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2030 Water Resources Group

Water Resources in Kenya: Closing the Gap

BRIEFING NOTE

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About 2030 Water Resources Group

The 2030 Water Resources Group (2030 WRG) is a global public-private-civil society partnership. The 2030 WRG facilitates open, trust-based dialogue processes to drive action on water resources reform in water stressed countries in developing economies. The ultimate aim of such reforms and actions is to close the gap between water demand and supply by the year 2030.

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Data sources

The data analysis in the report is primarily based on the National Water Master Plan 2013 (NWMP 2013, released in March 2014), which was developed by the Kenyan Water Resource Management Agency with the financial and technical help of the Japanese government. The NWMP primarily draws on 2010 data.

About this report

The purpose of this report is to stimulate and inform a constructive national dialogue regarding the challenges and opportunities linked to Kenya's future water needs and resources, in order to:

- Help decision makers in the private and public sectors sustainably manage the country's water resources while supporting long-term economic and social development. The time horizon contemplated in this report is 2030.
- Strengthen collaboration between (and within) government, industry, and civil society regarding water resource management.
- Help the Kenyan government initiate a national partnership to develop and implement projects to improve water security and efficiency across economic sectors.

The report was produced by the 2030 Water Resources Group (2030 WRG) in collaboration with various stakeholders and at the request of Kenya's Ministry of Environment, Water and Natural Resources.

INTRODUCTION

When it comes to water, Kenya is a land of contrasts. Though it is home to some of the great water towers of East Africa, 90 percent of the country is either arid or semi-arid. Rainfall patterns are highly variable, both annually and across seasons, a challenge likely to be further exacerbated by climate change. For the economy, local water stress is already a factor, not only in the arid areas but also in more water-rich regions where water-intensive economic activity has grown rapidly, such as Naivasha, greater Nairobi, and northern Mt Kenya.

In the future, water demand is expected to grow very rapidly, especially in the context of ambitious agribusiness development plans.

Water is an essential input to Kenya's varied and dynamic economic activity—be it agriculture, industry, energy production, or wildlife tourism—and access to safe water and sanitation is necessary for the health and well-being of Kenya's 44 million people. The development and management of water resources is therefore critically important for the economy, the environment and society.

Kenya's Vision 2030 development plan aims to transform the country into a newly industrialized, middle-income country, providing a high quality of life to all its citizens by the year 2030. The Government recognizes that water—in adequate quantity, and of sufficient quality—is a critical input to the realization of its development targets.

At the invitation of the Government of Kenya, the 2030 Water Resources Group (2030 WRG) has undertaken a preliminary analysis of water resource dynamics for the Kenyan economy. Through the analysis, the 2030 WRG aims to foster stronger dialogue and collaboration amongst all stakeholders groups and water-using sectors (industry, agriculture, energy).

Drawing from a wide range of published sources, as well as from interviews with over 50 stakeholders drawn from government, private sector, finance, and civil society, this Briefing Note summarizes the findings of the analysis, highlights pragmatic opportunities to close the potential water gap, and outlines plans for a Kenya 2030 WRG partnership to help realize these opportunities.

Figure 1: Water Supply and Demand Scenarios

		WATER DEMAND	
		Business As Usual	**Achievement Vision 2030**
WATER SUPPLY	**Business As Usual**	**BUSINESS AS USUAL** **Water Demand:** ■ Slow irrigation expansion, at current rate of 15% p.a. of Vision 2030 target **Water Supply:** ■ Water storage, water transfers and desalination at current (2010)levels ■ Current level of irrigation efficiency (60%) and NRW/ physical water losses (43%/30%)	**CONSTRAINED & UNSUSTAINABLE ECONOMIC GROWTH** **Water Demand:** ■ Achievement of proposed irrigation expansion **Water Supply:** ■ Water storage, water transfers and desalination at current (2010)levels ■ Current level of irrigation efficiency (60%) and NRW/ physical water losses (43%/30%)
	Achievement Vision 2030	**UNEXPLOITED ECONOMIC POTENTIAL** **Water Demand:** ■ Slow irrigation expansion, at current rate of 15% p.a. of Vision 2030 target **Water Supply:** ■ Implementation of all proposed water infrastructure ■ Achievement of 70% irrigation efficiency and reduction of NRW/ physical water losses (20%/14%)	**SUSTAINABLE ECONOMIC GROWTH** **Water Demand:** ■ Achievement of proposed irrigation expansion **Water Supply:** ■ Implementation of all proposed water infrastructure ■ Achievement of 70% irrigation efficiency and reduction of NRW/ physical water losses (20%/14%)

Water Demand–Supply Gap

Scenarios

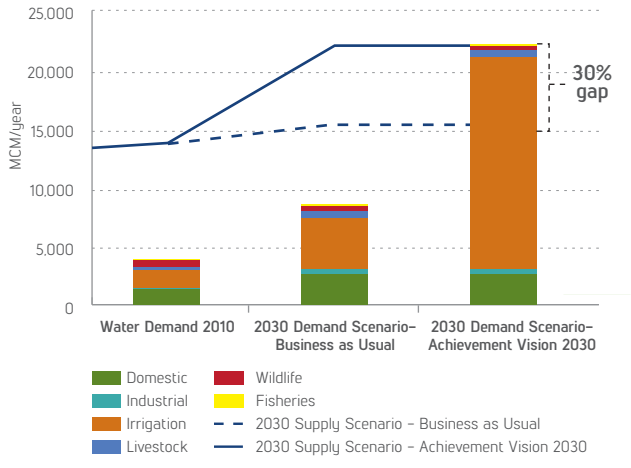
The initial assessment uses two demand and two supply scenarios (see Figure 1 on previous page). The first scenario assumes that the growth in water supply and demand follow a "business-as-usual" trajectory, while the second scenario assumes the achievement of the targets outlined in Kenya's Vision 2030. The assumptions underlying each of these scenarios are outlined in the annex.

National Analysis

The gap analysis contrasts Kenya's practically available water resources with current and projected water demands. Available water supply takes into account total surface water runoff and groundwater recharge, distribution and conveyance losses, and the amount of surface water required to maintain environmental flows.

Based on current water demand and future national development plans, it is estimated that Kenya could face a **31 percent gap** between water demand and practically available water supply by 2030 (see Figure 2 below).[1] This assumes that investments in increased water supply will follow a business-as-usual pathway, while demand for water will grow as required to achieve Vision 2030 development targets. If supply side investments also match development plans, the gap can be closed at a national level, although catchment and sub-catchment gaps will remain (see Figure 5 overleaf).

Figure 2: National water gap analysis



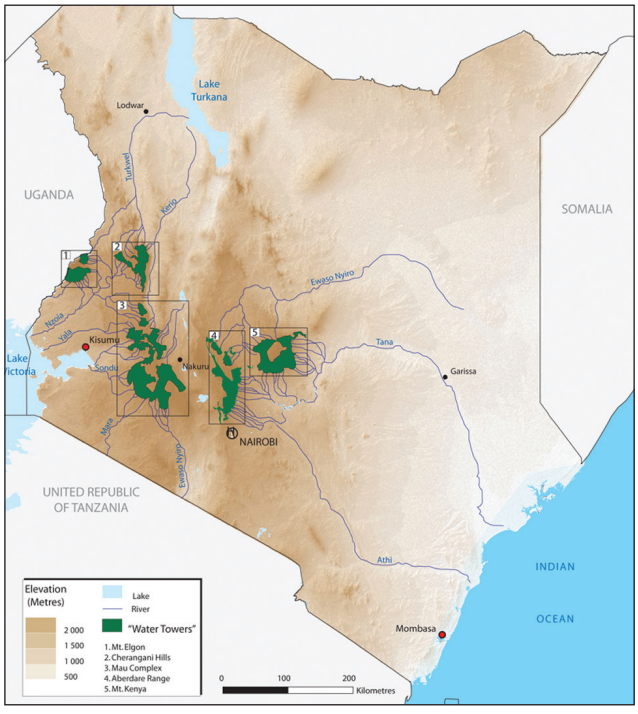
Clearly, irrigation plans represent the major driver of increased demand: the Kenyan government's 2013 National Water Master Plan states that 623,675 hectares of new irrigation development is possible with the country's available water resources. The Vision 2030 has a much more ambitious target: 1.2 million ha of irrigation development by 2030.

Figure 2 provides only a snapshot. It downplays the extent of dry season water stress in Kenya, as the figures are based on data from Kenya's National Water Master Plan (2013), which uses *average* annual surface water figures. Given the high seasonal variability of rainfall in Kenya, and low levels of water storage, any surplus of supply over demand during the dry season will actually be much lower than Figure 2 would suggest.

Catchment Focus

While the national gap analysis provides a quick snapshot, it does risk downplaying the extent of localized stress. Water resources in Kenya are very unevenly distributed, both across, but also within, Kenya's five major catchment areas (see Figures 3 and 4 for maps of the catchments and the corresponding major water sources, or "water towers," of Kenya).

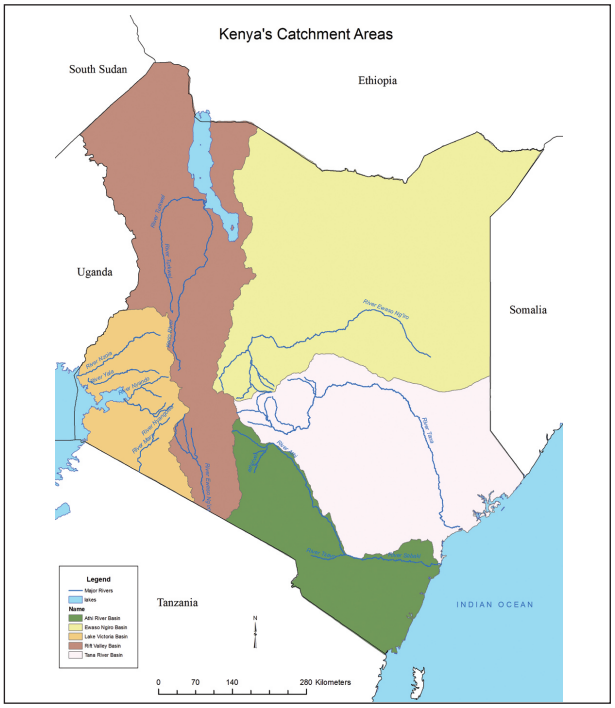
Figure 3: Kenya's water towers



Source: www.unep.org

1 This reduces to 6 percent if we take into account (unsecured) transboundary waters.

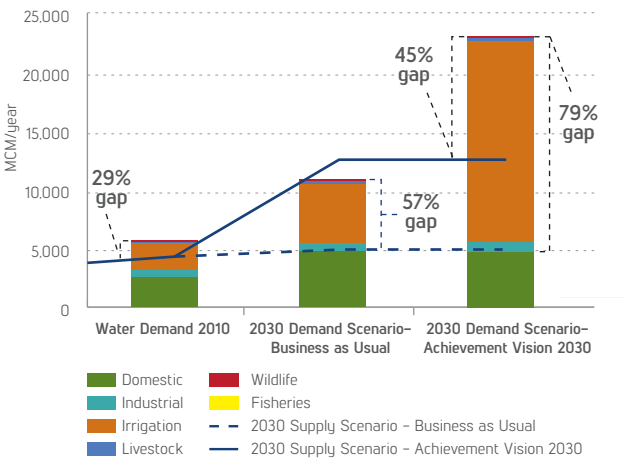
Figure 4: Kenya's catchment zones



Source: Kenya Bureau of Statistics

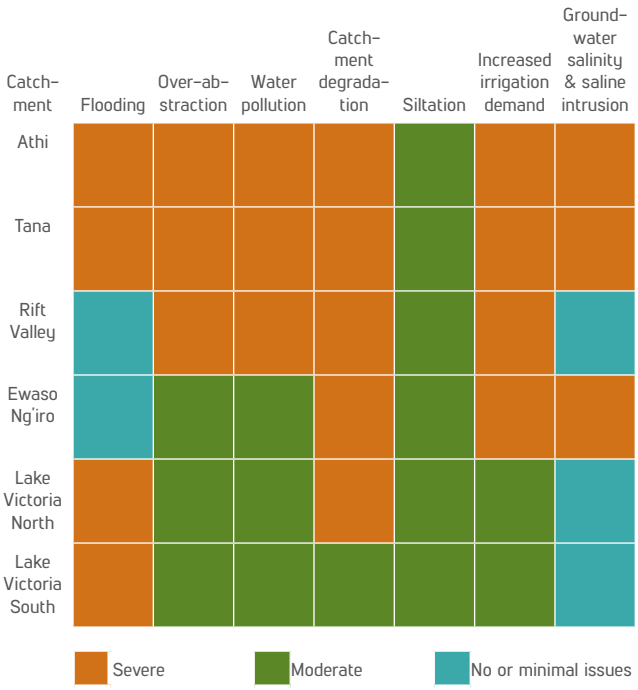
Applying the gap analysis at a catchment level, we see a different picture emerging. Figure 5, for example, shows that in the highly populated Athi catchment, as of 2010 water use is already exceeding environmentally sustainable limits by a substantial margin.

Figure 5: Water gap analysis—Athi catchment (2010, 2030)



The different catchments in Kenya, however, face different vulnerabilities, not all of which are captured through a simple supply-demand analysis. The heat map in Figure 6, compiled from secondary data and stakeholder consultations, provides another way of visualizing the challenges. This shows that the Athi and Tana catchments are most vulnerable. Catchment degradation, which increases hydrological variability (i.e. increases the risk of droughts and floods) is the challenge most widely faced, and one that increases risks for all water users, including farmers, energy producers, industry, and pastoral groups.

Figure 6: Catchment area heat map—variations in regional vulnerability



Opportunities For Closing The Gap

Though the challenges to sustainable water management are considerable, Kenya has already demonstrated considerable creativity and pragmatism in rising to these challenges.

This section highlights some notable or emerging success stories from Kenya that could be replicated elsewhere in the country to improve water resource management. These can be grouped around four categories:

- **New forms of catchment water partnerships**, such as the Imarisha Naivaisha platform for collective action, built on the premise that water-related risks are shared among government entities, businesses, communities, and the environment, and

Box 1: The business case for collective action on water sustainability

Water risk is now a business reality, in Kenya and globally. Water risks can be linked to water quality and availability (physical risk), to regulatory action, and to a company's reputation. Water scarcity may result in insufficient water for a business to maintain production, while poor water quality could increase pre-treatment costs for industry. Weak water governance may result in erratic water deliveries, resulting in production delays. Real or perceived social or environmental impacts of water use can result in a sudden loss of social license to operate.

Businesses in Kenya are already starting to adjust their operating modes to address inadequate water quantity or quality, by relocating water-intense operations to areas with more water, securing alternative sources of supply, or building artificial storage. A water-intensive private sector organization interviewed during the stakeholder consultation cited physical water risks as a possible reason for relocation of its plant from the Athi catchment. Two of the businesses interviewed retreat all water received from the Water Service Provider because of its poor quality. Obviously, this adds to their production costs and decreases their competitiveness.

Businesses have a stake in ensuring the sustainability of their own practices, as well as the efficacy of water management in the areas in which they operate.

The business case for proactively manage water-related risk is driven by five primary motivations:

- Ensuring the company's local legal or social license to operate in a specific location.
- Preventing operational crises resulting from inadequate supply or quality of water, or water-dependent inputs in a specific location.
- Assuring current and potential investors and markets that business operations will continue to be profitable in future by assuring water availability for operations and supply chains.
- Upholding corporate values and ethics based on sustainable and equitable principles by contributing to the well-being of watersheds, ecosystems, and communities.
- Gaining advantage over competitors due to stakeholder and consumer perceptions that the company uses natural resources responsibly with minimal effects on communities.

Source: http://pacinst.org/issues/corporate-water-stewardship/business-case-for-water-sustainability/

which supports the development and implementation of a water resources action plan for the Naivasha catchment.

- **Water efficient technologies**, such as efficient irrigation and monitoring systems being adopted by various commercial agribusiness producers, and increasingly being extended to smallholder production.
- **Water resource financing and incentive mechanisms**, such as a credit guarantee to support Water Service Providers in accessing funding (Kenya Commercial Bank, Housing Finance Bank), and a fund investing in the protection of the Tana river catchment (Upper Tana-Nairobi Water Fund).

New Water Partnership Models

Governance of water resources remains a critical issue in Kenya, and an active debate is underway regarding the most appropriate governance and institutional arrangements for the development, management and regulation of the nation's water resources, in light of the recent devolution process.

While such public sector discussions continue, various examples can be seen where local water stress is compelling civil society and the private sector actors to take on a more proactive role, alongside the public sector, to improve watershed management.

Such collective initiatives have come together in various geographies, in a variety of forms and under a variety of names, from "collective action for water security" to "water stewardship," to "multi-stakeholder water partnerships." They are, however, based on the common understanding that poor water management presents a shared risks, and that inclusive, transparent governance is the best way to present water conflicts and move towards long term sustainable water management.

Kenya has a world-class example of a collective action platform, developed to address shared risks around water scarcity and quality in the Lake Naivasha catchment. This "Imarisha Naivasha" case, presented in Box 2, provides a powerful example of local best-practice, one that could be replicated in other catchments in Kenya where water risks and water competition are beginning to grow.

New Water Efficient Technologies

Investments in supply side water storage and distribution infrastructure are of vital importance for most countries, and especially those, like Kenya, with large seasonal variations in rainfall. Nevertheless, infrastructure is costly, and often the most cost-effective investments are on the demand side, and not the supply side.

Reducing leaks in urban distribution systems and installing water efficient household appliances are often identified as "quick wins" when it comes to saving water cheaply.

However, in the context of Kenya, it is the irrigation sector that will be of most critical importance to managing future demands. Agriculture accounts for half of Kenya's water demand. Developing irrigation potential is vital for Kenya's development—only 16 percent of the country's land is arable, and 84 percent is arid or semi-arid, and therefore suitable for irrigated farming and livestock production. Irrigation currently covers only 2-3 percent of Kenya's total cultivated area.

The roll-out of large-scale, government-led irrigation programs is expected to increase rapidly over the years to come, in order to meet important food security goals. Modern irrigation technologies offer an opportunity to substantially increase agricultural output within current water constraints. For example, one large commercial producer interviewed had reduced their water requirement by 30 percent after replacing overhead sprinkler irrigation with new drip irrigation, for the same level of production.

Box 2: Platform for collective action: Imarisha Naivasha

Centered on a large freshwater lake, the Naivasha catchment supports thousands of livelihoods, including commercial flower and vegetable growing, tourism, geothermal power generation, fishing, and pastoralism.

Naivasha is at the center of Kenya's flower export market —a substantial foreign exchange earner. It accounts for 70 percent of the country's total cut flower exports in 2012. The basin is also responsible for 20 percent of Kenya's vegetable exports, and it contributes more than 10 percent of the country's total export earnings.

Naivasha Town has grown to support a population of over 300,000 and several informal settlements have developed around the lake, mainly to house workers from flower farms. This diverse community shares a dependence on the Naivasha catchment, including the attendant risks related to water pollution, over-abstraction, and poor resource management.

The horticulture industry in Kenya faces tough competition from countries such as Ethiopia, Egypt, and Tanzania. With lake levels dropping in the late 90s and early 2000s, it was realized—both by the government and the private sector—that if water issues were not addressed, a substantial share of the country's horticulture sector could be lost to competitors. The associated risk of loss of exchange earnings, tax revenue and sunk investment galvanized the private sector and the Kenyan government into action.

Imarisha Naivasha ("Arise Naivasha") was created in 2011 to tackle the growing concerns around water stress and water quality of Lake Naivasha and its surrounding catchment. It is a multi-stakeholder partnership that brings together the area's major horticulture companies, the government, and civil society to collectively strengthen water resource management within the Lake Naivasha basin.

The first step Imarisha Naivasha took was to address the most urgent needs, repairing mechanical equipment at the Naivasha sewerage treatment works, supporting community-based tree nurseries, and helping beach traders create better fish-processing facilities with cold storage equipment.

In parallel, the program prepared a longer-term integrated management plan and a sustainable development action plan "to restore the ecosystem functions, biodiversity and natural attractions of Lake Naivasha."

Strong private sector engagement

By 2014, Imarisha Naivasha was receiving contributions from Kenya-based and international horticulture companies of more than $6.5 million annually. Four retailers from the United Kingdom—Asda, Tesco, Marks and Spencer, and Sainsbury's—contribute more than $300,000 a year to Imarisha Naivasha's activities, recognizing that the reputational and product-sourcing risks associated with an unsustainable environment are real and worth mitigating.

Local banks are also involved in the initiative: Equity Bank provides low-income loans to farmer groups to reconstruct dams during dry periods.

The Kenya Flower Council and the Lake Naivasha Growers Group actively participate in the partnership, contributing to "Payment for Ecosystem Services" voucher payments to smallholders in the upper catchment to address erosion and poor agricultural practices.

While such examples are fairly commonplace in the commercial agribusiness sector, an exciting emerging trend is the reach of such technologies into the smallholder sector. Kenya in particular has seen the growth of small-scale horticulture, with entrepreneurial farmers combining low cost greenhouses and micro-irrigation to increase productivity on small plots of land. Expanding the number of farmers able to access such inputs, for example through new innovative financing mechanisms, may be an important way to increase food production within the country's water constraints.

Water financing mechanisms

Whether we seek to close the gap through new supply side infrastructure or demand side technologies, new forms of financing are critical. Public funds in Kenya are inevitably insufficient to meet the scale of investment needed to achieve water security, and hence new sources of financing need to be leveraged. While not yet a well-developed area in Kenya, there are early-stage examples on which to build. Two are highlighted here:

Credit guarantees for water infrastructure investments

In Kenya, water services are provided through decentralized, publically-owned Water Service Providers (WSPs). Traditionally, these WSPs have not been considered creditworthy, and hence have struggled to obtain commercial finance to invest in their water infrastructure. In response to this, development organizations like the World Bank, USAID and KfW are helping to develop risk sharing mechanisms which, combined with technical support, will enhance the borrowing capacity of WSPs, enabling them to invest both in supply-side expansion infrastructure and demand-side non-revenue water reduction measures.

To date, the Kenya Commercial Bank has signed a $3 million development credit authority guarantee for water financing, while Housing Finance Bank is expected to secure a $6 million guarantee. The Housing Finance Bank has already financed a 29 kilometer pipeline for Embu Water Company Ltd through this initiative.

The Nairobi Water Fund

The Upper Tana-Nairobi Water Fund was launched in Kenya in March 2015. Coordinated by the Nature Conservancy, the Fund was established with support from a range of public-private stakeholders in the catchment, including the Kenya Electricity Generating Company (KenGen), International Centre for Tropical Agriculture (CIAT), Tana and Athi Rivers Development Authority (TARDA), Water Resources Management Agency (WRMA), East Africa Breweries, Coca-Cola, Frigoken Horticulture, and Pentair.

The fund provides a pooled financing mechanism for stakeholders, including major downstream water users, to support the protection of the upper Tana catchment. The upper Tana provides the major water source for the city of Nairobi. The fund was established following background analysis which estimated that a US$10 million investment is expected to return US$21.5 million in economic benefits over the 30-year timeframe. The fund is designed to provide sustained water supply to over 9.3 million people, finance on-farm tree planting, purchase of drip irrigation for farmers, terracing and other erosion-control measures, as well as protection of river banks and cutting pollution of water sources in the Upper Tana River basin.

THE WAY FORWARD

The 2030 Water Resources Group (2030 WRG) is a global public-private-civil society partnership. The 2030 WRG facilitates open, trust-based dialogue processes to drive action on water resources reform in water stressed countries in developing economies. The ultimate aim of such reforms and actions is to close the gap between water demand and supply by the year 2030.

In Kenya, the 2030 WRG was invited in 2014 by the Ministry of Environment, Water and Natural Resources to support the development of a national multi-stakeholder partnership. The structure of the Kenya 2030 WRG partnership is now taking shape, and is expected to be formally launched by mid-2015. The objective of the partnership is to:

- Enhance access to, and sharing of, best practices in water resource management for Kenya, drawing on both national and international experiences
- Generate, package and disseminate analysis on water supply and demand trends, potential gaps, and major water risks, to inform sector dialogue and planning, and to engage stakeholders from outside of the mainstream water sector
- Enhance coordination of water related multi-stakeholder efforts in Kenya, building on and strengthening existing structures where possible
- Foster stronger collaboration, commitment and ownership amongst all stakeholders groups and water-using sectors (industry, agriculture, energy)
- Support stakeholders to identify and design practical new programs and projects to improve the use of water across all key economic sectors in Kenya and close the projected gaps between water supply and demand by 2030

The opportunities highlighted by stakeholders, and summarized in this note—including the development and strengthening of catchment level partnerships, the roll out of new technologies, and the development of new financing and incentive mechanisms—represent the kinds of practical initiatives to be developed under the partnership.

The partnership is intended to be fully inclusive, and all parties interested in supporting improved water resource management in Kenya are encouraged to engage.

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ANNEX 1: ASSUMPTIONS UNDERLYING 2030 WATER DEMAND PROJECTIONS

Projected domestic water demand is based on an assumed population increase of 75 percent between 2010 and 2030. About 67.8 percent of the total population will live in urban areas, while the remaining 32.2 percent will live in rural areas. It is assumed that, by 2030, 75 percent of the country's water supply would be provided through piped WSPs, with the remaining 25 percent provided through springs, wells, and boreholes. Piped WSPs will provide all urban areas with water, while 78 percent of rural areas will be supplied by springs, wells, and boreholes.

Projected industrial water demand is based on the assumption set out in Kenya's Vision 2030: Kenya will achieve a GDP growth rate of 10 percent annually by 2017, which is then expected to continue at a more moderate annual rate of 8 percent between 2017 and 2030. Industrial water use will increase in line with the growth of urban water demand.

Projected irrigation water demand: Building on Kenya's Vision 2030, the government aims to increase the area under irrigation to 1.2 million ha by 2030.[2] To achieve this, the land under irrigation and drainage will be expanded by 40,000 ha annually, of which 8,000 ha shall be rehabilitated per year. Achieving this target will result in irrigation water demands of 18,048 MCM/year by 2030. However, based on the Vision 2030's progress reported in the first Medium Term Plan 2008–2012, targets have not been met in their entirety. The Medium Term Plan targeted an increase of 200,000 ha of irrigated land, of which 34,600 ha (about 17 percent) was achieved in 2012, mostly by rehabilitating irrigated land in the Tana catchment.[3]

Projected livestock demand is assumed to increase in accordance with population growth as more milk and meat is needed to ensure food security.

Projected inland fisheries demand is also assumed to increase with population growth. The development of fish ponds is expected to increase by 176 percent between 2010 and 2030.

Projected wildlife demand: Wildlife water demand is projected to remain unchanged between 2010 and 2030. This is due to Kenya's target to sustain its wildlife population, which means that the unit water demand should remain constant.

Projected hydropower demand: Based on the information collected for proposed hydropower development projects, annual water use was estimated using features like planned installed capacity, estimated annual average power generation, and design plant discharge. However, information on the design of the hydropower plants, including the surface area of the reservoirs, is not available. As this is a key determinant to calculate evaporative losses, the additional hydropower demand cannot be included in the 2030 projections. The evaporative loss from the existing hydropower plants, however, is included.

Caveats

While the analysis is based on the best available data, the following caveats should be considered:

- Uncertainty on fossil groundwater aquifers. For example, the Ministry of Water Resources is currently verifying the recent discovery of a Turkana aquifer, which is why it has not been included in this analysis.
- Potential trans-boundary water resources are not included in the main analysis because discussions on water-sharing international treaties and agreements with neighboring countries are ongoing. However, a hypothetical scenario analysis is included in the annex.
- The effects of climate change in 2030 are difficult to predict and need to be considered with care.
- To date there is no global standard on calculating environmental flows, with ongoing debate about which methodology is best. Methodologies result in quite different estimates for environmental flows, so caution is advised in their interpretation.
- Return flows have not been considered due to lack of available data on factors influencing these, such as soil structure, gradient, etc. which are highly localized and thus aggravate any catchment or national scale assessments without further analysis.
- Water deficits within sub-catchments are not included in the analysis.
- Water storage is assumed to be annually, which means that the water stored in the preceding year is assumed to be available in the analyzed year. Inter-seasonal increases in practically available water have not been considered.
- Water demands are based on estimates, rather than verified water abstractions, due to lack of available data.

2 While the initial target was set to increase irrigated areas in arid and semi-arid regions by 1.2 million acres, this has been recently revised to 1.2 million hectares. The initial target is still mentioned by the National Irrigation Board (see: http://www.nib.or.ke/irrigation-programmes/national-economic-program-galana-kulalu-projects.html). Please see NWMP (2013) Sectoral Report G, Page G-36/ 37 for more information.

3 Kenya Vision 2030—Highlights of Vision 2030 Achievement (2013).

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