reveal the public authorities' "willingness-to-pay" for climate-resilient development. Crucially, values act as a baseline

[6] Climate risk management is a process of "incorporating knowledge and information about climate-related events, trends, forecasts and projections into decision making to increase or maintain benefits and *reduce potential harm or losses."* (Travis and Bates, 2014)

indicator for the capacity of public authorities to manage climate risk in the years of the ALRMP – values associated with low capacity to govern climate risk. Many are associated with issues such as contingency-focused strategies, omission of 'climate' in development policy, and general under-capacity to establish resilience by the principal structures governing climate variability and change (Lebel *et al.*, 2006). The analysis uses this reference point to anticipate the *additional* benefits of TAMD through the introduction of climate risk management.

Step 4: Monetary benefits of TAMD

Climate-resilient development is the decoupling economic productivity from adverse climate events. The implementation of TAMD institutionalises climate risk management for the first time in Kenya, and represents the *essential governance component*[7] in climate-resilient development (see Figure 3). The application of TAMD reforms and transforms governance of climate risk by establishing system-wide participatory infrastructures specifically designed to inform climate-resilient decision

Table 1: Losses, expenditures and investment requirements related to climate variability and change

ADAPTATION INVESTMENTS	CLIMATE-RELATED LOSSES	GOVERNMENT EXPENDITURES	AMOUNT
2013–2017 total adaptation investments (GoK, 2013)			107bn Ksh (£0.76bn)
Recovery needs of 2008–2011 rought (GFDRR, 2012)			156.2bn Ksh (£1.11bn)
	Losses from 2008–2011 drought (GFDRR, 2012)		968bn Ksh (£6.91bn)
	Losses from 1998–2000 drought (World Bank, 2004)		16% of GDP annually
	World Bank (2004) losses from 1997/98 El Niño		11% of GDP
		Cost of 1998–2000 drought (SEI, 2009)	US$2.8bn (£1.76bn)
		• GoK drought 2011 allocation	18bn Ksh (£0.12bn)
		• Emergency expenditure 1999–2010	US$173.2m (£109m)
		• 2011 External humanitarian funding	US$248m (£156m)
		• 2012–2016 DRR needs to boost resilience	184bn Ksh (£1.13bn)
		• NDMP 10-year drought management budget	US$2.36bn (£1.5bn)
		• MNKOAL 5-year development plans (Fitzgibbon, 2012)	US$5.1bn (£3.25bn)

[7] Pillar 2 of the World Bank's framework for climate-resilient development involves "focusing on knowledge and capacity development by improving weather forecasting, water resource monitoring, land-use information, disaster preparedness…and strengthening capacity for planning and coordination, participation and consultation." (Adger *et al.*, 2011)

making – no other existing or pre-existing externally financed project, or governmental function, has this capacity. In addition, the effects of pre-existing abilities to govern climate risk are incorporated within past values of losses, expenditures and investment requirements (see Table 1).

Yet, additional factors, including investment, developmental capacity and human capital, contribute to the same objective. A specific goal is to assess the discrete proportional weight of good governance on achieving climate-resilient development, while simultaneously considering other factors. By focusing on economic growth occurring despite the presence of climate events, the analysis adapts a simple economic growth model of African economies to climate-resilient development. Results show a positive relationship between good governance and climate-resilient development, and how incremental benefits accrue as governance improves.

In essence, the application of TAMD raises capacity of public authorities in Kenya to govern the economic development despite the impacts of climate variability and change. The result is the institutionalisation of climate risk management for the first time and sets Kenya on the path to climate-resilient development (see Figure 3). Therefore, by analysing the role of governance in securing climate-resilient economic growth, the analysis has a proxy indicator to simulate the individual contribution of TAMD in achieving climate-resilient development.

Figure 3: Linkages between TAMD and climate-resilient development

4

Costs of ALRMP and TAMD

The following section initially costs M&E capacity within the ALRMP. ALRMP data are downscaled to cost the establishment and maintenance of this capacity within the district of Wajir. Additional costing of TAMD implementation in the county of Isiolo complements this. Valuations are weighted according to population (Isiolo remains the same, but Wajir costs are reduced relative to population size) to facilitate comparison.

4.1 Costs: ALRMP M&E

The ALRMP M&E includes two activities: a) World Bank annual and bi-annual joint missions, and more consistent DCU evaluation exercises; and b) local government M&E through district development committees (DDC), District Steering Group (DSG), CDCs and the Ministry of Planning (see Table 2). What follows investigates ALRMP M&E costs from World Bank primary sources; the time and inputs of the local government M&E activities are excluded, although overlap exists as MET/World Bank employees work within local government structures.

Annual World Bank missions occurred in early stages of Phase II, but mid-term reviews recommended an increase to bi-annual missions. Initially, missions were conducted by World Bank sector-based experts, the main M&E officer themselves and other interested parties.[8] Large groups (10–20 personnel) travelled for several weeks to select ALRMP locations to gather data on chosen indicators. Over time, the number of representatives lessened to limit costs, but the frequency of missions was maintained.

Table 2: ALRMP M&E institutions

DISTRICT
World Bank missions (A)
Mobile Extension team (C, Dat, A)
District Coordination Unit (C, Dat, A)
Community development committees (Dat)

C=coordination; Des=design; Dat=data gathering; A=analysis

Aside from World Bank missions, M&E officers from other World Bank funded institutions conducted internal M&E exercises for the ALRMP. METs contributed through overseeing implementation plans, project oversight, data gathering, monitoring and reporting. METs delivered reports on the progress of interventions, and were overseen by the DCU. The DCU was constituted of ALRMP component heads and professionals situated in districts, and reporting directly to national-level ALRMP managers. In theory, DCU, METs and national-level ministry representatives conduct quarterly evaluation visits. In practice, funding constraints limited these to annual exercises. The DCU held the budget and is the primary decision maker on the size and direction of internal monitoring visits.

[8] For instance, the Food and Agriculture Organization sometimes accompanied the core World Bank M&E team.

Local government structures had little systematic connection with M&E of the ALRMP. District M&E steering committees (a sub-group of the DSG) were under resourced[9] with inadequate capacity. As a consequence, DSGs[10] had limited information from government institutions to plan and manage new policy rounds. DSGs were overseen by the Ministry of Planning to ensure objectives remain in line with the overall aims of the district. In theory, Ministry of Planning were required to conduct monitoring visits for all interventions in the district, but lacked resources to undertake practices. Indicative of disconnect between ALRMP M&E and government planning structures is the absence of ALRMP representatives on DDCs as primary decision makers of district policy.

Additional costs to operate ALRMP M&E involve: (1) World Bank-funded missions and DCU M&E exercises; (2) ALRMP staff (M&E coordinators, clerks and METs); and (3) consultant costs, plus capacity building workshops. Table 3 scales down costs for Wajir district, which are adjusted for inflation (2013) and weighted according to population for comparison with TAMD costs in Isiolo.

The ALRMP provided initial large sums to facilitate capacity building of CDCs and MET [825k Ksh (£5.8k)] that are comparable to staffing costs. World Bank missions and other evaluation exercises initially amounted to less than half a million Ksh (£3.5k), but rose in successive years. Meanwhile, staffing and training costs immediately fell, and continued to decline. As a result, World Bank missions and evaluation exercises represent a large share of resource use.

4.2 Costs: TAMD

Relevant public authorities – ministries, departments, agencies or committees – have TAMD M&E responsibilities including: a) coordination; b) design; c) data gathering; d) analysis; and e) information dissemination. Costs occur at county and ward levels to introduce climate risk management and assess vulnerability reduction.

4.2.1 Track 1 & 2

Resources are used to introduce contextual knowledge into planning, management, monitoring and evaluation of adaptation and development policy. Track 1 requires assessments of institutions integrating climate risk management into policy design, coordination and implementation. Track 2 builds an infrastructure to plan and assess contributions of policy through WAPCs. Resources are spent conducting participatory resilience assessments, designing ToC, indicator selection and data collection. The result is a system-wide participatory M&E process engaging governance institutions and local populations.

Table 3: District-level costs of ALRMP

TYPE	DETAILS	COST (KSH)	KSH PER YEAR (£)
Year 1 establishment costs			
Staff costs + data collection	METs, CDCs	838,000	838,000 (£5,985)
Capacity building	Workshops, training, M&E framework design	825,000	825,000 (£5,892)
Evaluations	World Bank mission, DCU evaluations	462,000	462,000 (£3,300)
			2.12m (£15,142)
Annual maintenance costs (average)			
Staff costs + data collection	METs, CDCs	353,000	353,000 (£2,521)
Capacity building	Workshops, training, M&E framework design	212,000	212,000 (£1,514)
Evaluations	World Bank mission, DCU evaluations	513,655	513,000 (£3,664)
			1.07m (£7,642)

[9] District-level representatives of the Ministry of Planning were allocated 50,000 Ksh (£350) a year for M&E

[10] Primarily involving Ministries of Agriculture, Livestock, Water and Irrigation and Planning; major civil society organisations, non-governmental organisations (NGO).

Table 4: TAMD Track 1 & 2 county institutions

COUNTY
County Adaptation Planning Committee, including the County Monitoring and Evaluation Committee (C, Des, A)
County Planning Unit (Dat, A)
Ministry of Devolution and Planning, NDMA (Dat, C)
Ministry of Environment, Water and Natural Resources, Department of Water (Dat, C)
Ministry of Agriculture, Department of Livestock, Meteorology and Crop Production (Dat, C)
Ward Adaptation Planning Committee (Dat, Des)

C=coordination; Des=design; Dat=data gathering; A=analysis; ID=information dissemination

In terms of Track 1, LTS Africa provides training on concepts and practice of climate risk management. Public authority personnel design ToC and select indicators during workshops (see Table 5).[11] After ToC exercises are complete, the NDMA's county planner and county officer collect and analyse data and public authorities coordinate through CAPCs. Prior information availability through relevant ministries, departments and agencies means data collection is inexpensive. Iterative data collection is more resource intensive, involving visits by the county planner to officials implementing adaptation policy.

For Track 2, LTS Africa provides training on the concepts and practice costing approximately 2.8m Ksh (£*20,000*) for the county of Isiolo. Second, WAPCs develop ToCs, select indicators and gather baseline data (see Table 6). The design of ToCs and indicator selection across five wards includes 15 members per ward and costs 720,000 Ksh (£5k). Conversely, WAPC representatives collect baselines by travelling to select sites for 10 days and which for five wards costs 120,000 Ksh (£842).

The TAMD framework requires engagement between WAPCs and CAPCs [County Planning Unit provides coordination functions in place of the, yet to be established, County Monitoring and Evaluation Committee]. WAPCs report on data collection to the CAPC,[12] who send information for final analysis by the Ada Consortium M&E officer. Final coordination and analysis costs approximately 120,000 and 15,000 Ksh (£842 and £105) respectively.

In summation, TAMD costs 3.01m Ksh (£21.8k) more to establish compared to the ALRMP M&E (Table 7); additional maintenance costs total 990k Ksh (£6.9k) for each additional year of operations. Higher costs are due to capacity building efforts in workshops designing ToCs, quantitative data collection exercises, or the additional resources for Track 1. The next section qualitatively and quantitatively explores what investors in TAMD receive for the additional outlay of capital.

Table 5: Costs of Track 1 in Isiolo

TYPE	KEY PERSONNEL	COST (KSH)	KSH PER YEAR (£)
Establishment costs			
Design theories of change – indicator selection	Workshop – all ministries and depts.	500,000	500,000 (£3,571)
Collect baseline data + analysis	County planner + NDMA officer	120,000	120,000 (£857)
			620,000 (£4,428)
Maintenance costs			
Data collection + analysis	County planner + NDMA officer	2 x 200,000	400,000 (£2,857)
			400,000 (£2,857)

[11] For more details, see LTS Africa (2014).

[12] This includes the collection of baseline rainfall data in order to later show resilience to climate variability over time.

Table 6: Costs of Track 2 in Isiolo

TYPE	KEY PERSONNEL	COST (KSH)	KSH PER YEAR (£)
Year 1 establishment costs			
Design theories of change – indicator selection	15 members x 5 WAPC	5 x 120,000	600,000 (£4,285)
Collect baseline data + first round	5 wards [WAPC reps x 10 days x 2 collections]	5 x [2 x 10 x 1,000]	100,000 (£714)
Analysis	M&E officer – Ada Consortium	83,000	83,000 (£592)
Coordination	2 x visits CAPC member	2 x 464,000	928,000 (£6,628)
Other training and establishment – Tracks 1&2	LTS staff costs	2.80m	2.80m (£20,000)
			4.51m (£32,219)
Annual maintenance costs			
Two collections per year	5 wards [WAPC reps x 10 days x 2 collections]	5 x [2 x 10 x 1,000]	100,000 (£714)
Iterative analysis	M&E officer – Ada Consortium	2 x 83,000	166,000 (£1185)
Iterative coordination	2 x visits CAPC member	2 x 700,000	1.4m (£10,000)
			1.66m (£11,857)

Table 7: Additional costs of TAMD in Isiolo

TYPE	KSH (£)
ALRMP establishment costs	2.12m (£14,800)
TAMD establishment costs	5.13m (£36,642)
Additional TAMD establishment costs	**3.01m (£21,842)**
ALRMP maintenance costs	1.07m (£7,510)
TAMD maintenance costs	2.06m (£14,459)
Additional TAMD maintenance costs	**990,000 (£6,948)**

5 Additional benefits of TAMD

This section follows the steps set out in Section 3 to establish monetary benefits of applying TAMD. Section 5.1 outlines the qualitative benefits of TAMD application relative to the ALRMP M&E. Additional benefits relate to introducing participatory, proactive and contextualised climate risk management practices from Track 1 and 2. Qualitative benefits then link to specific monetary values climate risk management processes are designed to avoid – climate related losses, expenditures and investment requirements. Such monetary values are the willingness to pay for climate-resilient development in Kenya. The Section 5.3 simulates the likely contribution of applying TAMD to climate-resilient development by investigating good governance as a determinant in climate-resilient economic growth. This identifies a range of values that constitute some of the likely benefits of using the TAMD framework.

5.1 Qualitative benefits of TAMD

The TAMD framework advances M&E design by offering public authorities a unique spatial, temporal, contextual and comparable framework to design/assess adaptation/development policy in terms of climate risk management capacity. Respondents[13] categorise benefits as community involvement in assessing climate risk, learning, coordination, management, proactive versus reactive responses, and policy application. In contrast, the ALRMP M&E system incorporates context through Participatory Integrated Community Development (PICD)[14] within the CDC[15] network, but emphasis is on community prioritisation of development projects without systematic incorporation of climate. The application of TAMD instead empowers communities to express specific climate risks through resilience assessments and ToC. Only once these are mapped can the design of climate-resilient projects be planned and managed.

CDC networks of the ALRMP M&E system provide members the opportunity to monitor project implementation. However, this involves cursory qualitative monitoring that simply documents the presence of interventions. The application of TAMD instead requires WAPC members to systematically collect quantitative data on indicators measuring adaptation benefits developed by WAPCs through ToC exercises. The process raises awareness for data collectors, while facilitating ownership of climate risk management practice within populations.

Many implementing agencies/NGOs collect data at local levels, and analyse according to baselines, yet there is limited exchange and holistic analysis of M&E information. The ALRMP evaluation system is primarily designed to inform progress on World Bank indicators, and knowledge building of Kenyan public authorities is secondary. This means public authorities have few

[13] Constituting public authority representatives implementing adaptation/development policy in national and county level institutions.

[14] PICD precedes 'participatory disaster risk assessments' of the NDMA, but is the successor of 'rapid rural appraisal', which demonstrates a growing need to incorporate climate into participatory development practices.

[15] Another disparity is the member selection process of the CDC versus the electing of WAPC members.

accessible information channels about the success/failure of ALRMP interventions to learn and improve policy. The TAMD approach institutionalises learning capacity from policy rounds by documenting (in) effectiveness in particular contexts, and engaging public authorities in CAPCs.

The ALRMP M&E system runs in parallel, and partially independently from, mainstream M&E processes in Kenya. Primary institutions for evaluation are the World Bank's annual missions and more consistent M&E activity from the DCU – neither raises M&E capacity for public authorities. Using TAMD, ministries and departments practice evidence-based coordination on issues of climate using the CAPC system. Information flows from data collectors to public authorities, which facilitate planning and proactive policy measures.[16] Further, applying TAMD raises awareness of other interventions ongoing within the county, and reduces duplication of efforts by different public authorities. Finally, the process links public authorities to the CIDP on issues of climate, raising the profile of adaptation and resilient development policy in prominent committees.

In summary, Track 1 assessments of climate risk management integration into policy are an innovation. Further, public authorities can include such practices in policy planning and design, which structures climate-resilient policy outcomes. This institutionalises mechanisms that manage and govern climate risks to deliver resilient development outcomes. Similar climate risk management processes are absent at all stages of the ALRMP M&E system. Standard development and contingency practices do not build resilience to present or changing climate, and which in turn structure greater climate losses, expenditures and investment requirements.

5.2 Pathways from qualitative benefits to monetary values

The application of TAMD introduces climate risk management either through decision-making process or planning and evaluation of contributions. Benefits are often space and time-specific and accumulate as climate variability and change intensifies in the medium to long term (Stern, 2006). Participatory and deliberative resilience building processes take a decade or more to foster trust and build resilience (Lebel *et al.*, 2006). In addition, up-scaling TAMD implementation has simultaneous national and county-level benefits. Matrix 1 outlines the qualitative benefits of applying TAMD over time and space according to public authorities in Kenya.

Short-term immediate governance improvements have an effect: at the national level, public authorities document context-specific climate risk assessments; and open information channels for policy coordination. At the county level, learning builds around the (in) effectiveness of climate policy; evaluation processes monitor and assess adaptation/development interventions; and norms of proactive climate planning begin to reduce losses.

Medium-term benefits include assimilation of climate risk management into planning and management practices of public authorities. At the national level, reductions in climate losses and expenditures begin to build; knowledge accumulation on climate risks increases resilience in primary functions such as budgeting; and institutional linkages establish between the national level, regions and counties. At the county level, knowledge building of best practices produces effective policy and subsequent vulnerability reduction; proactive planning is established in the CIDP and associated expenditures reduce; and benefits of resilient development rise further.

The long-term benefit at the national and county level is climate-resilient development whereby the Kenyan economy grows uninhibited by climate variability and change.

Qualitative benefits have tangible effects linked to monetary values. By introducing the governance of climate risk within the public authorities in Kenya, losses, expenditures and investment requirements of inadequately managed climate variability and change begin to reduce. Matrix 2 illustrates the type of values associated with low climate risk management capacity over space and time. In the short term, values include annual expenditures on assistance for drought and flood emergencies, indirect effects on health and premiums on crop and livestock insurance. Medium term values include event-based, damages/recovery costs for drought and floods, contingency funding, significant funds to facilitate adaptive actions and values for periodic general climate events. In the longer term, considerable economic costs are forecast over the coming decades.

Up-scaling TAMD contributes to the avoidance of losses, expenditures and investment requirements over time through the introduction of climate risk management and establishment of climate-resilient development. Yet other factors – including investment and education – also improve climate resilience. Therefore, the benefits of TAMD, as a governance framework, cannot be established without controlling for relative weights of other factors in the process of climate-resilient development.

[16] Relative to the ALRMP's governance norm of reacting after events occur.

Matrix 1: Time-space benefits of TAMD

	SHORT TERM (1–3 YEARS)	MEDIUM TERM (4–10 YEARS)	LONG TERM (10–20 YEARS)
NATIONAL	Contextual resilience assessment of changing climate • M&E framework for climate policy • Development indicators with climate resilience capacity • Interactive supply of contextualised data (ward-county-national level)	Reduction of climate-related emergencies • Climate-resilient budgeting • Institutionalised link between county and national levels • Institutional link between county, national and regional objectives (IGAD)	Climate-resilient development
COUNTY	Understanding of dynamic change in climate • Contextual participatory design of policy • Proactive climate-resilient planning • Learning about climate risk management • Learning of best practices in policymaking • Policy effectiveness as evaluative criteria	Effective vulnerability reducing policy • Coordination across institutions on policy • Proactive climate-resilient resource allocation (CIDP) • Attraction of adaptation external assistance • Increasing climate-resilient development	Climate-resilient development

Relevant climate-sensitive public authorities (ministries, departments and agencies) include: NDMA; Ministry of Agriculture, Livestock and Fisheries; Ministry of Devolution and Planning; Ministry of Environment, Water and Natural Resources

5.3 Climate-resilient economic growth model and the monetary values of TAMD

This section develops select values from Matrix 2 to provide a sense of the monetary benefits of TAMD. To reiterate, reductions in losses, expenditures and investment requirements cannot be entirely attributable to applying TAMD, as only part of a set of policies designed to achieve a more climate-resilient economy. In particular, investments[17] that increase resilience avoid losses, expenditures and investments in other adaptation initiatives. Yet effective bureaucracies secure outcomes such as economic growth and poverty reduction (Henderson *et al.*, 2003). Public entities are orchestrators of formal adaptation and resilience processes (Finan and Nelson, 2007); climate risk management transforms decision-making processes (Lebel *et al.*, 2006; Brooks *et al.*, 2013; Travis and Bates, 2014) by policy formulators and evaluators (USAID, 2014). Primary evidence suggests applying TAMD introduces climate risk management practices for the first time in Kenya, raising resilient policy governance capacity.

Using available data on the proportional role of good governance in achieving climate-resilient economic growth, the study simulates the likely contribution of

[17] This includes investments, but also grant-based initiatives to develop resilience.

Matrix 2: Time-space willingness to pay for climate-resilient development (see Annex 1 for full list of sources)

	SHORT TERM (1–3 YEARS)	MEDIUM TERM (4–10 YEARS)	LONG TERM (10–20 YEARS)
NATIONAL	UNOCHA humanitarian assistance [US$76m (£47m) per year] • GoK (NDMA) food security expenditure [173m Ksh (£1.2m) per year] • Emergency flood expenditure [28m Ksh (£196k)] • Emergency flood expenditure [331m Ksh (£2.23m)] • Drought response allocation [18bn Ksh (£126m)] • Climate-related health expenditure [82.2bn Ksh (£576m) (2001–02)]; [122.9bn (£85m) (2009/2010)] • Costs of drought [US$2.8bn (£1.76bn) • Costs of drought (16% annual GDP) • Cost of the 1997–98 El Niño (11% annual GDP) • Cost of drought response 2008-09 [365m Ksh (£2.56m)]	Losses/damages from drought [US$125m per year (£78m)] • Severe flood damage (US$800m–1.2bn per event (£504m–£757m) • Periodic extreme climate events (US$5bn–10bn per event (£3.15bn–7.3bn) • NDMA contingency fund (US$5.5m per year (£38k)] • Drought damages 2008–11 (968bn Ksh) • Drought recovery/construction 2008–11 [156.2bn Ksh (£1.09bn)] • Emergencies expenditure 1999–2010 [US$173.2m/year (£109m)] • Drought resilience expenditure 2012–2016 [184bn Ksh (£1.29bn)] • Adaptation investments 2013–17 [107bn Ksh (£751m)]	Economic costs of climate change [2.6% of annual GDP (2030)] • Africa Drought Management Programme – 10-year planning budget for Kenya [US$2.36bn (£1.48bn)]
COUNTY	Livestock insurance (3–6% of livestock valuation) • Premium on farming inputs (5% per year) • Isiolo drought expenditure [80.4m Ksh per year (£589k)] • Drought-related health expenditures per person [US$144 PPP (£90)] • Drought interventions – four arid districts [US$4m (£359m]	Severe drought expenditure in Isiolo [134m Ksh per event (£940k)]	

TAMD application to climate-resilient development. Governance is compared to other factors, such as the level of investment [official development assistance (ODA)], degrees of human capital (education) and development levels (GDP per capita).[18] African economic growth data (2000–2012) and Centre for Research on the Epidemiology of Disasters data on climate disasters is used to model economic growth despite adverse climate events.

The analysis (Table 8) applies the Kauffman Index that defines governance as 'traditions and institutions by which authority in a country is exercised'. The primary indicator is government effectiveness (GovEff) defined as "government's capacity to formulate and implement sound policies" (Kaufmann, 2010, p4). Other factors are included based on a simple economic growth model (Evans and Rauch, 1999) with the addition of ODA indicating investment levels.

Table 8: Logistic marginal effects

DEPENDENT VARIABLE = 1 IF GOVERNMENT ACHIEVES CLIMATE-RESILIENT GROWTH, 0 IF OTHERWISE	
GovEff	0.03** (0.03)
ODA	0.16*** (0.04)
Human cap.	0.05*** (0.03)
GDP per capita	–0.10*** (0.03)
R^2	10.36%
N	564

***p < .01, **p < .05, *p < .1

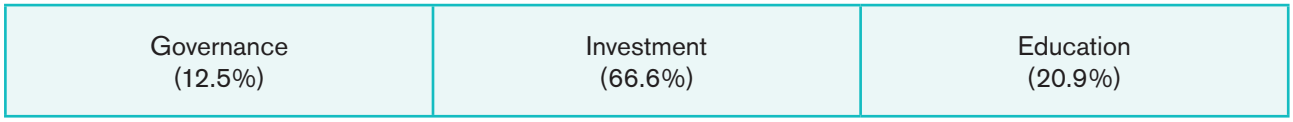
By standardising variables and using marginal effect functions, the analysis demonstrates the proportional role of government effectiveness versus levels of investment and human capital.[19] Results show government effectiveness has a positive effect on the likelihood of achieving climate-resilient growth. Good governance contributes 12.5 per cent, investment 66.6 per cent and human capital 20.9 per cent to the probability that a country will grow despite climate events. This is modest compared to Evans and Rauch (1999) finding of bureaucratic functions contributing approximately 50 per cent towards the achievement of economic growth. Figure 4 illustrates the proportionate arrangement of factors.

The objective is use the proportional role of governance to provide a range of values across different types of avoided losses, expenditures and investments. What follows demonstrates values in terms of expenditures of public authorities for drought, flood and adaptation across all sectors. This provides some representation of the types of values the application of TAMD seeks to avoid, and which will have the sum attributable to TAMD calculated at the end of this section.

Expenditure on drought: primary data from all relevant ministries, departments and agencies in Isiolo County show average annual drought-related expenditure between 2010–14. Drought expenditure costs Isiolo County approximately 80.4m Ksh (£567k) per year. These figures are up-scaled to demonstrate values across ASAL counties and reveal a figure of 7.8bn Ksh (£55m) per year.

Flood damage: this data is from the *T21 costs of adaptation* report conducted by government employees for the GoK. Period flood events (approximately every five years) are associated with damages to infrastructure (roads, buildings and communications), public health effects with incidental fatalities and loss of crops. Annual estimates suggest a 2 per cent reduction in GDP, but associate US$800m–1.2bn with an extreme flooding event. The mid-point suggests US$1bn damages every five years, or US$200m [18bn Ksh (£127m)] annual economic losses. This figure is down-scaled to the ASALs according to differential weights of vulnerability.

Figure 4: Proportional role of governance and other factors



[18] The elements of a simple economic growth model (Evans and Rauch, 1999).

[19] Levels of development – indicated by GDP per person – is negatively related to growth in this analysis.

Adaptation investments: Costing of priority adaptation actions report conducted by the International Institute for Sustainable Development estimates total public sector investment requirements for climate adaptation across 30 sectoral actions. These include all capital, labour and programmatic costs incurred to deliver adaptation action in Kenya, whether expended by the GoK or other contributions. The total figure [to cover the Medium-Term Plan (2013–17)] was 108bn Ksh (£762m) or US$1.3bn. Figures were developed into annual investment requirements totaling 21.4bn Ksh (£152m) are down-scaled to the ASALs [10.4bn Ksh (£74m)] according to vulnerability weighting.

The exercise provides a range of values for an initial assessment of the complex and multi-faceted benefits of TAMD (see left-hand column in Figure 5). It does not capture all values associated with TAMD, but the objective at this stage is be as transparent as possible about the pathways from the qualitative benefits to the suggested monetary values. The next section compares these monetary values with the additional costs of TAMD to estimate the likely returns on investment.

Figure 5: Proportional role of TAMD in avoided losses, expenditures and investment requirements

12.5% (Governance)	**66.6% (Investment)**	**20.9% (Education)**
Drought resilience (985m)	Investment (5.24bn)	Education (1.64bn)
Flood resilience (2.25bn)	Investment (11.9bn)	Education (3.76bn)
Adaptation investments (2.67bn)	Investment (14.25bn)	Education (4.47bn)

6 Findings

The final section compares the inflation adjusted and discounted[20] costs and benefits of implementing TAMD to arrive at NPVs for a range of benefit valuations: Section 6.1 explores uncertainty within NPVs by assuming that, as a governance framework, TAMD implementation will take time to become effective and full benefits may not be realised within the 20-year lifecycle; Section 6.2 explores the range of NPV on offer if the analysis includes similar levels of uncertainty as in climate economic impact scenarios; Section 6.3 uses figures to develop a break-even analysis showing when investors will see returns.

6.1 Gradual effectiveness

ALRMP M&E and TAMD costs are up-scaled to assume implementation across the ASAL areas in Kenya over the next 20 years. On these assumptions, total additional costs of implementing TAMD are 778m Ksh (£5.5m) over 20 years (see Table 9). As expected, developing contextualised climate risk management infrastructure is more resource intensive. Climate-resilient decision making requires establishing, maintaining and raising the capacity of institutions.

Table 9 shows adjusted values (adj1) on an incrementally increasing linear scale [per cent per cent (year 1) – 100 per cent (year 20)] that demonstrates the assumption that full effects of TAMD implementation will not materialise until the final year of implementation (see top three rows). This has no bearing on the overall sign of the net benefits, and indicates significant positive returns [between 1.51bn Ksh (£*10.7m) and* 2.27bn Ksh (£16.2m) in avoided drought expenditure and adaptation investments respectively].

To take the adjustment process further (adj2), the bottom three rows of Table 9 provides NPVs based on the assumption that TAMD implementation only ever captures half of the avoided losses attributable to governance, and increases on a linear scale [2.5 per

Table 9: Adjusted net present benefits

ADDITIONAL TAMD COSTS	BENEFITS FLOOD	BENEFITS DROUGHT	BENEFITS ADAPTATION	KSH NPV (£)
778m	2.57bn (adj1)			1.79bn (£12.7m)
778m		2.29bn (adj1)		1.51bn (£10.7m)
778m			3.05bn (adj1)	2.27bn (£16.2m)
778m	1.28bn (adj2)			502m (£3.58m)
778m		1.14bn (adj2)		362m (£2.58m)
778m			1.52bn (adj2)	742m (£5.30m)

[20] Inflation rate is 5.7%; discount rate is estimated as the annual return on low risk corporate bonds (8.23%), as the best indicator of time preference.

cent (year 1) – 50 per cent (year 20)]. This addresses the possibility that other governance processes may become operational that specifically address climate-resilient development, or that all efforts to achieve climate-resilient development only manage half the assumed effect within the 20-year lifecycle of TAMD. Under these stringent scenarios, TAMD remains a viable investment returning between 362m Ksh (£*2.58*m) and 742m Ksh (£*5.30*m) in avoided drought expenditure and adaptation investments respectively.

6.2 Adjustments for uncertain economic impacts of climate change

To include further uncertainty, the analysis provides values for benefit types based on scenarios given for the economic costs of climate change. An investment can be made in TAMD to improve climate risk management, but benefits may have a considerable margin of error depending on the level of impact climate has on the economy. In Kenya, the Stockholm Environmental Institute report (2009) stands as the most significant effort to estimate the economic impacts of climate change. Each of the adjusted benefits (adj1 and adj2 in Table 10) above are recalculated to adopt the same margin of error – a 37.5 per cent upper and lower bound – that incorporates this aspect of uncertainty.

Results show a range of benefit values for previously adjusted avoided losses, expenditures and adaptation investments. On lowest estimates, all bar one show positive NPVs – the basic benchmark of economic viability. This indicates that even if climate variability and change has the least expected effect, the benefits of implementing TAMD are greater than costs in nearly all scenarios. The exception is the NPV using the lower bound for previously adjusted avoided drought expenditures.

6.3 Break-even analysis

This section informs when the application of TAMD will likely generate a positive return. The break-even point is the intersection where accumulative costs and benefits meet. At this point, investors cover their initial costs and maintaining TAMD implementation generates further positive revenue from avoided losses, expenditures and

Table 10: Adjusted net benefits including uncertainty of economic impacts

ADDITIONAL TAMD COSTS	BENEFITS FLOOD	BENEFITS DROUGHT	BENEFITS ADAPTATION	KSH NPV (£)
778m	1.92bn (adj1 low)			1.13bn (£8.07m)
778m	2.57bn (adj1 mid)			1.78bn (£12.7m)
778m	3.21bn (adj1 high)			2.43bn (£17.3m)
778m		1.71bn (adj1 low)		932m (£6.6m)
778m		2.29bn (adj1 mid)		1.50bn (£10.7m)
778m		2.86bn (adj1 high)		2.08bn (£14.8m)
778m			2.28bn (adj1 low)	1.50bn (£10.7m)
778m			3.05bn (adj1 mid)	2.27bn (£16.2m)
778m			3.81bn (adj1 high)	3.03bn (£21.6m)
778m	800m (adj2 low)			22m (£157k)
778m	1.28bn (adj2 mid)			502m (£3.5m)
778m	1.76bn (adj2 high)			982m (£7m)
778m		712m (adj2 low)		-66m (-£471k)
778m		1.14bn (adj2 mid)		362m (£2.58m)
778m		1.56bn (adj 2 high)		782m (£5.58m)
778m			950m (adj2 low)	172m (£1.22m)
778m			1.52bn (adj2 mid)	742m (£5.03m)
778m			2.09bn (adj2 high)	1.31bn (£9.35m)

investment requirements. Figure 6 and 7 illustrate two scenarios of adjusted costs and benefits (adj1 & adj2 from Table 9).

The Adj1 scenario (see Figure 6) assumes TAMD implementation incrementally achieves climate-resilient development over 20 years. Investors cover costs – reach the end of the payback period – within four to five years, regardless of whether avoided losses, expenditures or investment requirements are under scrutiny. Conversely, the more stringent Adj2 scenario assumes TAMD implementation only half achieves climate-resilient development over 20 years, but the break-even point is still between eight (avoided adaptation investments) and 11 years (avoided drought expenditure). Therefore, even focusing on just one type of avoided losses, expenditure or investment, and assuming partial effectiveness over the long term, the application of TAMD pays for itself during the first decade.

Figure 6: Break-even analysis of Adj1

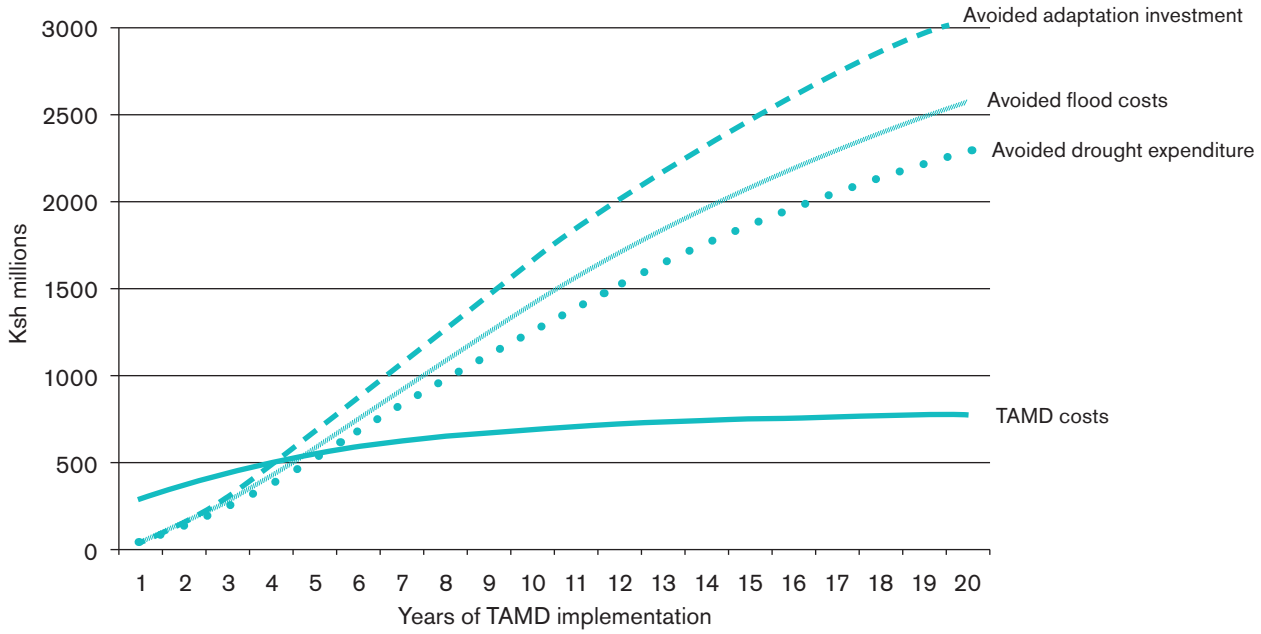
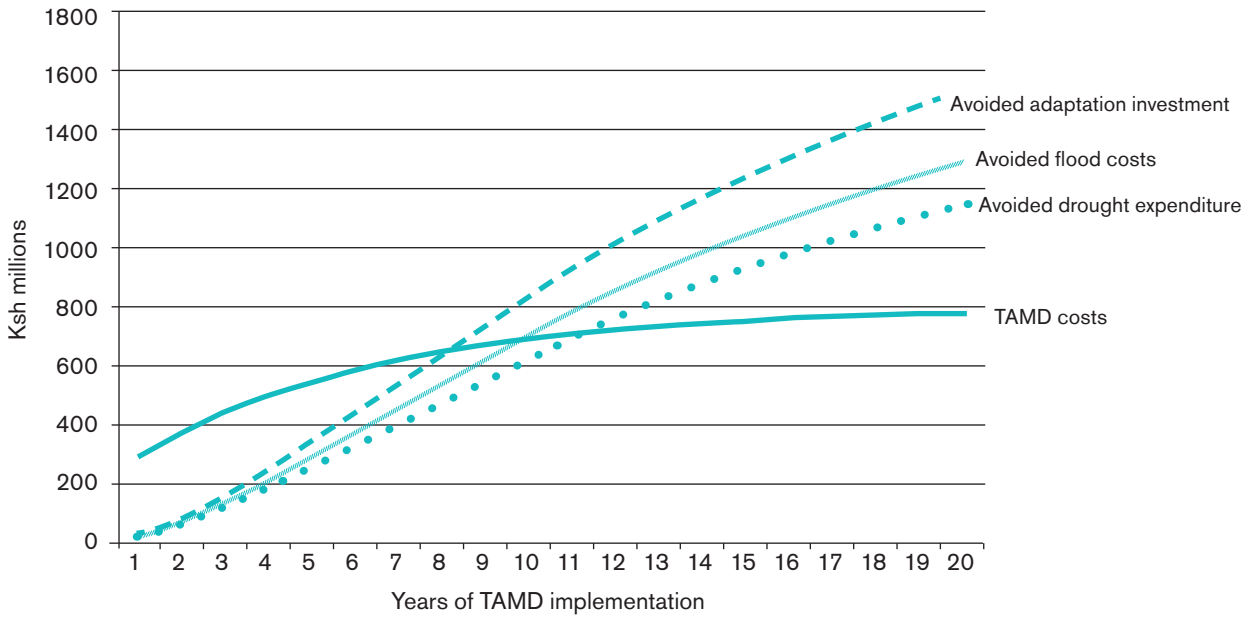


Figure 7: Break-even analysis of Adj2



7

Discussion

Kenya experiences significant economic welfare losses from climate variability and change. Applying the TAMD framework is designed to lessen costs by applying climate risk management to inform the decision making of public authorities. The objective of this study was to provide a sense of the monetary benefits of TAMD, and compare these with the costs of implementation. The ALRMP M&E provide the baseline to show the additional costs (associated with setting up necessary infrastructures) and additional benefits (introducing climate risk management) of implementing TAMD across the ASALs for 20 years.

Results illustrate significant returns of investing in TAMD, largely because climate losses, expenditures and investment requirements are high, and forward looking climate-resilient planning is a novel activity in Kenya. TAMD implementation introduces context through a system-wide participatory design of planning and evaluation mechanisms; raises awareness and engagement through participatory data collection; and develops capacity for learning and policy effectiveness by systematic knowledge building of climate-resilient policy practice. Using just single indicators of avoided losses, expenditures and investment requirements, and under pessimistic assumptions, applying TAMD creates considerable savings for public authorities dealing with the economic impacts of climate change. Even the introduction of partially effective climate risk management offers positive returns in the medium term.

These findings are based on recent/current costs, and omit the economic impacts of future climate variability and change. This study is the first attempt to place monetary values on TAMD, or any other governance framework directing adaptation or development policy. If fully or partially effective, the returns on investing in TAMD dwarf any costs to public authorities – but establishing precise figures on such a complex and multi-faceted benefits structure inhibits the presentation of robust point estimates, and firmer conclusions. Nevertheless, given the number and scale of losses, expenditures and unnecessary investments TAMD is designed to avoid, the full monetary value associated with the benefits of TAMD are certainly higher than those presented here.

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Annex 1: Sources from Matrix 2

- Total adaptation costs 2013–2017 – 107bn Ksh (US$1.26bn) (GoK, 2013)
- Costs of drought 1998–2000 – 16% of GDP annually (World Bank, 2004)
- Cost of 1998–2000 drought – US$2.8bn (SEI, 2009)
- Cost of El Niño 1997/1998 – 11% of GDP (World Bank, 2004)
- Cost of 2008/2009 drought interventions – 365 m Ksh (Fitzgibbon, 2012)
- Costs of drought interventions 2000/2001 in 10 arid districts – US$4m (Fitzgibbon, 2012)
- GoK allocation to drought 2011 – 18bn Ksh (US$ 219m) (Fitzgibbon, 2012)
- Emergency expenditure 1999–2010 – US$173.2m per year (Fitzgibbon, 2012)
- External humanitarian funding 2011 – US$248m (Fitzgibbon, 2012)
- External humanitarian funding 2000–2010 – US$76m per year (Fitzgibbon, 2012)
- DRR needs to boost resilience 2012–2016 –184bn Ksh (US$2.1bn) (Fitzgibbon, 2012)
- NDMP 10-year drought management budget – US$2.36bn (Fitzgibbon, 2012)
- MNKOAL five-year development plans – US$5.1 bn (2010–2016) (Fitzgibbon, 2012)
- Total adaptation costs 2013–2017 – 107bn Ksh (GoK, 2013)
- Effects of climate change by 2030 – 3% GDP (SEI, 2009)
- Losses from drought 2008–2011 – 968bn Ksh (US$12.1bn) (GFDRR, 2012)
- Recovery needs of drought 2008–2011 – 156.2bn Ksh (US$1.77bn) (GFDRR, 2012)
- Drought-related health expenditures – US$144 PPP (Letchenfeld and Lohmann, 2014)
- Livestock insurance – 3–6% of livestock valuation per year (Shirefaw *et al*., 2014)
- Severe flood damage – US$800m–1.2bn per severe event (Wang'ombe, 2011)
- Periodic extreme climate events – US$5bn–10bn per event (SEI, 2009)
- Drought disaster risk reduction damages, losses and risk reduction needs – 184bn post-2009–2011 drought (GFDRR, 2012)
- GoK (NDMA) food security expenditure – 173m per year (Fitzgibbon, 2012)
- UNOCHA humanitarian assistance – US$76m per year (Fitzgibbon, 2012)
- Aggregated economic losses/damages from drought from all sectors – US$125m per year (Fitzgibbon, 2012)
- GoK average expenditure on food and non-food emergencies between 1999 and 2010 – US$173.2m per year (Fitzgibbon, 2012)

Implementing the tracking adaptation and measuring development (TAMD) monitoring and evaluation (M&E) framework allows public authorities to assess climate risk management processes and contributions from adaptation or development policy. In Kenya, TAMD is used to introduce climate risk management into institutional decision making and to plan, manage and evaluate local policy. Yet we know little about the costs and benefits of applying TAMD – in Kenya or elsewhere. This study demonstrates the additional costs and benefits of implementing TAMD, providing a complete costing of TAMD operations and a range of benefit valuations (avoided losses, expenditures and investment requirements) associated with greater climate resilience.

IIED is a policy and action research organisation. We promote sustainable development to improve livelihoods and protect the environments on which these livelihoods are built. We specialise in linking local priorities to global challenges. IIED is based in London and works in Africa, Asia, Latin America, the Middle East and the Pacific, with some of the world's most vulnerable people. We work with them to strengthen their voice in the decision-making arenas that affect them – from village councils to international conventions.

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