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Seminar: IWRM and ecosystem based approaches: Complementary, duplicating or competing?

ABSTRACT VOLUME

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Seminar: IWRM and ecosystem based approaches: Complementary, duplicating or competing?

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Assessing the effectiveness of water policy and governance in Brazil

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Keywords
Governance, Brazil, Observatory, OGA

Highlights

- To share the experience of building the 'Water Governance Observatory' in Brazil;
- To point out its potential contribution to the improvement of the Brazilian National System of Water Resources Management;
- To highlight the lessons learned and the challenges to the sustainability of this platform

Introduction and objectives

Governance has been described as a multi-layered, multi-scale, and multi-sector ensemble characterised by a combination of hierarchical structures, participatory dynamics, associative action, and market mechanisms (Castro, 2007). The existence (and appropriate functioning) of arrangements aimed at ensuring the shared and sustainable management of water resources is directly associated with better protection of freshwater ecosystems. In this context, the report outlines the process of building a national and independent water governance observatory in Brazil (the 'Water Governance Observatory'), an evidence-based, participatory platform for continuous, independent assessment of the effectiveness of water governance in Brazil, with more them 80 institutions signatories.

Methodology approach

Considering that all the authors are directly involved in the process, representing institutions that have supported the OGA since its inception, the methodological approach can be characterized as 'Participant Observation'. The purpose is - from this inner vision - to share the experience of building the 'Water Governance Observatory' in Brazil, pointing out its potential contribution to the improvement of the Brazilian National System of Water Resources Management, promoting a critical reflection on the lessons learned and the challenges to the sustainability of this platform.

Analysis and results

A national Water Governance Observatory was first thought of in 2004, under the leadership of WWF-Brazil, which conducted studies and technical meetings, included a short publication evaluating the 'achievements and challenges' from the first eight years of the policy. This report also identified and discussed a series of 32 potential indicators. In 2012, after a period of dormancy, it was decided that this issue should be tackled again as there was little sign from the federal or state governments of progress with the National Water Resources Management System (SINGREH). In a partnership with Fundação Getúlio Vargas a study was conducted applying their systematic approach and associated indicators to evaluate SINGREH. This took one year, including extensive background research, stakeholder interviews and the convening of two expert workshops. It resulted in a 2014 report: Governance of Water Resources – Proposal of indicators to monitor implementation. As a consequence of this process, by November 2015 the concept of an observatory had generated great interest throughout the country, with over 50 key institutions engaged in the observatory.

By the end of 2017 more than 80 institutions were already engaged in the observatory, including federal and state water basin committees and forums.

Conclusions and recommendation

Brazil has made remarkable progress in water resource management, based on a decentralized, participatory and integrated system. However, multi-level governance is particularly critical in a federation, and rooted in a recent history of participatory democracy (OCDE 2015). Therefore, despite the progress achieved, the management of SINGREH still needs to be consolidated in order for it to be effective (WWF, 2016). We defend that the 'Water Governance Observatory' can be an important tool to provide the transparency required to enable Brazil to move towards responsible management and guarantee sustainable access to water for its citizens, economic activities and for natural ecosystems.

Assessing the interconnectedness of ecosystems, water and food

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Keywords
ecosystem services, ecohydrological modelling, assessment of interconnectedness

Highlights
Three showcases of an integrated assessment of water related ecosystem services in complex multifunctional river basins in China and Siberia are presented. Ecohydrological and ecohydraulic model chains were used to analyse impacts of land use and climate change on water resources, aquatic biodiversity and water-related ecosystem services

Introduction and objectives
Typically, river basins are clearly multi-functional, providing various types of ecosystem services affecting virtually every aspect of life. Water resources and ecosystems in particular are under pressure, being affected by multiple stressors and all dimensions of global change. To understand and ultimately manage these relations and the interaction of key drivers, landscape processes and feedback mechanisms, an integrated and interdisciplinary modelling approach in accordance with the principles of IWRM is required.
The objective of this study is to assess the interconnectedness of ecosystems, water, energy and food and where possible to quantify impacts of IWRM on water-related ecosystem services

Methodology approach
For all three case studies an ecohydrological/hydraulic modelling change has been established applying the SWAT model on catchment scale and the HECRAS model for instream processes. Changes of land use (induced by hydropower dams or agricultural intensification) have been detected using field surveys, farmer interviews and remote sensing. Aquatic biodiversity was assessed with field surveys and the implementation of species distribution models. Impacts of climate and land use change on water resources have been quantified with the modelling chain and the impact on water related ecosystem services as well as on biodiversity have been analyzed.

Analysis and results
Case 1: Three Gorges Dam
The resulting land-use changes, due to resettlement of lost agricultural land and urban areas, potentially could increase erosion and landslides in the catchment, which would imply a high risk of eutrophication in the reservoir. The results of these model runs, however, show that cropland was partly converted to forest and orange orchards, showing a move from home self-subsistance to market fruits. As a result, the sediment yield was, contrary to expectations, cleary reduced.
Case 2: Chiangjiang River
This integrated approach enabled a joined hydrobiological and hydrological assessment. The assessment demonstrated how the spatio-temporal variations in hydraulic variables shape the distribution of key species (grazers and filter feeders) in this river system.
Case 3: Northern Siberian Lowlands

The main question posed here was, what would happen to ecosystem services (provisioning, regulating, cultural) if projected temperature increase affects snow melt, the key hydrological driver in this area. The interdisciplinary methodological framework resulted in an indicator-based assessment of several ecosystem services. It revealed that water flow regulation is the key service in this landscape, because water flow is the dominating/limiting factor for agriculture.

Conclusions and recommendation

In conclusion, with regard to the interconnectedness of water, food, and biodiversity the impact of land-use change/climate change on water balance components is relatively well understood, despite data scarcity or non-stationarity. Progress has been made in linking hydrology and hydraulics to model aquatic biodiversity as a function of global change. It has also been made in depicting spatially and temporally distributed ecosystem services. However, more research is still required when it comes to considering multiple landscape functions/services for multi-goal optimization (e.g., agricultural yield, water quantity and quality, biodiversity, income) as a stakeholder driven process

Can you sue a river? Legal rights and IWRM

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Keywords

legal rights, IWRM, competition, collaboration, river

Highlights

In 2017, rivers in New Zealand, India, and Colombia were granted the status of 'legal persons' to protect their ecosystems. Reactions to the new ecosystem-based legal rights for rivers show that creating separate, legally enforceable rights for aquatic ecosystems can increase competition between water users and weaken IWRM.

Introduction and objectives

In 2017, rivers in New Zealand, India, and Colombia were granted the status of 'legal persons', and now have the right to enter contracts, to own property, and to sue and be sued in court to protect their ecosystems. Although these specific legal rights remain highly novel, the concept of creating legal rights to water for the environment (including rivers, wetlands, groundwater systems, and estuaries) is widely accepted. However, the reaction to the new ecosystem-based legal rights for rivers shows that creating separate, legally enforceable rights to water for the environment can undermine the goals of IWRM.

Methodology approach

This presentation examines the creation of legal rights for rivers in three countries (New Zealand, India, and Colombia) from the perspective of IWRM. Data is presented on: (1) the method of creating the new legal rights; (2) aims and objectives of the legal rights; (3) institutional settings, organizational capacity and funding for the entities now considered to be the 'voice' of the river; and (4) reactions from the media and local governments on the implementation of the new legal rights, including the willingness to manage the rivers under an IWRM framework.

Analysis and results

Reactions to the new legal rights for rivers have been telling. In New Zealand, farmers within the catchment of the Whanganui River are concerned that the rights of the river may interfere with their ability to farm. In India, the state government guardian was so concerned that it could be held responsible (and sued) for the future flooding of the Ganges River that it appealed the decision to the Indian Supreme Court. When placed in the context of water resource management, these examples demonstrate the challenge of establishing adequate legal protections for aquatic ecosystems, without creating an adversarial, competitive relationship between the environment and other water users.

Effective IWRM requires different water users to work together to achieve shared benefits, particularly when water is scarce. However, private rights based systems for managing water and the environment often drive the creation of new legal rights to water for ecosystems. These legal rights can lead to better environmental protection, but they also reduce the willingness of other water users to collaborate and achieve multiple outcomes. Worse, there is a growing fear that people affected by the 'actions' of a river (such as flooding) will seek to sue the river for damages.

Conclusions and recommendation

Rivers and other aquatic ecosystems are increasingly being granted legal rights, including rights to water as well as the rights of a legal person. These rights are lauded as increasing legal protection for aquatic ecosystems, but more thought needs to be given to how these new rights can operate with IWRM frameworks. At present, there is a real risk that legal rights will increase competition with other water users, and undermine collaboration between water users and across water sectors.

Coastal flood adaptation for indigenous communities in Canada

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Keywords

Indigenous, Coastal Flooding, Climate Change Adaptation, Cultural Values

Highlights

First Nations in the North American continent region are working to overcome conflicts over water management. The Canadian Water Resources Association (CWRA) a network of water professionals across Canada has formed an Indigenous Water Issues Committee to provide focus on First Nations challenges such repeated flooding from coastal inundation.

Introduction and objectives

Future predicted flood levels due to sea level rise will further impact already problematic flooding in coastal First Nations communities. This presentation will overview the challenges to First Nations from increasing coastal flooding. First Nations traditional knowledge is abundant yet rarely integrated into the Integrated Water Resources Management approach which incorporates flood impacts with environmental and social aspects of water management. First Nations in coastal BC are beginning to study the future impacts of climate change on their communities and are now developing adaptation plans that consider their relationship with water and how traditional knowledge and values can be considered.

Methodology approach

Working with First Nations Communities and Canada's Federal Government, CWRA's Indigenous Water Issues Committee acts to facilitate understanding of coastal adaptation issues due to climate change. The committee discuses shared water concerns and responsibilities and assist to incorporate traditional knowledge, relationship to water and environmental issues into integrated flood adaptation planning. The committee engages First Nations and facilitates a transfer of information and input from our network of water professionals, and provides assistance to enhance internal capacity. The CWRA Indigenous Water Committee acts as a facilitator in this process.

Analysis and results

CWRA's committee provided oversight of a conference session which facilitated sharing of results of adaptation planning and shared challenges. This built better understanding of First Nations coastal flooding challenges, their relationship to traditional knowledge and values such as connection to water. This undertaking built First Nations professional capacity to present project findings in an open forum. This resulted in a greater integration of First Nations water issues into CWRA's conference and resulted in a

This sectoral conflict between First Nations and other communities can result in increased flood risk to coastal First Nations communities. Results indicate that integration of First Nations traditional values can enhance ecosystem function, establish interlinkages in the planning process and result in better more comprehensive values moving toward the values of UNDRIP.

Conclusions and recommendation

Conclusions are that First Nations within the Canadian region are more vulnerable to climate change than other non-indigenous communities due to lack of funding, community professional capacity and understanding of flood risk. With the consequences to flooding increasing as sea level rises, so will the risk to First Nations. Integration of cultural values and knowledge into IWRM planning has provided an opportunity for CWRA promote more effective Indigenous water management.

Effective stakeholder participation in IWRM and ecosystems approach

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Keywords

Stakeholder, Sustainability, Permaculture, Ecosystems, Community

Highlights

In 2012, Water For People partnered with Strathclyde University to implement an Integrated Water Resources Management (IWRM) approach in the Traditional Authority Chapananga in Chikwawa-Malawi. The goal was to maximize economic and social welfare in an equitable manner, without compromising the sustainability of vital ecosystems

Introduction and objectives

In 2016 a research study was initiated to evaluate the work that has been carried out between 2012 and 2016 in respect to localised IWRM in Chikwawa district of Malawi. The research assessed the impact of localized IWRM on functionality of water points and the incentives for stakeholder participation. IWRM recognizes the economic benefits of managing water and related resources in an integrated manner. Well-managed water and other natural resources provide high levels of Ecosystems. Ecosystems valuation and management is a practical way of achieving IWRM goals as well as other tangential socio-economic and environmental benefits.

Methodology approach

The research was carried out in 115 villages in Traditional Authority Chapananga- Chikwawa. This is the area where the localized IWRM project was implemented in 18 villages, hence the 115 villages included both non- and intervention villages. Water point mapping and service provider interviews were conducted.

Specific Objective

- Assess if there is a relationship between practicing IWRM principles and functionality of water points (a water point is both a resource and habitat for ecosystems).

Research Questions

- Is there is a relationship between adopting IWRM principles and functionality of water points?

Analysis and results

Assess if there is a relationship between adoption of IWRM principles and functionality of water points To find out whether communities adopted IWRM principles we looked at the following indicators: (1) High Stakeholder participation – community confidence and competence to create financial and social value around the water supply system beyond merely providing clean water, especially in women. (2) Permaculture - Development of gardens to use excess borehole water and local resources to grow crops, which generates income with the understanding that water is a finite resource and for sustainability of the (3) Water Point Banking – Establishment of tariff structure to recover full costs and be converted to savings, which can be loaned out at an agreed interest rate to the users, further building financial capital for pump management. This links to the understanding that water is both a social and economic good. Results In our sample of 115 villages, 100 percent of the water points (41/41water points) where the villages adopted IWRM principles had their water points functional, this is much better than the non IWRM adopters (64.9% functional) or national

figures where 25% of water points are nonfunctional at any given point (Joint Sector Performance Report,2014).

Conclusions and recommendation

It can be concluded that there is a relationship between practicing IWRM and ecosystems approaches and functionality of water points/resources. Where IWRM and Ecosystems approaches are integrated, there is high probability that the water resource would be sustainable as it also plays as a habitat for ecosystems.

Environmental paradigm and water management at Lujan River Basin in Argentina

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Keywords

Lujan River Basin, Ecosystem Approach, Ecosystem services, Water Management Fragmentation, Integral Management of the Water Resources.

Highlights

This paper contributes to:

1. The evaluation of the effectiveness of legal-institutional mechanisms which are influenced by two interrelated approaches: the IWRM and the Ecosystem Approach,
2. To analyze ecosystem services valuations at Lujan River Basin, Argentina, and
3. To analyze the effectiveness of class actions in connection with water affectation.

Introduction and objectives

Pollution in the metropolitan basins of Greater Buenos Aires is the most important urban environmental problem in Argentina, and one of the most serious in the world. However, since the 1990´s there have been important progresses in the institutionalization of the environmental paradigm.

In this paper we analyze the level of effectiveness of these institutional advances, in connection with the application of two fundamental and interrelated approaches, for the implementation of the environmental paradigm, the IWRM and the ecosystem approach, in one of the metropolitan basins of Greater Buenos Aires: Lujan River Basin.

Methodology approach

A qualitative research was adopted, according to R. Ying's case analysis method (2004) and the strategy of methodological triangulation: conducting interviews with experts and key informants; legal and jurisprudential analysis of ecosystem services, of public documents and of national newspapers.

All the rules are examined at the municipal, provincial and national levels applicable to the Lujan River Basin, and all argentine court rulings referred to this case study. The methodology of legal hermeneutics was used for jurisprudential and normative analysis.

Analysis and results

The extremely complex legal-institutional context, which was conditioned by the fragmentation and normative overlap, the almost absence of the ecosystem approach in politics and law in the Province of Buenos Aires, the insufficiency of scientific knowledge or the use of the available, the lack of sufficient mechanisms of citizen participation, diagnosis and integrated management plans, the lack of procedural regulation of collective actions in environmental matters in Argentina, and the avoidance of environmental responsibilities by different players, constitute substantial obstacles for the implementation of the environmental paradigm in the Lujan River basin.

We highlight a series of consequences of the aforementioned obstacles for the application of the environmental paradigm to our case study: the serious risk of one of the most biodiverse ecosystem, and with unique characteristics in the world: the Delta of the River of Plata, causing the increase of occurrence of

floods; the deterioration of the archaeological and cultural heritage; causing adverse socio-environmental effects, including the lack of substantiation of environmental rights and obstructing access to drinking water and environmental sanitation of coastal populations.

Conclusions and recommendation

The empirical and bibliographic-documentary evidence analyzed shows that water policies at the level of the basin, in our case study, are deficient and have low standards of effectiveness, while policies focused around ecosystems are practically absent. We conclude that there is a need of coordination between the various jurisdictions, including the international one, as well as the conjunction between the management of river basin and of the ecosystems.

Finally, we highlight an urgent need to incorporate the role of ecosystems recognized by the Millennium Ecosystem Assessment in water policies in Argentina.

IWRM and ecosystem, the gap between theory and application

Presenting Author: Dr. Luay Froukh, Jordan Water and Reuse Organization, Jordan
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Keywords
IWRM, Ecosystem, River Basin Management, Jordan Valley, Sustainable Management

Highlights
This paper presents the gap between theory and application in IWRM and Ecosystem management approaches. The ecosystem should be considered as an essential element in the IWRM and not duplication. However, the main issue here is not the in the concepts but rather in the application.

Introduction and objectives
According to GWP IWRM main objective is to maximize the economic and social welfare from the development and management of water, in an equitable manner without compromising the sustainability of vital ecosystems.
The sustainability of ecosystem is an outcome or result from the IWRM. In other words, the IWRM form the strategies and actions to protect the ecosystem. This make it clear that there is no competition or duplication between IWRM and Ecosystem.
The problem here is not in the IWRM and Ecosystem concepts but rather in the application part where the IWRM plans do not consider the ecosystem elements.

Methodology approach
The paper analyzed IWRM for several case-studies, the analysis includes IWRM objectives, elements and outcomes. The analysis show that a clear lack of focus on ecosystem services and a stronger focus on more conventional services. Those cases demonstrate a lack of integrated approach where all elements of ecosystem are considered including other issues such as transboundary dimension, soil, animals, plants, food production, water storage and flood prevention. This shows the gap is in the IWRM integration and implementation rather than concepts. The IWRM for Jordan River Basin is used to demonstrate the gap.

Analysis and results
The Ministry of Water and Irrigation (MWI) in Jordan had developed IWRM for the Jordan River basin. The system focus was on how to increase the water availability and water quality in the catchment area of the Jordan Valley without endanger vital ecosystems and social and economic conditions.Going through the IWRM it aimed at (1) minimize quality degradation and maximize efficiency of water resources(2)Consider and evaluate specific social, economical and ecologic conditions and impacts of water resource development options; (3)Identify the benefit and applicability of alternative technologies for sustainable water usage (4) Increase the understanding of the hydrological system.
As shown above the goals covered only part of the ecosystem elements (water, quality, ecological conditions, impact of water resources development, sustainable water usage). Other elements such as soil, climate, animals, biodiversity, floods protection were not covered. There is a gap in integrating all elements for different reasons such as level of importance (the water usually comes as high priority in any study area while others less so in most IWRM are ignored. This proofs that the gap is in the IWRM integration and implementation rather than concepts itself.

Conclusions and recommendation

Ecosystem is an essential part of the IWRM and not duplication. The integrated approach for incorporating ecosystems into IWRM would produce new benefit opportunities such as;

- Biodiversity benefits and increased resilience to extreme climate events such as floods and droughts, which would complement more traditional benefits such as hydropower and navigation.
- It covers an essential part related to compensations of resulted damage or impact in the failure of services related to any element of ecosystem.
- It encourages incentives and markets for managing and providing healthy and sustainable ecosystems, and addressing drivers of ecosystem change more systematically.

Participatory ecosystem management as decentralised IWRM: Lessons from India

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Keywords

Participatory ecosystem management, water conservation, decentralised IWRM, India, community participation

Highlights

This presentation will highlight the complementarities between ecosystem-based approaches and IWRM. It will discuss how participatory ecosystem management at the local scale reinforces IWRM which ultimately enables water security and balances water use between people, food production and environment, presenting successful case studies from India.

Introduction and objectives

Ecosystems and water resources are closely intertwined but ignorance of this delicate relationship and mismanagement of ecosystems for obtaining narrow and short-term economic gains has ultimately led to water insecurity in many parts of India. However, the mistakes have been identified in some areas at the local scale and community-based efforts are under way to implement sustainable solutions by restoring the over-exploited ecosystems. What is the nature of these participatory ecosystem management approaches? What outputs have these efforts delivered in terms of IWRM? This presentation aims to answer the above questions, illustrating successful case studies from different parts of India.

Methodology approach

The presentation is based on the findings of an empirical research in arid/semiarid India funded by Vetenskapsrådet. Data was collected through qualitative research methods in selected villages in states of Rajasthan, Bihar and Maharashtra. The study was based on the framework of IWRM, conceptualized as an approach promoting coordinated restoration and management of water, forest and other natural resources, with the aim to maximize equitable social welfare together with ecosystems sustainability. 'Integration' primarily focused on: green and blue waters and the water cycle, different water use sectors, and that of all stakeholders in planning and action.

Analysis and results

The study revealed that ecosystem degradation in the study villages was a result of overexploitation of natural resources, notably water, forest and pastures. Consequently, ecosystem restoration process, which was initiated with community participation, had 3 main components, namely, water conservation, afforestation and rejuvenation of pasturelands. Both women and men participated in the process and over time the effects became visible, with higher water availability. The water conservation was carried out differently in different econiches. Watershed structures like checkdams, anicuts, water absorption trenches and gabions were constructed to slow down the flow of water as well as help retention of soil moisture and groundwater recharge. Simultaneously, the lost vegetation has been replanted, and the forest trees as well greenery in the pastures so restored has been protected through community management rules. These efforts have rejuvenated lost rivers and ponds, recharged groundwater and enhanced green water content

in soil, restoring the flora and fauna. In turn, these actions have revived agriculture, provided safe drinking water, enhanced crop and animal productivity, thereby preventing migration and fighting poverty. In the end, many such villages could come back to the path of sustainable development.

Conclusions and recommendation

The study has presented complementarities between approaches of participatory ecosystem management and IWRM at micro-watershed scale in India, illustrating how the former has helped reinforce what can be called 'decentralized IWRM'. The complementarities between the two approaches primarily constitute 'integration' of: green and blue waters, and different water use sectors, and active participation of all stakeholders in planning and action, ultimately bringing forth water sustainability. Given its success at the local scale, it can be argued that replication of the approach in neighboring degraded micro-watersheds can lead to achieving IWRM at progressively higher scales within and between river basins.

Reducing uncertainty in ecosystem based approaches towards more holistic IWRM

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Keywords

IWRM, Environmental Flows, Kura Basin, Ecosystem-based approach

Highlights

This paper examines both IWRM and ecosystem based approaches through the lens of a collective action problem, where uncertainty and player needs identification provides clarification of the challenges of implementations for both approaches. The implementation of environmental flows in the Kura basin will serve as the case study.

Introduction and objectives

IWRM Application is often based on a model of water resource distribution rights similar to those of any classic 'tragedy of the commons' scenario in which excessive use of a limited resource at a particular time degrades the availability of the resource to other users. The ecosystem-based approach expands the user pool to wider and less well-defined users and interests, creating uncertainty. The question then emerges how to deal with the inherent uncertainty in the ecosystem-based approach to more effectively implement a more-holistic IWRM with balanced demands for all sectors and actors applied with pareto-optimal outcomes in the Kura Basin.

Methodology approach

The methodological approach of this paper relies on examining how to apply IWRM and ecosystem-based approaches to staged environmental flow methodologies in the case of Kura River sub-basins. Using collective action and common property management approaches to examination incentive structures of IWRM and ecosystem-based approaches through the case study of application of increasingly complex staged environmental flow methodologies.

The case studies emerge from the UNDP-GEF Kura II Project: Implementing IWRM Across the Kura River Basin, which will test these approaches within the framework of this project, using both the environmental flow staged approaches and collective action for common-pool resource management.

Analysis and results

This paper explores the economic trade-offs and institutionalized rules of the game for 'traditional' IWRM, for the 'ecosystem-based approach', and how to interlink these to increase long term sustainability of water resources using staged environmental flow management scenarios found in the Kura River basin. Traditional IWRM relies on principals of common pool resource management with relatively clear data driven demand forecasts, all players as user sectors, are given voice are apportioned user rights. The ecosystem-based approach includes wider societal uses and ecosystem services and needs that are less easily measured, introducing a higher level of uncertainty for all players. This uncertainty contributes to resource guarding among sectors and increases incentives for free riding.

The case studies will highlight existing and planned management practices designed to equitably allocate water resources across sectors in current and planned development schemes for improved sustainability,

that emphasises not only the downstream social and ecosystem demands but also the upstream contributions that must be fostered to ensure pareto-optimal outcomes.
Technical environmental flow management approaches will be presented in the partner paper 'Staged approaches for implementing environmental flows to maximize wider social and ecological benefits in the Kura River Basin' by Ahmed Abou Elseoud et. al.

Conclusions and recommendation

The preliminary conclusion of this ongoing study is that application of a traditional IWRM approach to water management for environmental flows in the Kura basin can be an effective starting point for bringing multiple sectors together to understand the critical need for integration. The application of data rich approaches increases trust and decreases free-riding. However, a more data intensive and often less concrete ecosystem-based approach is needed to ensure the contribution of ecosystem services to water management in order to sustainably manage water resources over the long term and account for climatic uncertainty. This recommends staging IWRM with ecosystem-based approaches.

SDG targets and implementation of IWRM in Sri Lanka

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Keywords

ecosystem approach, water management, conservation, assessment, governance

Highlights

- The sustainable development plan targets and potential implementation of IWRM in Sri Lanka
- How to bridge the gaps between national plans and SDG
- IWRM and good water and ecosystem approaches is an asset for growth in the economic, social and environmental sectors in Sri Lanka.

Introduction and objectives

The ecosystem approach to water management, is a complementary to IWRM, that adopted as SDG 6 dealing with the complex task of securing and balancing water for all human needs. But the dependency of human well-being on ecosystems has been given insufficient attention. Experience with the SDG's has shown that conventional governance approaches have only inadequately addressed this challenge. This paper discusses how cross-sectorial linkages and multi-stakeholder water stewardship and good governance based on comprehensive policies combining the strengths of the private sector and civil society provides for a significant increase in ecosystem-sensitive development in Sri Lanka.

Methodology approach

The research paper adopts a comparative case study methodology of two upstream and coastal ecosystems in Walawe Basin of Sri Lanka, how they manage conservation, restoration and sustainable use of inland freshwater ecosystems and their services. The participatory approach was used mixing qualitative and quantitative methods including: a household survey; group discussions, participation of local stakeholders and politicians were used to bridge the gaps between the current sustainable plans and SDG's. The multi-criteria analysis tools, complementing IWRM was used on a proper assessment of environmental and social ecosystem cost and benefits, securing and balancing water for people.

Analysis and results

Statistical analysis of the household surveys reveals that lack of cross-sectoral linkages leads to uncoordinated water resource development and management, resulting in conflict, waste and unsustainable ecosystems hindering large scale deforestation and denudation of green cover. The study showed that the new government has developed multi-functioning ecosystem-sensitive development plans linked with better alignment and combination of policies laws and regulations with some incentives and innovating financing to restore, protect, use and manage their environment complementing IWRM approach. It coordinated harmonically all stakeholders including politicians at micro-watershed level to work towards breaking the cycle of ecosystem degradation and loss. Result shows that 19% increased in new forest cover. The new innovative systems like circular economy to reuse and recycling of wastewater and sludge handling strategies at Rice Mills and Sugar Factories, highlights energy saving and water purity systems, where research shows that the economic return spending is US $ 7.50 per US dollar invested. Infrastructure investments provides to affects coastal zone ecosystems, to prevent and reduce marine pollution, including design of Salinity

Barrier and Wetland that will treat municipal waste and prevent saline intrusion, targeting saving over 759 million annually managing environmental and social ecosystem by complementing IWRM.

Conclusions and recommendation

The study proposes IWRM and ecosystem based approaches is a complementary for addressing ecosystems degradation and the maintenance of ecosystem services. This systematic process can be applied to any other vulnerable ecosystems. This should be based on cross-sectoral linkages and multi-stakeholder water stewardship and good governance combining with interrelated multi-functioning plans linked with combination of policies laws and regulations. Which should provide incentives and innovating financing for a significant increase in ecosystem-sensitive development complementing IWRM approach. If implemented at a large scale, this can provide opportunity to work towards achieving multiple SDG targets