

Resource Material in a Nutshell

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This compendium is a comprehensive guide to the study of Integrated Water Resources Management (IWRM). Rooted deeply in the philosophy of social equity and sustainable management, more and more mainstream water management professionals are applying the principles of IWRM in their work. This document while throwing light on the key concepts of IWRM, dwelves into niche areas exploring gender and equity, and how they can be mainstreamed through an integrated system of water management. It is an optimum mix of scholarly articles, fact sheets and case studies that will be particularly relevant to the South Asian region. The Economics and Financial aspects of IWRM theme sheds light on the current challenges in the way water is perceived as an economic commodity, where power rests in the hands of a few private, vested interests. The papers in the Water and Ecosystems section address the ecological context and its relevance on contemporary IWRM. There are also some specialist issues addressed on sanitation, health, sewage, river basin management, water rights and laws and water policy, governance and regulation.

Module 1: Introduction to Integrated Water Resources Management

1.1 Hydraulic Mission to IWRM: Paradigm Shifts within Water Sector Development

The parallel evolution of development and water management is discussed in great detail. Post-colonial definitions and perceptions of development models across different eras have been explained and also represented in tables. Critiques and features of Mainstream Development Theories, Critical Development Theory, and Alternative development theory are explored at length, along with the concepts of Liberalism and Neo-Liberalism. Human Development, a concept which put forth the proposition that development is not of expanding supplies of commodities but of enhancing the capabilities of people, is introduced. The Human Development Index (HDI) is a more wholesome measure of the quality of life, compared to GDP. HDI is a comparative measure of life expectancy, literacy, education and standard of living for countries worldwide. Post-Development is a critique of development, as defined by industrial nations. In the past era, environmental degradation, and mass displacement are some of the ugly remnants of archaic development methods. Sustainable Development is also an offshoot of environmental degradation and livelihood crises becoming imminent as a result of “development”.

In section two, “Hydraulic Mission to IWRM: Water Sector Development Paradigms”, the design of the hydraulic mission India, and later, its challenges with respect to maintenance, operation and management are discussed. In two different sections, “Rates of Return on Investment on Infrastructure and Management of Water Resources” and “Evolving Role of Citizen and State in Water Management”, discuss the financial gap in the water sector and the citizen's and state's role in the global water debate respectively. The Five paradigms of Water Management are discussed in some detail, with the emergence of the latest one: Integrated Water Resources Management (IWRM). This is a holistic approach and an unprecedented level of political cooperation.

Reference: Narayanan NC. 2010. 'Hydraulic Mission to IWRM: Paradigm Shifts within Water Sector Development', Lecture note prepared for Training of Trainers in Integrated Water Resources Management held at Kandy, Sri Lanka from 16-25 September 2010. Available online at <http://www.saciwaters.org/CB/iwrm/modules/Module1.pdf>(uploaded in November 2011).

1.2 Integrated Water Resources Management (IWRM): A Way to Sustainability

Competing demand for water has led to over exploitation of the resource and also adding to its pollution. Governments are struggling to manage the conflicts between different user groups. The governance of water brings widely brings the principles of Integrated Water Resources Management (IWRM) to bear the challenges of sustainable water management practices in developing countries. This document starts with a brief description on water crisis and then offers an achievable solution to the problem looming water resources. It states that IWRM provides a flexible framework to deal with the multifaceted problems in the water sector and helps move towards achieving sustainable water management. The framework understands the integrity of institutions and processes that govern water and define a set of achievable indicators of good water governance strategies. The document cites examples where IWRM principles have been adopted in many projects.

Reference: Info Resources. 2003. 'Integrated Water Resources Management (IWRM): A Way to Sustainability', Info Resources Focus, No.1, pp. 1-16. Available online at http://www.inforesources.ch/pdf/focus1_e.pdf (accessed in July 2011).

1.3 Integrated Water Resources Management: A Reassessment: A Water Forum Contribution

How are states going to move forward in dealing with the water crisis situation? How are the institutions involved in managing water resources work towards finding a solution for the problems? How is IWRM used both inside and outside academic circles in addressing water problems? These and other issues are covered in this article. The author of this article critically examines the concept of IWRM, argues why this concept has gained popularity in the recent times and finally states that it is difficult to operationalize its principles.

Reference: Biswas, Asit.K. 2004. 'Integrated Water Resources Management: A Reassessment: A Water Forum Contribution', *Water International*, Vol. 29, No. 2, pp. 248-256. Available online at <http://www.adb.org/Documents/Books/AWDO/2007/dp05.pdf> (accessed in July 2011).

1.4 Integrated Water Resources Management

Over the past few decades one of the most contentious issues faced by the developing countries has been access to water and its quality. In order to meet the intensifying challenges faced by water sector, it must undergo a fundamental change. This document states that deployment of IWRM principles will be able to encounter those challenges. It will assist the countries to deal their problems in a cost effective and sustainable way. To begin with the document states that there exists no universal blueprint of applying these principles in practice. Therefore there will be variation when they are applied in a specific region. This document profiles the different aspects of IWRM and is divided into two parts. First section deals with application of IWRM principles globally, defines the concepts and processes. The second section specifically provides advices and guidance on how the IWRM principles could be implemented in different countries.

Reference: GWP (Global Water Partnership), Technical Advisory Committee (TAC).2000. 'Integrated Water Resources Management', TAC Background Paper No. 4. Stockholm: GWP. Available online at http://www.gwptoolbox.org/images/stories/gwplibrary/background/tac_4_english.pdf (accessed in July 2011).

1.5 The Dublin Principles for Water as Reflected in a Comparative Assessment of Institutional and Legal Arrangements for Integrated Water Resources Management

The current water crisis has raised many questions about how to govern water by whom. As negotiations on water management continue, disagreements between different actors within and outside their respective institutions continue to persist. Although there are many variations in the positions of different actors, broadly speaking, the countries favor in adoption of IWRM principles. This paper seeks to analyze the relationship between the Dublin principles, IWRM and water law. It provides a set of alternatives and experiences to the readers seeking information about institutional issues affecting water management.

Reference: Solanes, Miguel and Fernando Gonzalez-Villarreal. 1999. 'The Dublin Principles for Water as Reflected in a Comparative Assessment of Institutional and Legal Arrangements for Integrated Water Resources Management', Technical Advisory Committee, Background Paper No. 3. Stockholm: Global Water Partnership Available online at http://www.gwptoolbox.org/images/stories/gwplibrary/background/tac_3_english.pdf (accessed in July 2011).

1.6 Introduction to the IWRM Guidelines at River Basin Level

This discussion paper aims to raise awareness of the importance of integrated approach in water resource management at river basin level and to address the practical implementation of IWRM. It consists of fundamental concepts of IWRM and also provides insights into perspectives of various stakeholders with regard to key water issues, the ways to overcome problems and also cites cases where such ways have been successfully applied. The guidelines encourage each stakeholder in water sector to participate and cooperate in IWRM in order to achieve both private and public benefit in a sustainable manner. Since the implementation of IWRM principles varies and depends on criteria's like area, capacity, political will and understanding of IWRM concepts, the paper is been split into different parts. It is designed in an easy-to-understand manner and the reader can go to specific sections based on the specific needs and circumstances.

Reference: The United Nations World Water Assessment Programme. 'Introduction to the IWRM Guidelines at River Basin Level', Dialogue paper, side publication series of World Water Assessment Programme. Paris: United Nations Educational, Scientific and Cultural Organisation. Available online at <http://unesdoc.unesco.org/images/0018/001850/185074e.pdf> (accessed in November 2011).

Module 2: Gender in Integrated Water Resources Management

2.1 Equity and Gender 1: Understanding Class, Caste and Gender

Academic literature has significantly discussed on key social issues of exclusion, exploitation and inequalities prevailing in a society. Analysis of these issues helps understand the dynamics of power as well as the key determinants of matrix of power- 'Caste', 'Class' and 'Gender'. These concepts get constructed by the socio-cultural and economic practices and ideology of the society. Though these notions and practices have got reconfigured in the dynamic socio-political and economic scenario yet these continue to exist in different forms. This lecture note gives a brief overview of the dynamic relationship between these three vital social issues by discussing their origins and the way they have been practiced in a society.

Reference: Kulkarni, Seema.2010. 'Equity and Gender 1: Understanding Class, Caste and Gender', Lecture note prepared for Training of Trainers in Integrated Water Resources Management held at Kandy, Sri Lanka from 16-25 September 2010. Available online at http://www.saciwaters.org/CB/iwrm/Lecture%20Notes/2.1.%20Equity%20and%20Gender%20Understanding%20Class,%20Caste%20and%20Gender_Kulkarni%20Seema.pdf (uploaded in November 2011).

2.2 Equity and Gender 2: The Water Context

There is strikingly significant difference in the uneven distribution of water across the different caste, class and gender. The most disadvantaged group is the women who in majority of the cases are the main collectors of water. The intimate relationship between gender and caste and class has their roots in the social and material conditions of the people. The ownership of land and its associated technology, access to the “commons” is a marker of class privilege and it becomes a terrain of class struggle between the elites and poor. The nexus between the class and caste continues to oppress the weak and marginalized. The severely affected of this section is women, who many cases are voiceless and powerless. Drawing from the vast literature on these key issues, this lecture note discusses about myriad issues related women's role in managing water resources. It illustrates numerous examples where the role of a women is defined and how patriarchic power is manifested at every stage of decision making processes related to water.

Reference: Kulkarni, Seema.2010. 'Equity and Gender 2: The Water Context', Lecture note prepared for Training of Trainers in Integrated Water Resources Management held at Kandy, Sri Lanka from 16-25 September 2010. Available online at http://www.saciwaters.org/CB/iwrm/Lecture%20Notes/2.2.%20Equity%20and%20Gender%202_%20The%20Water%20Context_Kulkarni%20Seema.pdf

2.3 Understanding Social Equity: Caste, Class and Gender Axis

Water management is not only about formal institutions and actors who make core decisions related to the resource. Socio- economic conditions of the people play a vital role especially in rural areas when it comes to access to water and the position from which they demand water. This lecture note covers myriad issues such as Caste, Class, and Gender that are functional in a society. These are socially embedded issues which act as informal institutions and are able to shape and construct the way by which the water is managed. Drawing important issues and concerns of various schools of thoughts of each key social and economic concept the note introduces to way through which a micro-analytic study is carried out in the governance of water.

Reference: Lingam, Lakshmi. 2008. 'Understanding Social Equity: Caste, Class and Gender Axis', Lecture note prepared for the Crossing Boundaries: Case Development Workshop held at the Tata Institute of Social Sciences (TISS), Mumbai. Presented at SAWA Fellows Training on Participatory Field Research Methodology facilitated by SAGUN and organised by SaciWATERS at Kathmandu and Dhulikhel, Nepal from 2-12 September 2008. Available online at http://www.saciwaters.org/CB/iwrm/Lecture%20Notes/2.3%20Understanding%20social%20equity_Lingam%20Lakshmi.pdf (uploaded in November 2011).

2.4 Gender, Class, and Access to Water: Three Cases in a Poor and Crowded Delta

A complete and plausible explanation to the issue of access of water would include the insights of social relation in a society. This article contributes to the literature on gender and class in relation to water. The article introduces a framework for disaggregating the conditions of access to water in Bangladesh. It further uses the framework to examine three important and serious issues in Bangladesh's water management system. These are: overexploitation of ground

water has led to drying up hand pumps, the level of arsenic content in groundwater and how the change in access to water has been affected by rise in shrimp aquaculture for export.

Reference: Crow, Ben and Farhana Sultana. 2002. 'Gender, Class, and Access to Water: Three Cases in a Poor and Crowded Delta', *Society and Natural Resources*, Vol. 15, No.8, pp.709-724. Available online at http://www.farhanasultana.com/publications/Crow_Sultana_SNR_FinalPDF.pdf (accessed in November 2011).

2.5 Mainstreaming Gender in Integrated Water Resources Management: Major Issues and Challenges

The paper traces issues and challenges in including gender sensitive approaches in IWRM. Effective and efficient management of water is achieved only when both sexes are involved in the management of water resources. Some of the challenges in implementing a gender-sensitive approach in processes and organizations include unavailability of required skills, flexibility and adaptability, support and policy evaporation. The paper also cites the multiple ways in which a gender sensitive approach in IWRM will benefit stakeholders.

Reference: Hamdy, A, R. Quagliaeriello and G. Trisorio Liuzzi. 2004. 'Mainstreaming Gender in Integrated Water Resources Management: Major Issues and Challenges', Proceedings of the Workshop on "Integration of Gender Dimension in Water Management in the Mediterranean Region". Available online at <http://ressources.ciheam.org/om/pdf/a62/06002397.pdf> (accessed in August 2011).

2.6 Gender Mainstreaming in Water Management: A Challenge to Sustainable Development

The paper is built on the premise that a gender sensitive approach is intrinsic to sustainable development and management of water resources. An effective gender mainstreaming plan requires clear objectives and gender equality targets, gender analysis, monitoring and reporting, resources to hold a dialogue on gender equality. Gender policies require situational analyses to precede them and an action plan to succeed the policy, itself, apart from a strong policy in place. The paper states that gender mainstreaming should essentially put both men and women's experiences integral to the design, implementation and evaluation of policies in public life. The major elements in adopting a gender approach in IWRM are carrying out proper participatory analyses to understand local gender dynamics, incorporate the results of the analyses in policies and programmes, and thirdly, ensure equitable participation at the decision making and stakeholder levels.

Reference: Hamdy, A and R. Quagliariello.2006. 'Gender Mainstreaming in Water Management: A Challenge to Sustainable Development', Paper prepared for the 3rd Arab Water Regional Conference: Research Advancement in Managing Limited Water Resources, 9-11 December, Cairo. Available online at http://www.waterandgender.net/share/img_documents/44_hamdy_and_quagliariello.pdf (accessed in August 2011).

2.7 Gendered Participation in Water Management: Issues and Illustrations from Water Users' Associations in South Asia

The formal involvement of women in Water Users Association (WUA) has received less attention. Like any other association and groups, WUA's have enormous impact on the lives of the people at the grassroots level. These include areas such as allocation of water, distribution of water based on the needs and requirements, creation of new assets but also promises of opportunity including the capacity to transform the style and way of functioning. This paper charts out the gendered analysis of such associations in South Asia. Though there has been marked increase in the recognition of differentiated needs and aspirations of men and women, yet more research is to be done on informal participation of women in other forms of associations. The imperative to examine the gendered dimension of WUA's derives from the fact that these organizations affect men and women in different ways. Drawing empirical examples from the region the paper argues how prime issues of concern of women get conveyed in meetings through a strong and effective social network. Thus it states that though there non-involvement in different levels of formal decision making structures doesn't entail that they are not non influential. This paper finally shows how the existence and active functioning of multiple associational groups opens new vistas to research on WUA's in the dynamic South Asian region.

Reference: Meinzen-Dick, Ruth and Margreet Zwarteveen. 1998. 'Gendered Participation in Water Management: Issues and Illustrations from Water Users' Associations in South Asia', *Agriculture and Human Values*, Vol.15, pp. 337-345. Available online at <http://www.chs.ubc.ca/srilanka/PDFs/Gendered%20participation%20in%20water%20management.pdf> (accessed in November 2011).

2.8 Mainstreaming Gender in Water Resources Management: Why and How

While most of the problems faced by water sector are primarily addressed through technical solutions there has been a growing need to approach these problems considering the social base of a society. Gender approach in managing water is now widely recognized in policy documents as it helps in ensuring effective, efficient and sustainable water systems and strategies. This paper outlines why it is important to include gender in any water project by illustrating a couple of examples where gender approach has been put into action.

Reference: Maharaj, Niala. 1999. 'Mainstreaming Gender in Water Resources Management: Why and How', Background Paper for the World Vision Process. World Water Vision and World Water Council. Available online at <http://www.pacificwater.org/userfiles/file/IWRM/Toolboxes/gender/MAINSTREAMING%20GENDER%20IN%20WATER%20RESOURCES.pdf> (accessed in November 2011).

2.9 Balancing Pains and Gains: A Perspective Paper on Gender and Large Dams

Changes in livelihood patterns and displacement of people are prominent features of large dam projects in India. Though the social impacts of large dams on people are well documented and analyzed by scholars in the field, the authors argue that such analysis tends to be gender blind. The impact on vulnerable communities such as children and women goes beyond the monetary losses resulting from displacement. This working paper addresses the multi faceted impacts of large dams in relation to gender.

Reference: Mehta, Lyla and Bina Srinivasan.2000. 'Balancing Pains and Gains: A perspective Paper on Gender and Large Dams', Working paper of the World Commission on Dams. Prepared for Thematic Review I.1: Social Impacts of Large Dams Equity and Distributional Issues. Cape Town: The World Commission on Dams. Available online at http://www.ids.ac.uk/files/Pains_Gains.pdf (accessed in November 2011).

2.10 Gender, Domestic Water Supply and Hygiene

This resource guide spells out the gender roles in the domestic water supply and hygiene. With a brief introduction of the conventional gender insensitive roles in water management, the guide sheds light on the significant role played by women domestic water supply. The relentless efforts of incorporating gender based approach in water management have led to many successful stories. The guide also provides the necessary and progressive steps to be taken to strengthen the role played by women in water management.

Reference: GWA (Gender and Water Alliance). 2006. 'Gender, Domestic Water Supply and Hygiene', Chapter 3: Sector-Specific Overviews, Gender and IWRM Resource Guide. Available online at <http://www.genderandwater.org/page/2791> (accessed in November 2011).

2.11 Gender and Water: Securing Water for Improved Rural Livelihoods: The Multiple-Uses System Approach

This is a document by International Fund for Agricultural Development, which tries to demonstrate how a well intentioned, designed and a promising water project can be successful if women are made part of the project cycle from the inception level itself. It presents the lessons learned in promoting women's participation in the decision making process of any water program or project. Further it also states how equitable development can be achieved through gender mainstreaming. The document sites several examples of women empowerment in developing countries such as: empowering women to improve their skills, knowledge and livelihood in Peru, improving women's access to fertile land for rice cultivation in Gamibia and making participatory irrigation development beneficial for women in the United Republic of Tanzania. The author makes the following conclusion: affirmative action is required to ensure women's participation in the decision making process, capacity building initiatives, access to capital, raising the awareness among women would yield better results. Further it also reveals that little has been documented about the successful efforts that involve women in project cycle, the need to identify constraints faced by women at different levels-policy, field or community.

Reference: Wahaj, Robina. 2007. 'Gender and Water: Securing Water for Improved Rural Livelihoods: The MultipleUses System Approach', Paper prepared by Robina Wahaj in collaboration with Maria Harti for International Fund for Agricultural Development. Rome: International Fund for Agricultural Development. Available online at http://www.ifad.org/gender/thematic/water/gender_water.pdf (accessed in November 2011).

2.12 Gender Roles and Multiple Uses of Water in North Gujarat

The ever growing demand for water for various purposes has added stress to water. Coupled with this is the problem of inequitable distribution of water among different users and sectors that has led to conflicts among them. Focusing specifically on the gender the paper examines the gender roles and responsibilities of multiple water users with an estimation of actual usage of water for domestic and livestock purpose. It also analyzes the operational income and expenditure associated with such home based small scale activities.

Reference: Upadhyay, Bhawana. 2004. 'Gender Roles and Multiple Uses of Water in North Gujarat', Working Paper no. 70. Colombo: International Water Management Institute. Available online at http://www.iwmi.cgiar.org/Publications/Working_Papers/working/WOR70.pdf (accessed in November 2011).

Module 3: Water and Equity

3.1 Bio-Physical and Socio-Cultural Peculiarities of Water in an IWRM Context and its Relationship to Equity

This document gives a brief introduction about the bio physical and socio cultural aspects of water. It starts by defining the peculiar features of water and the need for having an understanding of different aspects related to water apart from the technical aspect of governing water. These fundamental features influence the way water is distributed, how allocations are made and entitlements are designed. Such understanding helps to draw conclusions about the quality of water, the way water rights are defined among competing users. This lecture note gives a brief description of these aspects of water.

Reference: Joy, K J. 2010. 'Bio-Physical and Socio-Cultural Peculiarities of Water in an IWRM Context and its Relationship to Equity', Lecture note prepared for Training of Trainers in Integrated Water Resources Management held at Kandy, Sri Lanka from 16-25 September 2010. Available online at http://www.saciwaters.org/CB/iwrm/Lecture%20Notes/3.1.Bio-Physical%20and%20Socio-Cultural%20Peculiarities%20of%20Water%20in%20an%20IWRM%20Context%20and%20its%20relationship%20to%20equity_Joy%20K%20J.pdf (uploaded in November 2011).

3.2 Equitable Water Distribution in the Context of IWRM: Conceptual Issues and Cases

Water is the main source of many livelihoods in developing countries of global south. It is one of the scarce natural resource which has become a prime area of contestation and conflict among different users. In this context, competition and crisis is further exacerbated with the problems of inequality prevailing in a society. The developing countries are characterized by vast gap between rich and poor who are further categorized into different caste and ethnic groups. This situation leads inequality in the society. This lecture note starts with an assumption that equitable distribution of water is one of neglected areas in Integrated Water Resources Management. It explores the meaning of two key social issues: 'equity' and 'equality' and then precisely discusses about issues such as equity, inequity, access to water, participation.

Reference: Joy, K J. 2010. 'Equitable Water Distribution in the Context of IWRM: Conceptual Issues and Cases', Lecture note prepared for Training of Trainers in Integrated Water Resources Management held at Kandy, Sri Lanka from 16-25 September 2010. Available online at http://www.saciwaters.org/CB/iwrm/Lecture%20Notes/3.2.Equitable%20water%20distribution%20in%20the%20context%20of%20IWRM_%20Coceptual%20issues%20and%20cases_Joy%20K%20J.pdf (uploaded in November 2011).

3.3 Integrated Water Resource Management: Incorporating Integration, Equity, and Efficiency to Achieve Sustainability

Traditionally water sector has been dominated by institutions that are technical in nature. Expansion of agricultural and industrial activities, urban areas, has widened the scope and nature of managing water. Recent times have witnessed the popularity of IWRM principles which are considered to be guiding principles of any water planning project. This document states that the criticism attracted by this concept will attract little criticism if it were to be understood as guiding principles incorporating the concept of "integration", "equity", and "efficiency". The article profiles these three concepts in the IWRM framework.

Reference: Placht, Maria. 2007. 'Integrated Water Resource Management: Incorporating Integration, Equity, and Efficiency to Achieve Sustainability', International Development, Environment and Sustainability, pp.1-3. Available online at <http://www.docstoc.com/docs/68240775/Integrated-Water-Resource-Management--Incorporating-Integration> (accessed in July 2011).

3.4 Water, Equity and Development

Decisions related to water, which are going to have significant social, political and economical consequences, are often made without the involvement of those whose interests are directly at stake. Weak access of the poor people to decision making process exposes them to more risks. The author of this article states that inequity is caused by the institutions. In India this brunt is faced by the landless and dalits. The inequities are widened when water is used for economic purposes such as for agricultural activities. The disparity has severe impacts on the health of the weaker and poor sections of society.

Reference: Phansalkar, Sanjiv J.2007. 'Water, Equity and Development', *International Journal of Rural Management*, Vol. 3, No. 1, pp. 1-25. Available online at <http://irm.sagepub.com/content/3/1/1.full.pdf+html> (accessed in July 2011).

Module 4: Economic and Financial Aspects of Integrated Water Resources Management

4.1 Water as a Social and Economic Good: How to Put the Principle into Practice

This paper formulates the concept of water as an economic good and elaborates on the economic tools that can be used to affect the socially, economically and environmentally efficient use of water. Economic tools have a role to play in socially accepted public decisions, especially in highly regulated situations, and this will in turn increase the role of the government in water management. The paper is devoted to presenting general principles and methodologies for estimating costs and values in the water sector, it also presents estimates of costs in different sectors (viz, urban, rural).

Reference: Rogers, Peter, Ramesh Bhatia and Annette Huber. 1998. 'Water as a Social and Economic Good: How to Put the Principle into Practice', Technical Advisory Committee (TAC), Background Paper No. 2. Stockholm: Global Water Partnership. Available online at http://info.worldbank.org/etools/docs/library/80637/IWRM4_TEC02-WaterAsSocialEconGood-Rogers.pdf (accessed in August 2011).

4.2 Financing & IWRM: Issues and Actions

The presentation provides a bird's eye view of issues in financing in Integrated Water Resources Management. Financing is so closely linked to the water sector, as public goods need proper funding. Also, implementing IWRM principles require funding, which can reap high returns. As far as governance is concerned, good governance can save expenditure by minimizing the need for finance. Investments can be crucial in IWRM, backed by strong policies and legal framework. As many IWRM components are meant for the public, they require large amount of funding. The budgeting in IWRM processes are channelised towards the creation of an enabling environment through policy settings, legislative changes and investment policy, forming new institutions and apex bodies, constructing a knowledge base and in public awareness and education and implementing and selecting economic tools.

Reference: Winpenny, James. n.d. 'Financing and IWRM: Issues and Actions', Virtual Library of Sustainable Development and Environmental Health (BVSDE). Washington, D.C: BVSDE. Available online at <http://www.bvsde.paho.org/bvsacg/e/foro4/18marzo/financing/financing.pdf> (accessed in August 2011).

4.3 Water as an Economic Good and Demand Management: Paradigms with Pitfalls

The paper asks whether economic pricing of water is an appropriate way to increase its demand. The implication of what water means as an economic good is not clearly understood. Water pricing should serve the point of financial sustainability through cost recovery. Equity considerations should also find a place in water pricing, viz, increasing block tariffs. A reasonable price that recovers the full cost needs to be defined, so that ecological considerations and safe water access can be ensured. Economists who subscribe to the neoclassical school of thought believe that water if priced economically will aid in re-allocation of water from agricultural sector to domestic/ urban sector. The value of other uses of irrigated water is underestimated. Water resources can be optimally allocated with strong regulations.

Reference: Savenije, Hubert and Pieter van der Zaag. 2002. 'Water as an Economic Good and Demand Management: Paradigms and Pitfalls', *Water International*, Vol. 27, No. 1, pp. 98-104. Available at http://webworld.unesco.org/Water/wwap/pccp/cd/pdf/educational_tools/course_modules/reference_documents/water/waterasaneconomicgood.pdf (accessed in August 2011).

4.4 Why Water is Not An Ordinary Economic Good, or Why the Girl is Special

Considering water as just another economic good and designating an appropriate price to water is a contentious issue. The author of this article using the metaphor about the girl refers to the fact that people generally consider their daughter to be special and not just as a girl. The paper gives an overview of why water is not considered as just another economic good which is the stand taken by water professionals. This group of people state that the combination of different characteristics of water leads to giving special treatment to the resource. On the contrary economists state that those aspects that make water complex and special form other economic goods can be dealt with and they therefore give logical explanation to the each characteristic. However they do agree with the fact there are many complication that makes water very special.

Reference: Savenije, Hubert H.G.2002. 'Why Water is Not An Ordinary Economic Good, or Why the Girl is Special', *Physics and Chemistry of the Earth*, Vol.27, No.11-22, pp.741 - 744 . Available online at http://webworld.unesco.org/Water/wwap/pccp/cd/pdf/educational_tools/course_modules/reference_documents/water/waterisnotanordinaryeconomicgood.pdf (accessed in November 2011).

Module 5: Water and Ecosystems

5.1 Relevance of Ecosystems in Integrated Water Resources Management

The lecture note studies the extent of the relevance of ecosystems in the principles of Integrated Water Resources Management, which can be described as a systematic process for the development, allocation and monitoring of water resource in the context of social, economic, environmental and institutional objectives. The note covers five ecosystems, viz, forests, cultivated and urban ecosystems, inland wetlands and coral islands, and the ecosystems and their role in Water resources management are studied with respect to hydrologic regime and biochemistry. Thus, the important role played by IWRM in conserving ecosystems to function as 'Environmental Reserve' is also highlighted.

Reference: James E J. 2010. 'Relevance of Ecosystems in Integrated Water Resources Management', Lecture note prepared for Training of Trainers in Integrated Water Resources Management held at Kandy, Sri Lanka from 16-25 September 2010. Available online at http://www.saciwaters.org/CB/iwrm/Lecture%20Notes/5.1.Relevance%20of%20Ecosystems%20in%20Integrated%20Water%20Resources%20Management_James%20E%20J.pdf (uploaded in November 2011).

5.2 Incorporating Ecosystem Perspective in River Basin Planning Illustrated by Case Studies on Wetland Ecosystems

The present lecture note focuses on the need for Integrated River Basin Management (IRBM). The integral part IRBM partakes in conserving ecosystems, especially wetlands, has been addressed. Some case studies from the Indian subcontinent, highlighting the importance of IRBM have been included, providing due weightage to the wise use of wetlands.

The case study of the delta formed by the Ganges-Brahmaputra-Meghna system brings out the need for international cooperation in managing these ecosystems. Another case study on the Chilika Estuary brings out the complications created due to over-exploitation of rivers draining into the wetland. Study on the Indus delta has shown how large-scale diversions in the upstream region of a river adversely affect the downstream flora and fauna population. Case studies on the South-West Coast clearly bring out the necessity for IRBGM, by taking the downstream wetlands into consideration. Some recommended management strategies for coastal wetlands of the area have also been highlighted. The case study of Loktak Lake situated in Manipur highlights issues facing the ecosystem which has resulted due to the development of a single sector, hydropower generation. Majority of the case studies infer for IRBM to reduce imbalances in water availability, quality and use pattern in different upstream sub-basins and the downstream reaches.

Reference: James E J. 2010. 'Incorporating Ecosystem Perspective in River Basin Planning Illustrated by Case Studies on Wetland Ecosystems', Lecture note prepared for Training of Trainers in Integrated Water Resources Management held at Kandy, Sri Lanka from 16-25 September 2010. Available online at http://www.saciwaters.org/CB/iwrm/Lecture%20Notes/5.2.Incorporating%20Ecosystem%20perspective%20in%20River%20Basin%20Planning_James%20E%20J.pdf (uploaded in November 2011).

5.3 Water Management and Ecosystems: Living with Change

This paper studies the relationships among humans, water resources and the ecosystem. It reinforces the importance of conserving our ecosystems, and how this can be incorporated in an agenda involving the principles of Integrated Water Resources Management (IWRM). While IWRM and ecosystem conservation are essentially led by the same principles, the difference in personnel involved in each and their diverging worldviews has made it difficult for the two schools of thought to be clubbed together, however recent trends indicate that the two philosophies are being simultaneously. The paper, further, demonstrates a framework by which, ecosystem perspective can be combined with social and economic perspectives to arrive at a holistic and multidimensional way of managing natural resources.

Reference: Falkenmark, Malin .2003. 'Water Management and Ecosystems: Living with Change', GWP (Global Water Partnership) Technical Committee, Background Paper No. 9. Stockholm: GWP Available online at http://www.gwptoolbox.org/images/stories/gwplibrary/background/tec_9_english.pdf (accessed in July 2011).

5.4 Water Security and Ecosystem Services: The Critical Connection

This report sheds light on the close link between ecosystem services and sustainable development. Specifically it discusses about the role of water security in addressing ecosystem sustainability. The report starts with a premise that the continued provision of ecosystem service is necessary for human development and economic development. It provides cases in which various measures have been adopted to facilitate ecosystem sustainability and water security.

Reference: UNEP (United Nations Environment Programme). 2009. 'Water Security and Ecosystem Services: The Critical Connection', Report by the UNEP. Nairobi: UNEP. Available online at http://www.unep.org/themes/freshwater/pdf/the_critical_connection.pdf (accessed in November 2011).

5.5 Environmental Flows in Integrated Water Resources Management: Linking Flows, Services and Values

This PhD thesis aims to present a new environmental flows assessment approach that explicitly links environmental flows, ecosystem services and economic values. The author of this thesis has tried to develop a simple and transparent decision support tool that can assess various environmental flows scenarios and also help arrive at a negotiated environmental flow allocation. This tool is based on an existing river basin simulation model, MIKE BASIN, and the calculation procedures are developed in MS Excel. Further the thesis also consists of a checklist that links ecosystem services provided by environmental flows to appropriate valuation methods and examples of monetary values.

Reference: Korsgaard, Louise. 2006. 'Environmental Flows in Integrated Water Resources Management: Linking Flows, Services and Values', PhD Thesis: Institute of Environment & Resources Technical University of Denmark. Available online at <http://www.fiva.dk/doc/thesis/louise.pdf> (accessed in November 2011).

5.6 Environmental Flows in Water Resources Policies, Plans, and Projects: Findings and Recommendations

This report sheds light on environmental flows and sustainable development. It specifically focuses on the integration of environmental water allocation and Integrated Water Resources Management, thereby filling in the knowledge gap on IWRM.

Reference: Hirji, Ra?k and Richard Davis. 2009. 'Environmental Flows in Water Resources Policies, Plans, and Projects: Findings and Recommendations', Report by International Bank for Reconstruction and Development (IBRD), World Bank. Washington, D.C: IBRD. Available online at http://siteresources.worldbank.org/INTWAT/Resources/Env_Flows_Water_v1.pdf (accessed in November 2011).

Module 6: Water Supply, Sanitation and Health

6.1 Safer Water, Better Health: Costs, Benefits and Sustainability of Interventions to Protect and Promote Health

It is a known fact that ensuring cleaner water and better access to it can go a long way in improving public health. This also has extensive direct and indirect economic benefits. This document consolidates and presents recent findings on how global health is impacted by water resources, by outlining information of interventions, and summarising data

from economic evaluations and describing financing insights. The health repercussions that are presented are derived from assessments and opinion reviews. While expert based opinions are not quite the same level of precision as intricate assessments, they provide interesting insights.

Reference: Prüss-Üstün, Annette, Robert Bos, Fiona Gore and Jamie Bartram. 2008. 'Safer Water, Better Health: Costs, Benefits and Sustainability of Interventions to Protect and Promote Health'. Geneva: World Health Organization. Available online at http://whqlibdoc.who.int/publications/2008/9789241596435_eng.pdf (accessed in November 2011).

6.2 Safe Water as the Key to Global Health

This report explores the challenges that the Millennium Development Goals pose in terms of access to safe water. It identifies the stumbling blocks to meeting the goals, what knowledge and tools need to be given to policy makers in the water and sanitation sphere, and explores options for provision of cheap and safe water to all. It also traces factors that hinder the provision of water access, viz. pitfalls in public policies and governance approaches, lack of finances, not maximising technology use etc.

Reference: Schuster-Wallace, Corinne J., Velma I. Grover, Zafar Adeel, Ulisses Confalonieri, Susan Elliott. 2008. 'Safe Water as the Key to Global Health', Report by the United Nations University. Hamilton: United Nations University International Network on Water, Environment and Health (UNU-INWEH). Available online at http://www.inweh.unu.edu/documents/SafeWater_Web_version.pdf (accessed in September 2011).

6.3 The Water Poverty Index: An International Comparison

This paper breaks down the construction of an International Water Poverty Index, so that a locally based version of the water poverty index may be formulated. The Water Poverty Index attempts to express a measure linking household economic status with water access, underlining the relationship between water scarcity and human welfare. Such an index will make it possible to conduct socio-economic surveys of countries and communities and analysing it in connection with water scarcity. This would consolidate data on resources available and social factors that impact water, to enable national and international organisations to study and act on related issues easily. Hundred and forty countries are covered in the paper, and the detailed methodology is also given.

Reference: Lawrence, Peter, Jeremy Meigh and Caroline Sullivan. 2002. 'The Water Poverty Index: An International Comparison', Keele Economics Research Papers Series 19, pp. 1-19. Staffordshire: Keele University. Available online at <http://129.3.20.41/eps/dev/papers/0211/0211003.pdf> (accessed in November 2011).

6.4 Effect of Irrigation and Large Dams on the Burden of Malaria on a Global and Regional Scale

Water resource development projects have been implemented at a stunning pace over the past few decades. According to estimates, 40,000 large dams and 800,000 small dams have been built over the past fifty years. Traditionally, the establishment and management of these water projects have caused an unprecedented in malarial and other vector diseases. This report assesses the impact of dams and irrigation on malaria (both incidence and prevalence). The statistics are specified according to incidences in each of the World Health Organization (WHO)'s sub-regions. The level of risk of a popular depends on its proximity to irrigation projects and large dams. In the sub-regions that are classified as dangerous, close to 15.3 million people live near large dams and 845 million near irrigation projects. The risk that a water project may trigger malarial transmission depends of other factors, viz, epidemiologic setting, socio-economics, vector management and health conditions. The paper concludes that wholesome malarial control measures, along with proper water management can mitigate spread of malaria near irrigation projects and dams.

Reference: Keiser, Jennifer, Marcia Caldas De Castro, Michael F. Maltese, Robert Bos, Marcel Tanner, Burton H. Singer and Jurg Utzinger. 2005. 'Effect of Irrigation and Large Dams on the Burden of Malaria on a Global and Regional Scale', *The American Society of Tropical Medicine and Hygiene*, Vol. 72, No.4, pp. 392-406. Available online at <http://www.ajtmh.org/content/72/4/392.long> (accessed in August 2011).

6.5 Water Quality in South Asia

The paper presents an overview of water quality in the South Asian region. It touches upon the contamination of water with human faces. Water quality problems don't end with microbiological contamination, there is arsenic contamination, that can lead to cognitive impairment, cardiovascular diseases and cancer. Water can also be contaminated with industrial pollution. This melange of chemicals can pose a risk to human health.

Reference: Luby, Stephen. 2008. 'Water Quality in South Asia', *Journal of Health, Population and Nutrition*, Vol. 26, No. 2, pp. 123-124. Available online at <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2740663/> (accessed in September 2011).

6.6 Water Recreation and Disease: Plausibility of Associated Infections: Acute Effects, Sequelae and Mortality

The report talks of the heightened risk of being infected in the course of recreational activities involving water. Diseases arise out of exposure to pathogen in the water environment. As water based activities occur throughout the year, water users are in danger of being exposed to different pathogens in the water at different times. The report talks of evidence of diseases, and then go on to list out the plausible outcomes for different types of viruses and bacteria that may be encountered in water recreation.

Reference: Pond, Kathy. 2005. 'Water Recreation and Disease: Plausibility of Associated Infections: Acute Effects, Sequelae and Mortality'. London: IWA Publishing. Available online at http://www.who.int/water_sanitation_health/bathing/recreadis.pdf (accessed in September 2011).

6.7 Impacts of Groundwater Contamination with Fluoride and Arsenic: Affliction Severity, Medical Cost and Wage Loss in Some Villages of India

High fluoride concentration in ground water in India is quite widespread, occurring especially in the states of Rajasthan, Gujarat, Tamil Nadu, Andhra Pradesh and Karnataka. Results of a field-based study that was held in six areas affected by flourosis, proves that people who belong to the high income level can afford safe drinking water, and that low income groups feel the pinch of flourosis affected water more. Medicinal cost and loss of pay forms a significant proportion of the earnings of the low income people and has a debilitating impact on the affected families. It is found that, over the entire affected population, fluoride and arsenic contamination pose high costs for society, and governmental agencies need to come up with a long term solution.

Reference: Indu, Rajnarayan, Sunderrajan Krishnan and Tushaar Shah. 2007. 'Impacts of Groundwater Contamination with Fluoride and Arsenic: Affliction severity, Medical Cost and Wage Loss in Some Villages of India', *International Journal of Rural Development*, Vol.3, No.1, pp. 63 - 93. Available on line at <http://irm.sagepub.com/content/3/1/69.full.pdf+html> (accessed in August 2011).

Module 7: Sewage and Waste Water Management

7.1 Needs Assessment Guidance to Develop National Plans for Domestic Wastewater Pollution Reduction

This needs assessment guide provides guidance in developing programmes, plans and measures to evaluate sewage management needs and generate options that would lessen the impact of wastewater discharge. This document is meant for governmental and non governmental personnel involved in public administration of sewage and water management projects. This document suggests a framework for both assessment as well as planning, identifies issues that typically crop up, inculcates importance of planning in the first phase and provides ready made case studies that illustrate how tools for planning are made use of, in real life situations.

Reference: UNEP (United Nations Environment Programme) .2003. 'Needs Assessment Guidance to Develop National Plans for Domestic Wastewater Pollution Reduction', Caribbean Environment Programme, Technical Report No. 44. Kingston: Caribbean Environment Programme Available online at <http://www.cep.unep.org/pubs/Techreports/tr44/cep%20tr44-en.pdf> (accessed in August 2011).

7.2 Sewage and Wastewater Treatment Plants

This needs assessment guide provides guidance in developing programmes, plans and measures to evaluate sewage management needs and generate options that would lessen the impact of wastewater discharge. This document is meant for governmental and non governmental personnel involved in public administration of sewage and water management projects. This document suggests a framework for both assessment as well as planning, identifies issues that typically crop up, inculcates importance of planning in the first phase and provides ready made case studies that illustrate how tools for planning are made use of, in real life situations.

Reference: Interior Office of Environmental Affairs .n.d. 'Sewage and Wastewater Treatment Plants', in Pollution Prevention Handbook, No. 13 in a Series of Fact Sheets. Washington, D.C: Department of the Interior Office of Environmental Affairs. Available online at <http://www.p2pays.org/ref/07/06631.pdf> (accessed in August 2011).

7.3 Sick Water? The Central Role of Wastewater Management in Sustainable Development

Globally, there is a water quality crisis that is waiting to happen. Urbanization and industrialisation are changing our water resources and causing unnatural changes that could have long term consequences on human well being. Addressing wastewater and taking steps towards wastewater management can help reduce poverty as well as enhance ecological sustainability. This report, firstly, enumerates the various challenges in wastewater management and spells out what this means for people and the environment. It then suggests solutions to overcome these challenges. Wastewater management requires innovative solutions, viz, in reducing volume and contamination, in treating and reusing the waste. The report also presents a production and treatment cycle, so that our processes can be made more sustainable.

Reference: Corcoran, Emily, Christian Nellemann, Elaine Baker, Robert Bos, David Osborn and Heidi Savelli (eds). 2010. 'Sick Water? The Central Role of Wastewater Management in Sustainable Development', A Rapid Response Assessment. Arendal: United Nations Environment Programme, UN-Habitat. Available online at http://www.unep.org/pdf/SickWater_screen.pdf (accessed in August 2011).

7.4 Status of Sewerage and Sewage Treatment Plants in Delhi

This report contains the results of the study carried out by the Central Pollution Control Board among the sewage treatment plants in Delhi to compare their capacities with their performances. The study concluded that out of 3267 mld of sewage, the treatment capacity can accommodate only about 71%, and actual treatment is given to only 45% of the total sewage. Out of an estimated 480 tonnes of sewage a day, only about 55% of the load is reduced due to treatment.

Reference: CPCB (Central Pollution Control Board). 2004. 'Status of Sewerage and Sewage Treatment Plants in Delhi', Control of Urban Pollution Series: CUPS August 2004. New Delhi: CPCB. Available online at <http://www.cpcb.nic.in/newitems/13.pdf> (accessed in August 2011).

7.5 Household Water Treatment and Safe Storage Options in Developing Countries: A Review of Current Implementation Practices

To be in a position to provide safe water and sanitation facilities, we need to come up with better interventions that have the potential to be more sustainable. There is quite a debate around what constitute appropriate and effective interventions in developing countries. Communication campaigns can go a long way in straightening weak links between health and water. There is evidence to suggest that Household Water Treatment and Safe Storage (HWTS) can go a long way in prevention and cure of waterborne diseases. This paper examines HWTS and describes some common HWTS options, viz. chlorination, filtration (biosand and ceramic), solar disinfection, combined filtration/ chlorination and combined flocculation/ chlorination, describing implementation strategies of each. It also documents learnings, success stories and best practices.

Reference: Lantagne, Daniele S., Robert Quick and Eric D. Mintz. 2007. 'Household Water Treatment and Safe Storage Options in Developing Countries: A Review of Current Implementation Practices', in M. Parker, A. Williams and C. Youngblood (eds), *Water Stories: Expanding Opportunities in Small-Scale Water and Sanitation Projects*, pp. 17-38. Washington, D.C: Woodrow Wilson International Center for Scholars. Available online at <http://www.wilsoncenter.org/topics/pubs/WaterStoriesHousehold.pdf> (accessed in June 2011).

7.6 Evaluating Household Water Treatment Options: Health-Based Targets and Microbiological Performance Specifications

The document provides a baseline guide to evaluate microbiological performance of Household Water Treatment options. It establishes health-based performance targets, provides guidance in informing new testing protocols while supplementing protocols that already exist. It also consists of information from national-level technology evaluation and verification programs, and the method of use of quantitative microbial risk assessment (QMRA) and pathogen performance targets.

Reference: WHO (World Health Organization). 2011. 'Evaluating Household Water Treatment Options: Health-Based Targets and Microbiological Performance Specifications', Document prepared by the WHO. Geneva: WHO. Available online at http://www.who.int/water_sanitation_health/publications/2011/evaluating_water_treatment.pdf (accessed in August 2011).

7.7 Evaluation of Sanitation and Wastewater Treatment Technologies: Case Studies from India

The document provides a baseline guide to evaluate microbiological performance of Household Water Treatment options. It establishes health-based performance targets, provides guidance in informing new testing protocols while, supplementing protocols that already exist. It also consists of information from national-level technology evaluation and verification programs, and the method of use of quantitative microbial risk assessment (QMRA) and pathogen performance targets.

Reference: Starkl, M, M. Phansalkar, R. K. Srinivasan, E. Roma and T. A. Strenstrom. 2010. 'Evaluation of Sanitation and Wastewater Treatment Technologies: Case Studies from India', Paper prepared for the National Sanitation Conference. Available online at

http://www.indiawaterportal.org/sites/indiawaterportal.org/files/Evaluation%20of%20sanitation%20and%20wastewater%20treatment%20technologies_Case%20studies%20from%20India_%20Paper%20presented%20at%20National%20Sanitation%20Conference.pdf (accessed in August 2011).

7.8 Greywater Management in Low and Middle-Income Countries: Review of Different Treatment Systems for Households or Neighbourhoods

The report is a compilation of case studies on greywater management at the household and neighbourhood level in low and middle-income countries. While, greywater is disposed in the drainage in urban areas, it is an altogether different case in rural areas, where the untreated greywater is reused for agricultural purposes, giving rise to potential environmental damage and public health risks. The document gives suggestions for reuse and disposal of treated greywater, and has documented systems such as local infiltration, garden irrigation, soil filters etc.

Reference: Morel, Antoine and Stefan Diener. 2006. 'Greywater Management in Low and Middle-Income Countries, Review of Different Treatment Systems for Households or Neighbourhoods', Report of the Sandec: Department of Water and Sanitation in Developing Countries. Dübendorf: Swiss Federal Institute of Aquatic Science and Technology (Eawag). Available online at <http://www2.gtz.de/Dokumente/oe44/ecosan/en-greywater-management-2006.pdf> (accessed in August 2011).

Module 8: River Basin Planning and Management

8.1 River Basin Management-I

Management of river basin is very important as humans have for a very long period of time utilized the river and their basins for their interest. In this process there has been a severe damage to the environment, the intimate relationship between land and river have been overlooked. This lecture note gives a description of the features of principles of integrated water resources management at basin level, its benefits. Further it also lays down the pre requisites conditions for implementing them.

Reference: Ambujam, N K. 2010. 'River Basin Management-I', Lecture note prepared for Training of Trainers in Integrated Water Resources Management held at Kandy, Sri Lanka from 16-25 September 2010. Available online at http://www.saciwaters.org/CB/iwrm/Lecture%20Notes/8.1.%20River%20Basin%20Management%20I_Ambujam%20N.K.pdf (uploaded in November 2011).

8.2 River Basin Management-II

The management of river basins requires a host of conditions such as proper planning, active participation of all stakeholders at different levels of decision making, flow of information, strong and sustainable economic and financial instruments and an effective pollution control mechanism. Since there are multiple actors involved in this management scheme, it becomes a constraint for adopting IWRM framework. This lecture note begins with a list of problems identified by Dr. Janakarajan in the river basin management and then discusses about the management strategies. The document further dwells with case studies in the state of Tamil Nadu.

Reference: Ambujam, N K. 2010. 'River Basin Management-II', Lecture note prepared for Training of Trainers in Integrated Water Resources Management held at Kandy, Sri Lanka from 16-25 September 2010. Available online at

http://www.saciwaters.org/CB/iwrm/Lecture%20Notes/8.2.%20River%20Basin%20Management%20II_%20Ambujam%20N%20K.pdf (uploaded in November 2011).

8.3 Operationalizing IWRM through River Basin Planning and Management

The theoretical concept of Integrated Water Resources Management (IWRM) has been subsequently accompanied by promotion of River Basin as the logical geographical unit for realizing it in its practical perspective. The River Basin approach offers various advantages for strategic planning, particularly at higher levels of government, though there are difficulties, which should not be underestimated. Issues such as groundwater aquifers frequently crossing administrative catchment boundaries, and river basins rarely conforming to existing administrative entities or structures can be quite problematic. This lecture note is based on materials derived from the Training Manual on “Integrated Water Resources Management for River Basin Organizations” developed by the Cap-Net.

Reference: Gunawardena, ERN. 2010 . 'Operationalizing IWRM through River Basin Planning and Management', Lecture note prepared for Training of Trainers in Integrated Water Resources Management held at Kandy, Sri Lanka from 16-25 September 2010. Available online at

http://www.saciwaters.org/CB/iwrn/Lecture%20Notes/8.3.%20Restraining%20conflict%20through%20institutional%20interventions_Gunawardena%20ERN.pdf (uploaded in November 2011).

8.4 Restraining Conflicts through Institutional Interventions: The Case of Mahaweli, Sri Lanka

Disputes emerging from water sharing arrangements are growing. Conflicts among different water user groups occur due their unmet demand. Though institutional arrangements are in place to take the necessary steps when a conflict emerges yet there is tussle between the users. With a brief summary of the emergence of irrigation system during colonial period in Sri Lanka, this lecture note then elaborates on a case study of Mahaweli development programme. The issues of irrigation policies and schemes are elaborately discussed in the note along with the role played by myriad national and international institutions at every stage the project. It also spells out the different role assigned to each body and the water distribution system in the scheme.

Reference: Gunawardena, ERN and KN Wickramaratne.2010. 'Restraining Conflicts Through Institutional Interventions: The Case of Mahaweli, Sri Lanka', Lecture note prepared for Training of Trainers in Integrated Water Resources Management held at Kandy, Sri Lanka from 16-25 September 2010. Available online at http://www.saciwaters.org/CB/iwrn/Lecture%20Notes/8.5.%20Operationalizing%20IWRM%20through%20River%20Basin%20Planning%20and%20Management_Gunawardena%20ERN.pdf (uploaded in November 2011).

8.5 A Handbook for Integrated Water Resources Management in Basins

The water resources are under continuously under pressure because of factors such as: population growth, rapid urbanization, expansion of agriculture, and change in climatic condition. These factors highlight the interdependencies of river, lake and aquifer basin and also a need for integrated approach to manage land and water resources. Regardless of the existence of internal conflicts among the various water institutions engaged in the management of water, the present scenario has welcomed an integrated approach for managing water both at national level and basin. This requires improving and strengthening of institutions and working practices among the different stakeholders. This handbook provides guidance for improving the governance of fresh water. The book goes on to make detailed analysis of: the links between challenges confronting water sector and IWRM response to it, suggesting ways to modernize basin organization to facilitate the adoption of IWRM approach by illustrating many examples of river, lake and aquifer management.

Reference: GWP (Global Water Partnership) and INBO (International Network of Basin Organization). 2009. A Handbook for Integrated Water Resources Management in Basins. Sweden: Elanders. Available online at http://www.siagua.org/archivos_adjuntos/documentos/libro_gestion_cuencas.pdf (accessed in August 2011).

Module 9: Water Rights and Laws

9.1 Rethinking the Concept of the Human Right to Water

This paper is composed of three sections, wherein it analyses the current status of water as a human right. The paper is interspersed with case studies from South Africa and Uzbekistan which illustrate instances of water as a human right. The second section of the paper deals with water access for livelihood needs, putting forth the view that right to water should also be for citizens' water-dependent livelihood needs. The case studies provide an insight into the legal

dimensions of water as a human right to water. Another case study proves that domestic water supply in the region actually helped in reduction of poverty and created employment and livelihood opportunities. Section three addresses the needs of the ecosystem in the human right to water space. The author explains that the right to water can be integrated to protect man and his environment. The author concludes by campaigning strongly for right to water, asserting that it would result in the improvement of resource management and help raise water productivity.

Reference: Ziganshina, Dinara. 2008. 'Rethinking the Concept of the Human Right to Water', *Santa Clara Journal of International Law*, Vol. 6, No. 1, pp. 113-128. Available online at http://www.internationalwaterlaw.org/bibliography/articles/Ethics/Common_Grounds_Symposium/Ziganshina.pdf (accessed in October 2011).

9.2 FAQ: World Water Council

This is essentially a fact-sheet which answers a set of questions of water rights. The questions range from legal aspects, state's role, the UN Millennium declaration and touches upon the economic aspect of water rights.

Reference: World Water Council. n.d. 'FAQ: World Water Council'. Available online at <http://www.worldwatercouncil.org/index.php?id=1764> (accessed in October 2011)

9.3 Water Rights Reform: Lessons for Institutional Design

This volume is a compilation of selected papers from an international working conference held in Vietnam in February 2003 organised by the International Food Policy Research Institute. The reform cases cover countries across six continents. The papers in the volume are a result of empirical data collection and analyze the entire gamut of issues that come under water rights. The first part of the book deals with institutional issues in water reforms, and the second part is a collection of case studies describing the implementation of water reforms. Equity issues in water governance are discussed in part three, and the fourth part analyses the consequences of recent legislation in water in the global south. The concluding chapter summarises and consolidates on patterns and goals of water rights reform.

Reference: Bruns, Bryan Randolph, Claudia Ringler and Ruth Meinzen-Dick. 2005. 'Water Rights Reform: Lessons for Institutional Design'. Washington, DC: International Food Policy Research Institute. Available online at <http://www.ifpri.org/sites/default/files/publications/oc49.pdf> (accessed in October 2011).

9.4 The Helsinki Rules, the UN Watercourses Convention and the Berlin Rules: Perspectives on International Water Law

The paper examines the work done in water rights and laws by the Institute of International Law and the International Law Association as well as the International Law Commission of the United Nations. The paper pores over similarities and differences between the different instruments of legislations and the challenges facing them. Adding to the fact that water resources are facing challenges due to population increase, industrialization, urbanization and hydrological variable, around 300 rivers and 100 lakes are shared by two or more states. Contemporary disputes over shared waters go beyond their quality and quantity. There is no universal treaty that regulates water resources, and this is the crux of a global problem.

Reference: Salman, Salman M. A. 2007. 'The Helsinki Rules, the UN Watercourses Convention and the Berlin Rules: Perspectives on International Water Law', *Water Resources Development*, Vol. 23, No. 4, pp. 625-640. Available online at <http://www.internationalwaterlaw.org/bibliography/articles/general/Salman-BerlinRules.pdf> (accessed in October 2011).

9.5 Getting Transboundary Water Right: Theory and Practice for Effective Cooperation

This volume is a collection of literature that present real-world experience of water cooperation at international, national and local levels, as well as cases that show political interference to cooperation. National politics add complexity to water issues. Surface water is found in 263 international basins, and inefficient governance of transboundary water management can impede management efforts. The authors suggest an analytical solution to help transboundary water management respond to power asymmetry. The document serves as a preface to the 2009 Water Week that focused on transboundary water management.

Reference: Jagerskog, A and M. Zeitoun. 2009. 'Getting Transboundary Water Right: Theory and Practice for Effective Cooperation', Report No. 25 of the Stockholm International Water Institute (SIWI). Stockholm: SIWI. Available online at http://www.siwi.org/documents/Resources/Reports/Report25_Transboundary_Waters_with_WWW.pdf (accessed in October 2011).

9.6 Trans-Boundary Water Politics and Conflicts in South Asia: Towards 'Water for Peace'

The study is situation in the premise that peace is a value grounded in human security issues and ensures regional well being, and is not simply the absence of war. The paper reiterates on the need for a water governance framework at the South Asian level, and deems it crucial in achieving regional and Millennium Development Goals. This framework must recognize the plurality of stakeholders in the water terrain as well as the civil society, which is often excluded. The process of water governance needs to be decentralised and from a bottom-up approach, and must work towards forging democratic ties with non state institutions. It should include water ecologies that are often neglected now, such as the Indus basin and the Ganga basin. Women's and other minority voices need to be taken into consideration, as they are a crucial part of the sustainable development movement.

Reference: Singh, Richa. n.d. 'Trans-Boundary Water Politics and Conflicts in South Asia: Towards 'Water for Peace'', Scoping study report. New Delhi: Centre for Democracy and Social Action. Available online at http://www.boell.de/downloads/intlpolitics/water._Final_1.pdf (accessed in October 2011).

9.7 From Communities' Hands to MNCs' BOOTS: A Case Study from India on Right to Water

The paper begins, elaborating on the fact that water is not a human right, enshrined in the Indian constitution. It also dwells on the issue of water privatization in the rapidly industrialising country and how it is affecting the poorer sections of the population. The paper argues that water in the India should be dealt with at the federal level so that its governance can be improved. The second section deals with constitutional outlook, legal provisions and various environmental laws in India. There is also a section on privatisation and corporatisation of water in India elaborating on its implications and consequences. The paper also touches upon past people movements in India in the water sector. It lists some contemporary improvements in the gamut of law and people's movements that have become an integral part of seeking water and environmental rights in India, viz, Environmental Impact Assessment and Right to Information Act.

Reference: Pant, Ruchi. 2003. 'From Communities' Hands to MNCs' BOOTS: A Case Study from India on Right to Water', Paper Submitted to Rights and Humanity, of the Right to Water Project, United Kingdom. Available online at http://www.righttowater.info/wp-content/uploads/india_cs.pdf (accessed in October 2011).

9.8 India: Evolution of Water Law and Policy

This paper traces the evolution of water law and policy in India. It begins with a brief description of the developments pre colonial times and then focuses on colonial and post colonial issues. The authors state that water laws in India remain "patchy" because of the following reasons: water remains as a state subject, also a concern at union level and some elements of the laws come under the terrain of environment and health laws. They further highlight the fact that water policy reflects the specifics of Indian situation as it is pushed in different direction by different stakeholders. The complex administrative set up, overlapping of functions, diverse geographical conditions makes it difficult to allocate water in a socially and economically sustainable manner.

Reference: Cullet, Philippe and Joyeeta Gupta. 2009. 'India: Evolution of Water Law and Policy', in Dellapenna, Joseph W., Joyeeta Gupta (eds) *The Evolution of the Law and Politics of Water*, pp. 159-175. Berlin: Springer. Available online at <http://www.ielrc.org/content/a0901.pdf> (accessed in November 2011).

Module 10: Water Policy, Regulations and Governance

10.1 The Empowers Approach to Water Governance: Guidelines, Methods and Tools

This book prescribes a water governance framework, involving users and managers of water with a focus on governance at the local level. It also takes the reader through developing a governance plan and implementing it for towns, villages and districts. It seeks to bring about a change in water governance at the grassroots. The suggested approach rests on two pillars: stakeholder dialogue and concerted action and management cycle of water. The book also has material on facilitation and capacity building of local human and material resources.

Reference: Moriarty, Patrick, Charles Batchelor, Firas T. Abd-Alhadi, Peter Laban and Hazem Fahmy. 2007. 'The Empowers Approach to Water Governance: Guidelines, Methods and Tools'. Amman: Inter-Islamic Network on Water Resources Development and Management (INWRDAM). Available online at http://waterwiki.net/images/d/d2/EMPOWERS_Guidelines%2C_Methods_and_Tools.pdf (accessed in October 2011).

10.2 Good Governance for Good Water Management

The author of the paper states that good governance is an essential aspect of effective water resources management however this fact receives less attention. With a brief introduction of the challenges while governing water the author discusses about the need for strong policy, legal and regulatory framework, the need to improve institutions and the need to make appropriate investments.

Reference: Bucknall, Julia. 2006. 'Good Governance for Good Water Management', Environment Matters. Available online at <http://siteresources.worldbank.org/INTENVMAT/64199955-1162240805462/21127276/8GoodGovernance.pdf> (accessed in November 2011).

10.3 Independent Regulatory Agencies: A Theoretical Review With Reference to Electricity and Water in India

Institutions governing water are changing and new institutions are being established and included in the core decision making processes. The changes occur due to changing water resources situations, actors and power relations. In India, reforms in water sector are emerging: they are in different forms and at different stages. This article contributes to the Indian water sector reform by discussing the emergence of Independent Regulatory Authorities in the country. The author discusses about the various theoretical perspectives of the political economy of regulation. The focus of the article is on the need for creating independent regulator. The way through which it's functioning can be improved and explore the way through which the newly established regulator can address the social issues in the economic decision making process.

Reference: Dubash, Navroz K. 2008. 'Independent Regulatory Agencies: A Theoretical Review With Reference to Electricity and Water in India', *Economic and Political Weekly*, October 4, 2008, pp. 43-54. Available online at <http://www.indiaenvironmentportal.org.in/files/Independent%20Regulatory%20Agencies.pdf> (accessed in August 2011).

10.4 Uttar Pradesh Water Management and Regulatory Commission (UPWMRC) Act, 2008: Need for Civil Society Attention

Indian water sector is experiencing a host of changes both in the style of its functioning and the actors who are involved in deciding in the matters related to managing water. The changes come under the rubric of reforms. The advocacy of such reforms tends to be made on theoretical as well as on empirical grounds. This document discusses about the reforms in the state of Uttar Pradesh, where water management and regulatory commission act was passed in the year 2008. The authors of the article first trace the origins of the act and then discuss about the fundamental changes brought in the regulatory framework. It also briefly mentions about the changes that the new regulatory law is bound to bring.

Reference: Wagle, Subodh and Sachin Warghade. 2009. 'Uttar Pradesh Water Management and Regulatory Commission (UPWMRC) Act, 2008: Need for Civil Society Attention', *Water Moves*, Quarterly Newsletter on Water Governance, Vol.2, No. 2, pp.1-16. Available online at <http://www.indiaenvironmentportal.org.in/files/UPWMRC.pdf> (accessed in June 2011).

10.5 New Law Establishing Independent Regulatory Agencies in the Indian Water Sector: Long Term Implications for Governance

Water is a state subject in India. The style of governing the resource varies across the states. The institutions involved in water allocation, and distribution, falls under the different departments. In the recent times water sector has witnessed a range of changes brought in by multiple organizations both national and international. One such major change is the establishment of Independent Regulatory Authority in the water sector. This is an evolving institution which has been established in few states through a special law. This paper examines the impact and the changes brought in this new institution in the governance mechanism in water sector and the interest of the "non dominant section of the society" after the establishment of the regulator.

Reference: Wagle, Subodh and Sachin Warghade.2010. 'New Law Establishing Independent Regulatory Agencies in the Indian Water Sector: Long Term Implications for Governance', *South Asian Water Studies*, Vol. 2, No.1, pp. 49-77. Available online at http://www.sawasjournal.org/v2i1/SAWAS_2_1_Jun2010_Wagle_Warghade_p49_p78.pdf (accessed in November 2011).