Innovation to sustainable water management in Rwanda

The challenging interface between Science and Policy

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Abstract

This paper contemplates the way sustainable water management is considered as an increasingly complex challenge and policy priority facing the society. It seeks to think differently about policy trends in water management and also considers the notion of innovative solutions towards community development through job creation in developing countries including Rwanda. Even though sustainable water management has been the focus of abundant research over the past decades, some key policy questions have not found clear answers yet. To what extent and how can innovative solutions assuring global access to safe –drinking water- through best practices and knowledge sharing? Should governments intervene to correct water access problems and, if so, with what types of interventions? What should be their policy objectives? To shed light on these important issues, the author highlights some existing models and their conflicting policy implications and discusses the policies that may be justified based on recent relevant empirical studies. These values include Innovative technologies for water supply, sanitation and storage. A key limitation is that water use efficiency is the most pressing social problem in developing countries.

Keywords

Sustainability, water management, innovation, adaptive capacity, Africa, Rwanda

I. INTRODUCTION

Water resources management has become an important and challenging goal in the design and formulation of appropriate policies in Rwanda. Water has been for long considered as the most precious of the natural resources of Rwanda. Water is a finite natural resource and its use must therefore be based on the principle of sustainability as articulated in the Rio Declaration on Environment and Development, 1992. [1]

[1] The *1992 Rio Declaration on Environment and Development*
http://www.unep.org/documents.multilingual/default.asp?documentid=78&articleid=1163

It sustains life, including human life and ecosystems' health, and supports all sectors of the national economy. It is a unique substance with no known substitute[2]. The current water resources management is governed by the existing water and sanitation policy developed in 2004 before a new water law was adopted in 2008 on the use, conservation, protection and management of water resources.

Despite the current approaches on water resources management, planning and development that seek to address the interdependence of the different uses and users of water resources, current findings are not clearly proving how these approaches can be adopted as new investments for community projects.

Current overall approaches to water resources management in Rwanda are mainly characterized by a range of clearly defined problems that society need to solve, but despite the availability of technologies and knowledge, the implementation into practical action is still lacking in most cases.

It is paramount to notice that in many developing countries, science plays a critical role in informing and supporting management and policy decisions in the water sector. Local vulnerable communities in remote rural villages value the opportunity to turn into water service providers themselves and make money while adopting these innovative solutions. Currently, all stakeholders are fully aware of the fact that the management of available water resources requires accurate knowledge of the resource available

Nevertheless, the uses to which it may be put, the competing demands for the resource, measures to and processes to evaluate the significance and worth of competing demands and mechanisms to translate policy decisions into actions on the ground[3], implementing a vulnerability management process is critical in a move to protect this resource against depletion and pollution in the face of global climate change.

Maintaining the speed of innovation in translating scientific knowledge into a language accessible to policy-makers and managers, is obviously important to further expand opportunities for people to come up with entrepreneurial and water management sound community-based projects. Entrepreneurship will drive economic change and innovation while at the same time boosting financial capacity for these communities living in remote zones.

Innovation measures in the water management will be very welcome. There are currently many development opportunities already available at national and regional level, but a more important innovation is necessary at the administration and policy level. This focus is needed because with current

[2] National Policy for Water Resources / Management (Rwanda Ministry of Natural Resources), Dec.2011

[3] Grafton, Q. R., & Hussey, K. (2011). Water Resources . New York: Cambridge University Press

political will, it would be possible to achieve the goals set out in the policy framework for water management.[4]

II. CHALLENGES IN WATER RESOURCES MANAGEMENT

This section outlines a number of scenarios where the challenges occur in water resources management. The description of each challenge could illustrate to which extent each stakeholder learnt lessons from this particular situation phenomenon. One of the primary uses of water in Rwanda is as an input into production in agricultural, industrial, mining, tour ism and other commercial sectors.

This vital resource has occupied an important position as a cross-cutting resource phenomenon, interacting with multiple sectors, including domestic consumption, agriculture, commerce, industry, transport and energy as well as ecological functions for environmental conservation such as forests, fisheries and wildlife.

Currently, one of the growing challenges facing currently water resources management in Rwanda is the increasing negative impact of climate change that affects quantitatively and qualitatively water resources, data collection must be strengthened to understand the water balance, meteorological observation and research to support water resources related planning and development.[5]

In light of these challenge, it is particularly important to promote change in routine practice when decision-makers within each organization at national level do not perceive changes as necessary.

Table 1: Water Availability in Rwanda

	Water availability Parameter	Unit	Amount
1	Average precipitation in depth	(mm/yr)	1,212
2	Total Renewable Surface water	(billion m^3/yr)	9.5
3	Total Renewable Ground Water	(billion m^3/yr)	7
4	Total renewable water	(billion m^3/ yr)	9.5
5	Per Capita renewable water (actual)	(m^3/ yr)	977.3
6	Per Capita renewable water (Africa)	(m^3/ yr)	4,008

Source: UNEP (2010): Africa Water Atlas

As shown in the Table 1 above, water remains a resource that must be carefully harnessed, optimally utilized, controlled and managed appropriately in order to obtain maximum benefit from it while minimizing its potentially adverse effects.

[4] Rwanda: Kagame advises Rwandan farmers on coping with climate change (Article published by PANAPRESS on 7 Feb 2017)

[5] Idem, Rwanda Ministry of Natural Resources

III. QUEST FOR INNOVATION ADOPTION

Innovations are amongst the most important driving forces for growth, employment and social coherence. Numerous studies prove that innovation activities have positive effects on companies' success, export activities and productivity.

Adoption usually starts with the recognition that a need exists and moves to searching for solutions, then to the initial decision to attempt the adoption of a solution and finally to the actual decision to attempt to proceed with the implementation of the solution (Damanpour and Schneider 2006; Gallivan 2001; Mendel et al. 2008).

Obviously, access to suitable drinking water and more effective domestic, school and workplace infrastructure for the separate treatment of human waste will result in more efficient employees in the labor market in better health conditions.

Without these changes, non-sustainable water management represents one of the contributing factors in jeopardizing the hard-earned successes in eliminating poverty and creating jobs.[6]

The most water-intensive sectors are agriculture, fishing and forestry, and they alone provide employment for more than 90% of the Rwandan population. The government must invest heavily in research and innovation in order to actually achieve the benefits in job creation.

Currently Rwanda's efforts in water resources utilization for growth are expected to increase, as more land will be put under irrigation; more hydro-power generation potential will be exploited; and more industrial activities is anticipated. [7] But the country needs to push national agenda by adopting technologies and management models that contribute to sustainable water management

IV. CONCLUSION

If successful adoption of these innovations in water management precedes successful implementation, the following step would be the exploration of adoption theories and constructs. As adopting organizations operate within their contexts and outside environments, adoption theoretical frameworks have identified socio-political and external factors that can influence adoption.

Obviously, financial incentives and reward systems for adoption should be positively associated with the pre-adoption stage at each level among all stakeholders.

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[6] Water and Jobs – World Water Development Report 2016, UNESCO https://www.unesco-ihe.org/sites/default/files/invi_wwdr_launch.pdf

[7] Rwanda's Second Economic Development and Poverty Reduction Strategy (EDPRS 2) http://www.minecofin.gov.rw/index.php?id=149

Nevertheless, organizational leadership, particularly in championing innovations, is important to pre-adoption and adoption.

The strategic national planning is to include scientific consideration for a better understanding of where and in what form water is from the existing sources such as rainfall (precipitation); surface water bodies; ground water aquifers; and wetlands.