Abstract Volume

World Water Week
in Stockholm
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Water for Development

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ABSTRACT VOLUME

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Workshop 5:
Managing water resources for green growth and equity

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Workshop: Managing water resources for green growth and equity

Negative impact of intensive farming on groundwater soil and land

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Keywords: Intensive farming, negative impact, groundwater-soil-land

Introduction and objectives

Intensified agricultural inputs during first two decades of Green Revolution (1970-1990) changed the face of Haryana State in terms of surplus food grain production reinforcing India's Food Security. However, subsequent decades (1991-2000) witnessed stagnation in production, diminishing farmland returns and surmounting stress on its small (<2ha) and medium (<10ha) farmers constituting >85% of the community. A remarkable decline in production of beans, pulses and coarse food grains alongside an awful degradation of its basic georesources like groundwater, soil and land are some of the negative impacts needing redressement (Lunkad and Sharma, 2007,2008).

Methodology approach

Proposed presentation is based on analysis of groundwater and soil samples obtained from 55 locations in 5 blocks of Kurukshetra, a leading district of eastern Haryana having come under negative impact of intensive farming during Green Revolution. Major ions including NO-3; pH, TDS, TSS, SOC, CEC, available N-P-K and granulometry were estimated using standard laboratory methods. For impact assessment data have been drawn from published and unpublished sources relevant to rainfall, canal irrigation, groundwater extraction, water-table recession, input of chemical fertilizers, degrading groundwater quality, soil salinization, land use change, urbanization, depleting pastures and cultivated land.

Analysis, results, conclusions and recommendation

Presentation focuses Kurukshetra district (1530 km^2), a part of Haryana's eastern agroclimatic zone growing wheat, rice and sugarcane as principal crops over 1444 km^2 (94.4%) land. About 82% irrigation is from groundwater and 18% by surface water canals. Haryana fulfils 53% of its irrigation demand from groundwater and 47% from surface water. Groundwater is overexploited. Number of tubewells doubled from 35,725 in 1973 to 71,910 in 2010 and their density increased from 10 to 40 per km^2. Groundwater extraction is 166% of potential rainfall recharge (negative budgeting). Water table has been declining over past 30-35 years at average rate of 0.3 m/year affecting farmers' bill (electricity/diesel for pumpsets). N-fertilizer application has increased over past 4 decades from negligible to 382 kg/ha, it is 3 times standard dose (120 kg/ha).

This is root cause of nitrate pollution of groundwater aquifers - the main source of potable water supply. In 27% samples nitrate is above permissible limit of 45 mg/l for drinking water (WHO) and in 23% samples it is 90-120 mg/l crossing 90 mg/l limit for Blue Baby Syndrome (Methaemoglobinaemia). Soil fertility indices are on decline. Despite heavy N-fertilizer application, available nitrogen (N) is very poor in soils (99 to 160 kg/ha); it should not be <250 kg/ha. Same is true for soil organic carbon (SOC) which is in 0.1-0.6% range (critical below 0.4%).

Recommendations:

- Restricting N-fertilizer application to 120 kg/ha; use of bio-fertilizers/green manures.
- Changing crop pattern from alternating wheat/rice to alternating wheat or rice with beans and pulses to enhance Nitrogen in soils.
- Enhancing sprinklers/drip irrigation.
- Increasing minimum size of holdings to 10-20ha by starting 'cluster cooperative agriculture'.
- Planning artificial recharge of aquifers in eastern Haryana from flood water of Yamuna river and surplus water of Sutluj-Beas rivers.

Taking water into account: the natural capital perspective

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Keywords: Natural capital accounting, water accounts, development planning, resource efficiency, sustainable development

Introduction and objectives

Despite its importance for human welfare and economic growth, water resources are typically not included in analyses of wealth and economic growth. In natural capital accounting (NCA), natural capital is incorporated into national accounts to support better decisions for inclusive development. Wealth Accounting and Valuation of Ecosystem Services (WAVES) is a global partnership led by the World Bank that aims to promote sustainable development by mainstreaming natural capital in development planning and national economic accounts. Water accounts are developed in partner countries to measure and assess tendencies in water use and impacts on their economy and water resources.

Methodology approach

The paper presents case studies from two partner countries, Botswana and Guatemala. The framework used is the System of Environmental and Economic Accounts (SEEA, UN 2012), an international statistical standard, and the framework developed in manual on water accounts, SEEA-Water. Data was compiled for water supply and use on the national and regional level, and disaggregated to different economic sectors: agriculture, manufacturing industries, forestry and fishing, building infrastructure and households. The agricultural sector further disaggregated to different crops. The resulting datasets were used for analyzing water use intensity, the economic contribution of water, and water pollution by different economic actors.

Analysis, results, conclusions and recommendation

For Botswana, it was found that self-providers account for half of the water consumption, and yet they are often overlooked in discussions about water resource management. The water supply and use of self-providers deserves much more attention in future water resource management. Unlike with water-service providers, no separate abstraction and use figures are available. A striking finding was the large amount of waste water, which if recycled can provide a significant resource. Competition for potable fresh water could be eased in the future by increasing use of saline water in mining operations. Irrigation expansion must be evaluated together with growing demands of mining sector and settlements.

A recommendation from the study was that water scarcity should become one of the considerations in the economic diversification drive. It should discourage economic diversification toward water intensive sectors and encourage the development of a water conservation industry for local and export markets. A challenging question in Guatemala, where water regulations and their enforcement are weak, was how much different economic and consumption activities contribute to pollution of water sources.

The water accounts helped identify the main uses and users of water, on the national level as well as disaggregated by management regions. The data produced by the process showed that 70% of the water extracted to be used by the economy returns to the environment as waste water lacking any type of treat-

ment. The analysis furthermore showed the intensity of water use by each economic and consumption activity, which gave important input to implement policies promoting a more sustainable management. It was shown that water consumption by households varied significantly between regions and between urban and rural population. Both studies provided important policy recommendations. The accounting system was shown to provide a consistent framework where data could be consolidated and data gaps and inconsistencies identified, to be addressed in future work. Moreover, the links between water resources and economy were highlighted.

Awakening of Lives- (Divi Aruna) Successful Sri Lankan Experience

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Keywords: System investments, allocation practices, preconditions, hard and soft components, sustainable solutions, economic progress

Introduction and objectives

Water resources and adequate water supplies coupled with sufficient system investments and efficient allocation practices will be essential preconditions to the achievement of economic development. Currently more than 2.2 million people die each year and 6000 children die every day due to inefficient water allocation, utilization and poorly manage water investments and sanitation solutions, Water is central to this challenge. Without it, no productive economy to live healthy lives cannot produce foods, energy and other basic necessities. In addressing the challenge new government enacts innovatively development pathway titled 'Divi Aruna'. The project encourages participatory and responsible water management.

Methodology approach

The objective of this paper is to discuss the methodology used in the DA project. Which coordinates by the National Council for Economic Development, mobilizing the relevant ministries, researchers and CBO, together with NDB and public private partnerships. Also it explained the prioritized investment plans and how they initiative fundamental structural Reforms, Ordinance and newly introduced alternative systems. Further discussed critical hard and soft components for sustainable solutions to achieved economic progress and how eradicates the extreme poverty by managing the economic and social consequences of water allocation, utilization among different water sectors, with lessons for future policy formulation.

Analysis, results, conclusions and recommendation

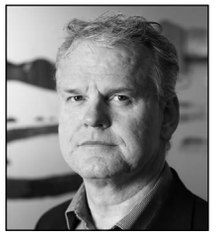
Today, water demand for emerging cities, food production, industries, environment and tourism are growing faster than the supply can be replenished by nature. While in most regions there is enough water to meet every ones needs, but they are wasting much water or used inefficiently. Responding that the project provided financial support for water resource investments and use through the NDB bank. They monitored the inefficient allocation rules creating a network of institutions to supply technical support through skills development.

It developed a knowledge-based community in the country, without considering the social, environmental, political and cultural throughout the 9 districts and 89 local authorities implementing 465 Water Associations, processed a strong links to water, economic development, social progress, equity and promoting healthy and rich environment. Water for food production has a fundamental roll in development agenda, DA has practiced proper water management to link Rain-fed and Irrigated Agriculture to gain the food security. It generates many growth opportunities, fisheries, agriculture, tourism and SME development to improve the economy of marginalized people.

They account for deposits to the value of over Rs. 55 billion with approximately five billion depositors. Hence Sri Lanka has been quite impressive in achieving most national targets, i.e. 86%, 94% and 98%

country's population has access to safe drinking water, sanitation and electricity respectively with 98% food security. (UNDP Report 2012 said that Sri Lanka have performed well) They could properly managed and used by organizing and harmonizing with the economic and social consequences, such as land and monetary policies, programs formulating effective regional action plans, practical tools considering the program and implement them within limited time frame along with continuous research. Thereby country could successfully achieved essential development objectives through the proper water resource investments and utilization, giving poor a better deal.

Strategic river basin planning and water allocation



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Keywords: Strategic Basin Planning Water Allocation

Introduction and objectives

Growing competition for water has driven major changes in the way river basin planning is undertaken and water is shared. This has resulted in a shift away from 'technical' approaches designed to maximise water availability and led to more strategic approaches. This paper summarises research by WWF and the General Institute of Water Resources and Hydropower Planning and Design, Ministry of Water Resources (People's Republic of China) on lessons from international approaches to river basin planning and water allocation. Our aim was to produce guidance on planning and allocation, especially in the context of complex and heavily contested river basins.

Methodology approach

We commissioned expert reviews of basin planning and transboundary water allocation in the USA, Australia, China, South Africa, Mexico, India, and Europe. Each review addressed questions regarding the planning, including prioritisation of desired outcomes and interventions; approaches to defining regional water allocations; institutional responsibilities; and lessons learned. From these reviews and a broader literature analysis we summarised the evolution of basin planning and allocation and distilled key challenges. We combined this analysis to derive strategic frameworks to guide basin planning and water allocation. The frameworks were specifically tested for suitability for addressing existing challenges in China.

Analysis, results, conclusions and recommendation

Traditional approaches to basin planning have adopted a technical/engineering approach to water resources management, aimed at meeting relatively straightforward, externally set objectives (in terms of supply, hydropower production, etc.). Such approaches are not suitable to highly developed and highly complex river basin systems, where it is not possible to meet all demands for water resources. At the same time, the case studies suggested that there are significant challenges evident in many countries with the application of the principles of integrated water resources management.

The study recommends a more strategic approach to basin planning in order to identify and satisfy social, economic and environmental priorities. Such an approach should be characterised by:

- Trade-offs between alternative economic, social and environmental objectives.
- Sophisticated understanding of environmental requirements
- Understanding basin interactions, including a range of hydrological, ecological, social and economic systems and activities at work within a basin.
- Alignment with development and other planning initiatives
- Robust scenario-based analysis to addresses future uncertainties
- Prioritisation: planning that identifies priorities in terms of economic development, social justice or environmental protection.
- High level objective setting at different time frames.

Economic development upstream vs water security downstream: Central Asia Case

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Keywords: hydro-economic model; water allocation; water-energy-food nexus; Rogun Dam

Introduction and objectives

Water resources are unequally distributed among Central Asian countries. Upstream countries of Kyrgyzstan and Tajikistan together control about 68% of the total water flow in the Aral Sea basin; in the same time the downstream countries of Kazakhstan, Turkmenistan and Uzbekistan consume about 85% of water resources in the basin. Such a large disproportion in water consumption transferred problem from just hydrological issue to the political aspect. The objective of the study is to show at macro-economic level how the planned Rogun Dam may change economic benefits that different countries derive from the river for their agricultural and energy sectors.

Methodology approach

This study investigates the linkages between water consumption, energy production and food security with the focus on the planned Rogun Hydropower Plant on the second largest Amu Darya tributary i.e. Vakhsh River. This study makes use of integrated hydro-economic model developed for the Amu Darya River Basin, consisting of hydrologic, agronomic and economic elements. The model shows how the differing water allocation modes enabled by the planned Rogun Dam (emphasising hydropower or irrigation, for example) result in differing economic benefits for different riparian countries.

Analysis, results, conclusions and recommendation

This study presents the analysis of possible future water allocation modes of the controversial Rogun Dam, located in the major tributary of the Amu Darya River. The hydro-economic modelling results of two water allocation modes –Energy Mode and Irrigation Mode– emphasise that the Dam can be operated in very different ways, leading to radically differing economic benefits and losses for the riparian countries of Uzbekistan, Turkmenistan and Tajikistan. However, neither operation mode provides as such optimal economic benefits for all the countries, emphasising how difficult it is to reach win-win situations in large river basins.

Both modelled water allocation modes have significant economic consequences, as Energy Mode causes reduction of water supplies downstream in summer and consequent decrease in potential agricultural land area in Uzbekistan and Turkmenistan. Similarly, Irrigation Mode would leave Tajikistan with practically no additional electricity supply from the Rogun Dam in winter.

The challenge of combining the economic benefits derived from water, energy and food sectors into one planning framework is therefore demanding, and calls for development of new approaches such as water-energy-food (security) nexus approach. Transboundary settings are particularly challenging, as they require also consideration of the highly political nature of water management between the riparian countries. At more general level, our study shows that while new water infrastructure (such as hydropower dam) are often designed to produce only certain type of economic benefits (usually energy), the additional water allocation possibilities they provide may actually be used also in other ways to benefit other sectors as well. Discussing such possibilities is particularly important in transboundary river basins, where the economic benefits for one country may lead to severe economic loses in another.

Risk Sharing in PPPs to Advance Water Infrastructure

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Keywords: Risk-sharing, Water infrastructure, Institutional investors, Risks in water infrastructure, Bankable water PPPs

Introduction and objectives

The 2008 financial debacle not only brought more stringent capital measures for institutional investors but also deterred them from investing in Public Private Partnerships (PPPs) with blurry risk-sharing structures. PPPs, and particularly those undertaking water infrastructure projects, are struggling to get funding given their complexity and the fact that water is generally regarded as a public good. If we want increased funds to be channeled towards this type of infrastructure, an appropriate risk management strategy needs to be devised. The presentation explores the value of effective risk-sharing mechanisms to increase the attractiveness of PPPs for water infrastructure.

Methodology approach

The authors' underlying hypothesis is based on the "bankability" concept – encompassing projects with effective risk sharing mechanisms and attractive returns. The discussion then moves to the notion of a standardized risk management strategy as an effective method to lower funding costs and increase resources available to water PPPs.

Analysis, results, conclusions and recommendation

Water PPPs generally find themselves unattractive for investment, given low water charges and poor recovery rates in many places. The uncertainty of fee collection and cost recovery acts as a huge default risk, which hinders funding. If additional risks are considered, like poor financial conditions and inaccurate or incomplete baseline data on the condition and reach of the existing distribution and sewage networks, the scenario becomes particularly risky and almost prohibitive for investors. Moreover, there is reason to doubt the capacity of many procurement offices to exhibit the enterprising behavior that allows for an adequate structuring of water infrastructure deals.

The presentation will suggest that if risks are properly identified and categorized (E.g. endogenous and exogenous), and a judicious negotiation process identifies which party is the most prepared to handle them, then a standardized risk management methodology can result in more attractive PPPs, reduced funding costs for water infrastructure, and better water services.

By increasing the capacity of the public sector to structure effective PPP deals, the goal is to contribute to the Sustainable Development Goals (SDGs) by increasing the both the number of people served by water services, and imporving the qulaity of the service they receive.

Water and Green Growth, Beyond the Theory for Sustainable Future

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Keywords: finance, financing, infrastructure

Introduction and objectives

Growing population, rapid urbanization and unpredictable climate change put water at greater risk. As the importance of water is rising in the post-development agenda, green paradigm should be considered as a solution for tackling water-related challenges. In such regard, the international co-research project, titled Water and Green Growth (WGG) is being undertaken by the Government of Korea (MoLIT and K-water) and World Water Council since 2010. The research aimed to emphasize the role of water and suggest a set of policies that can help policy makers attain economic growth, environmental protection and social inclusiveness. In the workshop, the progress of the WGG Project will be introduced briefly and the main outcome of the project will be highlighted.

Methodology approach

Achieving Water and Green Growth objectives highly depends on a solid policy framework. As the research steps went on, the policy guideline has been elaborated and strengthened based on case study analyses. WGG Team selected 26 cases in the phase 1 based on the common challenges each country may face. The number of cases was narrowed down into 11 cases based on each region's particularities, for example in terms of the level of development or the endowment of water resources. When analyzing case studies, both qualitative and quantitative methods were adopted to explore effective institutions and policy instruments. A list of questionnaires and interviews were utilized for quantitative analyses and the qualitative approach was used to examine the relationship between exogenous and endogenous factors, institutions and their effects on project performance.

Analysis, results, conclusions and recommendation

As a result of the analysis, WGG suggested a set of policies, types of policy mix and policy implementation roadmap. Since water is cross-cutting natural resource and the water-related challenges cannot be overcome by a single instrument, the policy mix helps policy makers to identify which institutions and policy instruments are appropriate for development needs in each country. It can be an opportunity to frame the scope of institutions and policy instruments depending on specific contexts and needs of a country. As the final step, policy makers can follow the policy implementation roadmap considering short-term and long-term timeframes.

In the context of the post-2015 SDGs, it is worth paying attention to the WGG Project. The WGG Project can provide practical approaches to using water as a vector through which green growth can occur in the both developed and developing countries.

Stockholm International Water Institute

The Stockholm International Water Institute (SIWI) is a policy institute that contributes to international efforts to combat the world's escalating water crisis. SIWI develops and promotes future-oriented and knowledge–integrated policies, towards sustainable use of the world's water resources leading to sustainable development and poverty eradication.

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