Illustrative Cases for Teaching IWRM (Volume II)

Support Material for Teachers

SaciWATERs

August 2010

Introduction

This is the ‘Companion Volume’ prepared for teachers who would use the pedagogic or teaching cases presented in the main volume titled: “Illustrative Cases for Teaching IWRM”.

This volume contains case-wise support material for teachers planning to use the pedagogic cases presented in the main volume. More importantly, this support material is prepared by the authors of the pedagogic cases from the main volume. The ‘Support Material’ provides some additional information on the substantive matters covered in the pedagogic case. However, the main objective is to help the teacher planning to use the cases, by providing inputs for conducting discussions in the class on these cases. This main section in the volume is preceded by a section that provides detailed explanations on how to teach these cases and on how to use the Support Material.

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Section I:
How to Use the Support Material for Teachers

Understanding the Illustrative Pedagogic Cases

This section of the companion volume is aimed at introducing the teachers to 'Illustrative Pedagogic Cases' and providing some inputs on how to use these cases in the class.

The term 'illustrated cases' needs to be explained in the beginning. The term refers to case narrations (or studies) written primarily for pedagogic or teaching purpose. The pedagogic case narrations need to be differentiated from the outputs of 'case-study method of research'. These outputs—or the case studies developed using the case narration research method—need not be useful for teaching purpose; while the 'pedagogic case narrations' need not be based on the research conducted using the 'case-study research method'.

Further, 'pedagogic case narrations' are divided in two groups: (a) 'pedagogic cases' used for developing decision-making skills, which are primarily used in management schools, and (b) 'pedagogic case narrations' used for providing experiential learning to students from engineering and other disciplines. The differences in these two types of pedagogic cases are explained in detail in the Introduction section of the main volume (also please refer to the accompanying Table 1). The second type of the pedagogic cases are the subject matter of these volumes and are called here as 'illustrative cases'. The first type is referred here as 'Decision-Training Case-Studies (or Cases').

The 'illustrative cases' are meant to be used in conjunction with other methods for teaching concepts and theories. In this sense, the illustrative cases do not obviate or substitute teaching of theories.

In this regard, an important difference in using these two types of pedagogic cases respectively in management schools and in other institutions (especially engineering institutions) needs to be noted. The make-up of students from management programs is much different from that of students from

engineering programs, at least in the South Asian countries. As observed in the Introduction to the main volume: "*while management students tend to be more outspoken and ready and willing for group discussions right from their admission stage, the engineering students—trained more through the medium of lectures—are less prepared to readily engage in nuanced discussions with the teacher in the class*." This has direct relevance for teaching with 'illustrative pedagogic cases', as it makes the role of the teacher both critical and challenging.

Table 1: Comparison of Two Types of Pedagogic Case Studies

Axis for Comparison	Decision-Training Cases	Illustrative Cases
Pedagogic Purpose	Training in the art and science of decision-making	Providing 'experiential learning' through exposure to relevant real-life situations
Content	Description of the problem or issue that requires a decision	Lucid and vivid narrations of real-life situations or stories of events
Expectation	Bringing out different as well as better options for solution of the problem	Bringing out and elaborating reflections (with nuances) in reality of different concepts and theoretical constructs
Structure	Short but containing data required to make decision	Detailed, elaborate, and lucid narrations, with relevant data
Mode of Discussion in Class	Competitive (if not adversarial), aimed at coming up with better solutions	Collaborative, Synergetic, aimed at exploring together the reality for understanding the theory

This challenging task requires teacher to put in more and conscious efforts for prior preparation. In order to help the teachers intending to use these illustrative cases, the authors (who were faculty members from engineering colleges) who wrote the illustrative case narrations from the main volume were requested to prepare support material for their own case narrations.

Support Material for Teachers

The Support Material provided by the authors has two main components: (a) a Case Map, and (b) Descriptive Supportive Material.

Case Map

The Case Map is schematic representation of the 'illustrative case narration'. It

essentially lays out the structure and substantive content of the narration. The Case map is made of different elements, which are described here.

Logical Building Blocks (LBB): The entire case narration is seen as made up of few Logical Building Blocks (LBBs), which together build the case narration. LBBs can also be seen as main sections of the narration.

Main Points: Each main section or the LBB of the narration has one or more Main Points (MP) that the narration is describing or explaining.

Learning Objective (LO): The Main Point in the narration is made in order to illustrate or explain some concept or point in the theory. In other words, the objective of describing the Main Point is to help students learn a particular concept or theoretical proposition. Hence, the objective underlying the main point is called the 'Learning Objective' (or LO). Articulation of LO is aimed at ensuring more clarity in teacher's mind on the ways in which class discussion should be conducted.

Each Main Point may have one or more LOs. Similarly, one LO may be illustrated through one or more Main Points in the narration.

Sub-Point: Each Main Point also has some sub-points which provide some details, nuances, variations, exceptions, special cases, or other information on the Main Point.

Thus, the Case Map is schematic representation of the case narration that is made of different elements: viz., Logical Building Blocks (LBBs), Main Points, Los, and Sub-Points. The figure in Box 1 provides a format for drawing a case map of any case narration[1].

It is necessary to note that the interconnections between LBBs need not be one-to-one or linear; rather, often, they will create complicated figures for the Case Maps, as shown in the second section.

[1] Box 1 is provided on the separate paper and also contains basic information about the Case Map. This can be used as a ready-to-use information sheet to be given to students for their reference.

Box1: Case Map: Format and Explanations

The Case Map is schematic representation of the case narration. It lays out the substantive structure of the case narration. The Case Map is made of different elements, which are described here.

Logical Building Blocks (LBB): The entire case narration is seen as made up of few Logical Building Blocks (LBBs), which together build the case narration. LBBs can also be seen as the main sections of the narration or the story.

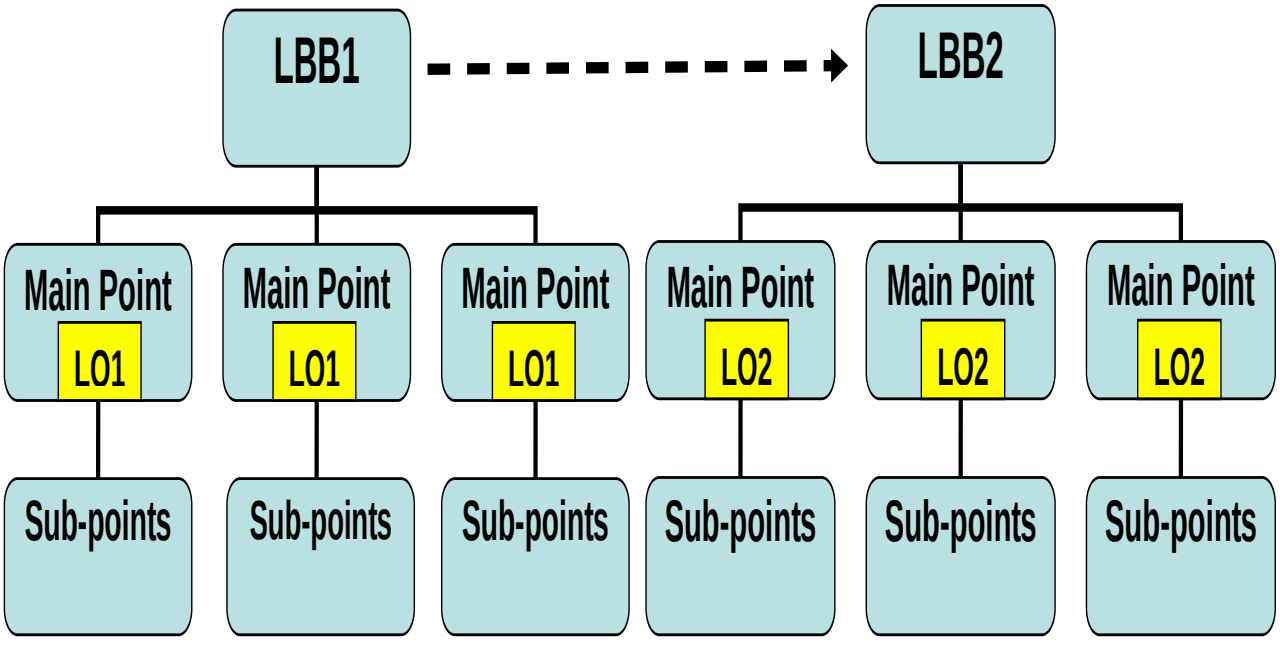
Main Points: Each main section or the LBB of the narration has one or more Main Points (MP) that the narration is describing.

Learning Objective (LO): The Main Point in the narration is made in order to illustrate or explain some concept or point in the theory. This objective underlying the description of the main point is called the Learning Objective (LO) that is to be achieved through class discussion.

Each Main Point may have one or more LOs. Similarly, one LO may be illustrated through one or more Main Points in the narration.

Sub-Point: Each Main Point also has some sub-points which provide some details, nuances, variations, exceptions, special cases, or other information on the Main Point.

Thus, the Case Map is schematic representation of the case narration and is made of different elements: viz., Logical Building Blocks (LBBs), Main Points, and Sub-Points. The accompanying figure provides a format for drawing a Case Map of any case narration.



Descriptive Support Material

In addition to the Case Map, the authors were requested to provide descriptive material in the format presented in Box 2. While it contains description of some elements of the Case Map, there are some additional elements also.

Box 2: Support Material for Teachers: Framework Provided to Authors

1. Central Theme:
2. Scope of the Case: What does the case cover?
3. Logical Building Blocks (LBBs) of the Narration
4. Logical Inter-relationship among the LBBs (in schematic form)
5. Main Points in each of the LBB
6. Learning Objectives to be Fulfilled through discussion on each of the Main Point
7. Sub-Points under each of the Main Point
8. Leading Questions to move discussion from one point (sub or main) to the next point (sub or main)
9. Case-Specific Explanations
   - Clarification / explanations to the teacher on Technical, Geographic, or other specificities
   - Practical Tips / Hints for conducting discussions that are useful only in the particular case
10. Explanations on the concepts & theoretical propositions illustrated through the case
    - From author's perspective
11. Suggested readings (optional)
    - To Provide to the students theoretical / conceptual background

The first two points in the format pertain to basic features of the case narration, viz., the 'core theme' and 'scope of substantive coverage'. The subsequent five points (Point 3 to Point 7) are different elements of the Case Map that are explained in the paragraphs above. Point 8 is meant to provide some clues to teachers, from the perspective of the authors, on how to 'lead' the discussion in the class from one point to the other (of the case narration). The Leading Questions are not part of the Case Map because they are not

part of the structure of the case narration. The teachers using the case narration can structure his or her own Leading Questions as per the proposed plan for the discussion in the class.

The next point in the format is about the Case-Specific Explanations that authors think are necessary to explain different aspects of the narration. These include the clarification or explanations on technical, geographic, socio-cultural, political, or other details or specificities of the case narrated. These would help the teacher and students (if they are shared by the teacher) to understand and appreciate the ground-reality. This will also include case-specific tips or hints that are useful to teachers in conducting discussion in the class. For example, the author may share the questions, queries, or clarifications that students ask or need at a particular point in the discussion.

In the tenth point in the format, the author may choose to provide further explanation pertaining to the concepts or theoretical constructs that author wants to illustrate through the Case narration.

At the end, the author may give a list of suggested readings (for teachers or for students or for both) on the conceptual / theoretical aspects covered by the case or some other dimension relevant for the case narration.

Section 2 of this companion volume contains the support material for teachers provided by the authors of the case narrations. Most authors have provided the Case Maps of their respective cases. However, the authors have used different formats and different styles in providing the support material, using their judgment of what is needed for their respective case narration.

Methodology for Teaching Illustrative Case Narrations

Sharing the Case Narration with Students

The case narration should be made available to students at least two weeks before the scheduled class. The format in which the case narration is printed should not be cluttered and should leave adequate blank space for students to

make notes and write comments. It is advised that students use the same prints of the case narrations provided in the main volume.

An introductory session would be advisable before the scheduled class to explain to students the nature of the case narration exercise. The session can cover: the pedagogic objectives, the method of conducting the class, responsibilities of students, and expected outcome. It would be good to explain them what will actually happen in the class, and how each of one will be involved in the discussion.

The teacher can guide them on how to read and “study” the narration. It would be useful to mention the importance of connecting the narration to the concepts and theory taught in the class.

Simultaneously, it would be helpful if the substantive concepts and theories covered in the case narration are indicated to them. Students should be encouraged to look for the links between the content of the case narration and the concepts and theories mentioned.

The teacher may choose to share the Case Map provided by the author or prepared / refined by the teacher. Alternatively, the teacher may explain the blank format of the Case Map and ask students to prepare the Case Map themselves before coming to the class.

Preparing for and Conducting Class Discussion

The first step in preparation is to read the case narration. Alternatively, the teacher may read the support material provided by the author before reading the case narration. There are advantages and disadvantages with both the approaches. The second approach is discussed at a later point.

Reading the author’s support material first makes the preparation easier and faster for the teacher, as the teacher gets advantage of inputs provided by the author.

The teacher may use any method for teaching the case narration that suits his or her own style and preferences as well as that is suitable to the needs of his

or her students. However, it is suggested here that using the Case Map as the Guide Map for initiating and conducting discussion on the case narration would be helpful to the teacher. By asking the appropriate leading questions, the teacher could lead the discussion in the class as per the scheme depicted in the Case Map. In fact, if teacher has access to the board (black or white), the teacher could draw different elements of the Case Map on the board as the discussion would progress in the class. At the end, the teacher would be able to recreate the Case Map on the board, which students can use as the 'take-away' from the class.

If the teacher finds this method of teaching the cases acceptable, then the Case Map becomes the main tool for preparation and planning of the class discussion. The teacher may start with the Case Map provided by the author and repeatedly revise or refine it so that it becomes the Teaching Plan acceptable to the teacher. In fact, the teacher may choose to take the Case Map to the class, along with the case narration.

Instead of starting with the support material provided by the author, the teacher may start by reading the case narration (before reading the support material). This provides the advantage to the teacher of thinking with a "Clean Slate", which would allow the teacher to take a fresh look at the case and develop his or her own understanding of and perspective towards the case. This would throw up new opportunities for the class, which the author might not have been able to envisage. The teacher might try and prepare his or her own Case Map after reading the case narration and detail out different aspects of the Case Map. This Case Map then can be compared with the Case Map and the other support material provided by the author. The comparison could help the teacher to improve, refine, or revise the Case Map prepared by the teacher.

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Section II:

Case-wise Support Material for Teachers Prepared by Authors

Support Material for Teachers on

Water and Women on a Tea estate in Sri Lanka

by

Saliya De Silva

Learning Objectives

To create gender sensitivity among IWRM students and practitioners by:

a) Gaining insights into the difficulties faced by women on tea estates

b) Understanding the reasons for and types of productive and reproductive tasks women undertake and how these are linked to water

c) Understanding the impact of water management, sanitation, and housing facilities on the tea estates on women's health and socio-economic status

Leading Questions

Section 1: Introduction to Malathi

a) What do you think about the division of labour in Malathi's family?

b) Can this division of labour be changed or improved?

c) Do you see any differences between the tasks performed by Malathi and women in other parts of rural Sri Lanka?

Section 2: Low education, low incomes and poor living conditions

a) How would you compare the socio-economic status of estate workers and people living in rural areas in Sri Lanka?

b) What might be the causes of the status of the workers on the estates?

c) Is the high contribution of the women on the states to the national economy reflected in their socio-economic status?

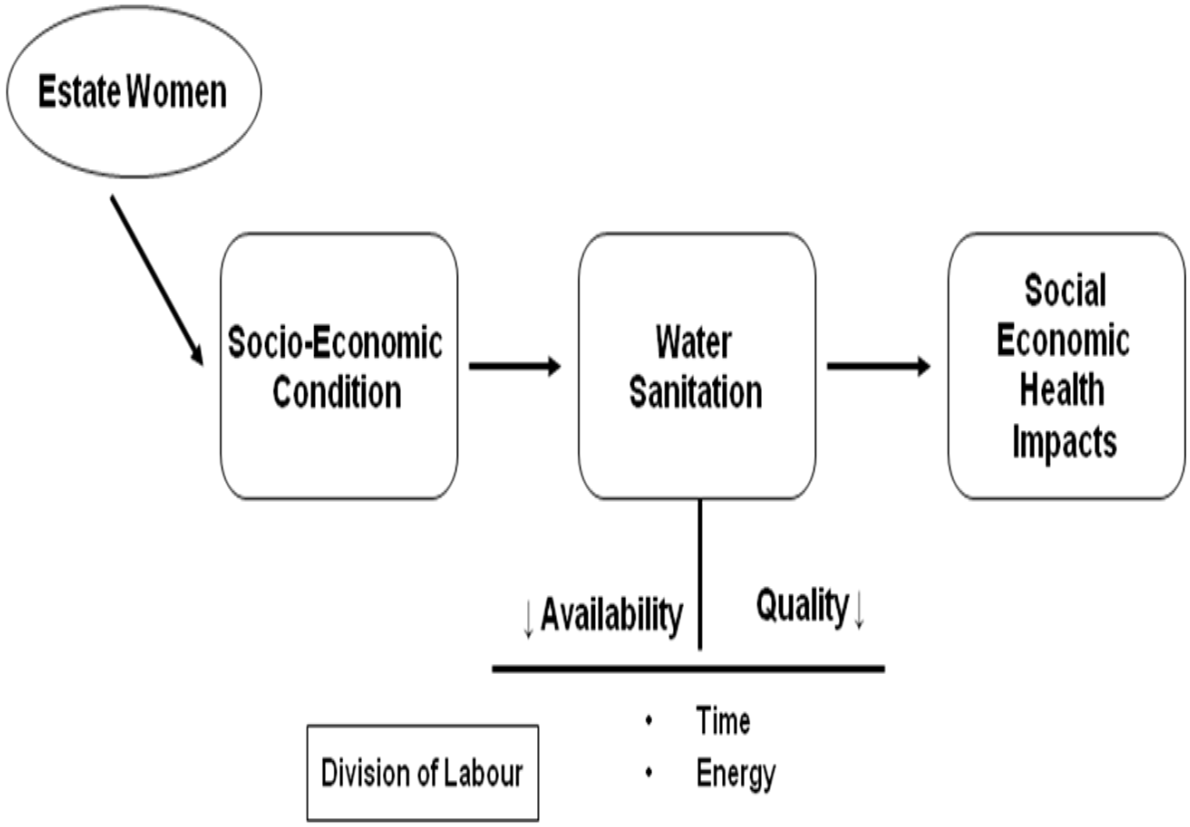
Section 3: Adding discrimination to deprivation

a) Discuss the roles performed by women on the tea estates the reasons for these roles.

b) Would you say that there is gender disparity or discrimination within the family?

c) What are the causes of such discrimination?

Case Map: Water and Women in Tea Estates of Sri Lanka



LO1 - Social Status ↓
British Slaves

LO2 -
1 - Income ↓
2 - Women's work
1 - Education ↓
2- "Dependent housewife"
1 - Living Condition
2 - "Live room, Kitchen, Latrines"
1 - Expenditure
2 - "Survival rather than upward movement" / " Eat Last or Least"

Reproductive work

(90%)

LO3 -
↓ Income (poorer)
Physical/Psychological Stress ↑
Diseases ↑
Social isolation

Section 3.1: Bare homes, barely any water

a) What are the differences between line rooms and separate rooms, and can separate rooms reduce the burden of women on the estate?

b) How does inadequate access to water contribute to the perpetuation of the status of women?

Section 3.2: Juggling multiple tasks

a) What are the productive and reproductive tasks performed by women on the estates?

b) Can you identity the reasons why women must do these multiple tasks?

Section 3.3: Water, sanitation and the status of women

a) Analyse the problems of water management and sanitation on the tea estates

b) What is the relationship between water, sanitation and the status of women on the estates?

c) Why are women more prone to illnesses and diseases?

d) What are the major consequences of the poor access to water and low quality of water?

e) What can be done to improve the situation?

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Support Material for Teachers on

Why is Meda Ela So Murky?

by

M.I.M. Mowjood

Learning Objectives

1. Understanding the complexity of the problem of water pollution.
2. Understanding the different perceptions of stakeholders about the causes of, and solutions to, the problem.
3. Learning to link “development” with how canals that flow through an urban area get polluted at multiple sources.
4. Differentiating between polluters and victims (upstream and downstream links).
5. Seeing how multiple laws/policies and institutions govern water bodies.

Leading Questions

Section 2: Polluters and victims

a) What are the causes and impacts of water pollution in and along the Meda Ela?

Section 3: Multiple sources of pollution

a) How does the multiplicity of sources of pollution add to the problem of managing the pollution?
b) Why are wastewater and solid waste dumped into the Meda Ela?
c) How are individual and institutional polluters different?

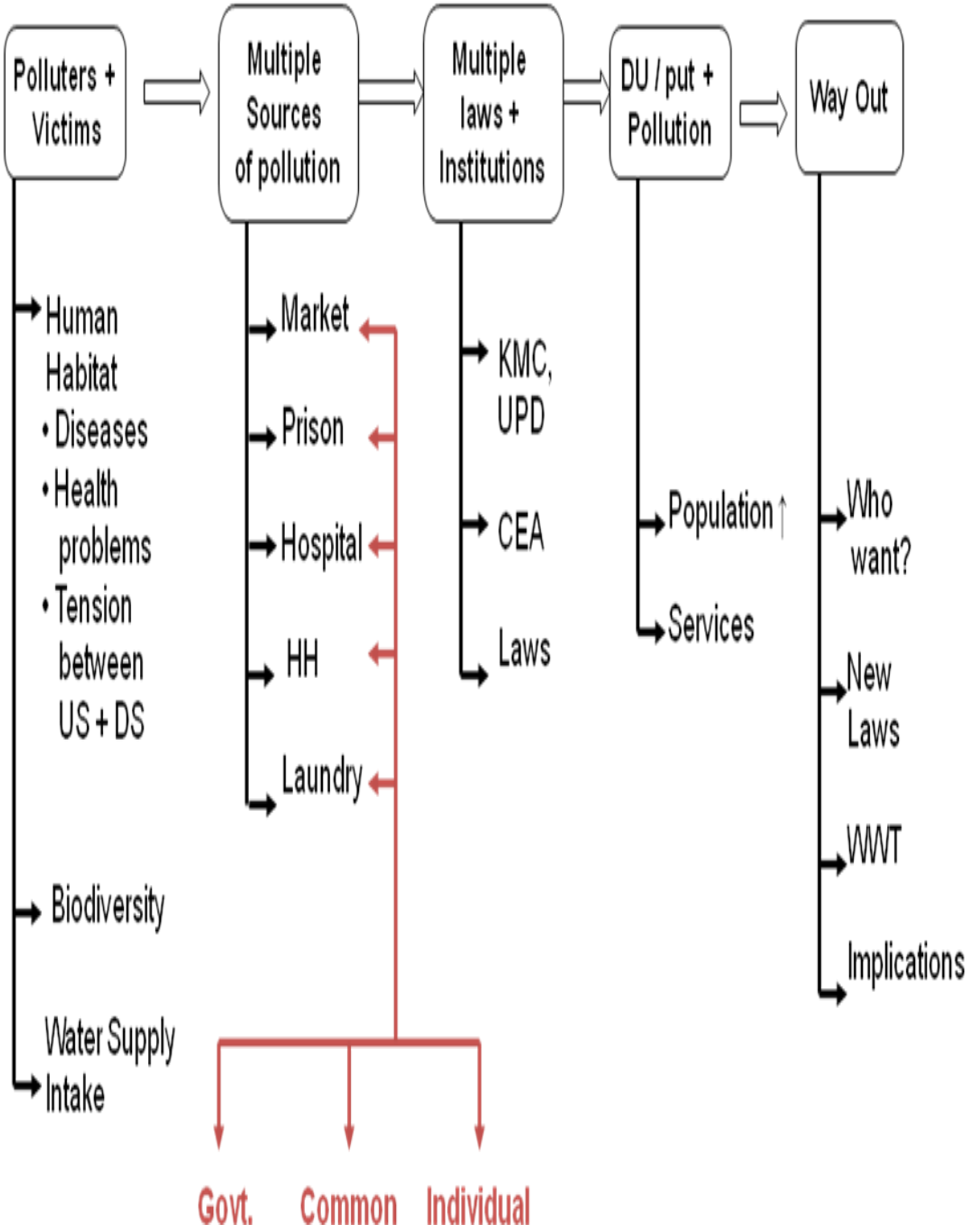
Section 3.1: Development and water pollution

a) Can the pollution of the Meda Ela only be avoided at the cost of halting “development”?

Section 4: Multiple laws, acts and institutions

a) Why is there such a multiplicity of laws, regulations and institutions dealing with pollution?

Case Map: Why is the Meda Ela So Murky?



b) Are new laws needed, or are existing laws adequate?
c) Why are the regulations on paper not implemented on the ground
d) Do different interests clash with regard to pollution? How and with what impact?

Section 4.3: Overlaps and gaps

a) Is the pollution of the Meda Ela a shared responsibility or a collective responsibility?
b) Will better coordination solve the problem?
c) Will a Centralised Sewerage Treatment Plant solve the problem?
d) Should national policies be localised?

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Support Material for Teachers on

Unlike People, Meda Ela Does Not Complain

by

Shamala Kumar and Tehani Gunawardena

Learning Objectives

1. Understanding how the perceptions and activities of different stakeholders affect pollution.
2. Trying to grasp the complex relationship of stakeholders with the pollution as both victims and polluters.
3. Studying how the community's views are influenced by status and relationship with each other and with pollution
4. Learning about how structural inefficiencies can affect pollution and implementation of policy
5. Learning about how political intervention can affect implementation of policy

Leading Questions

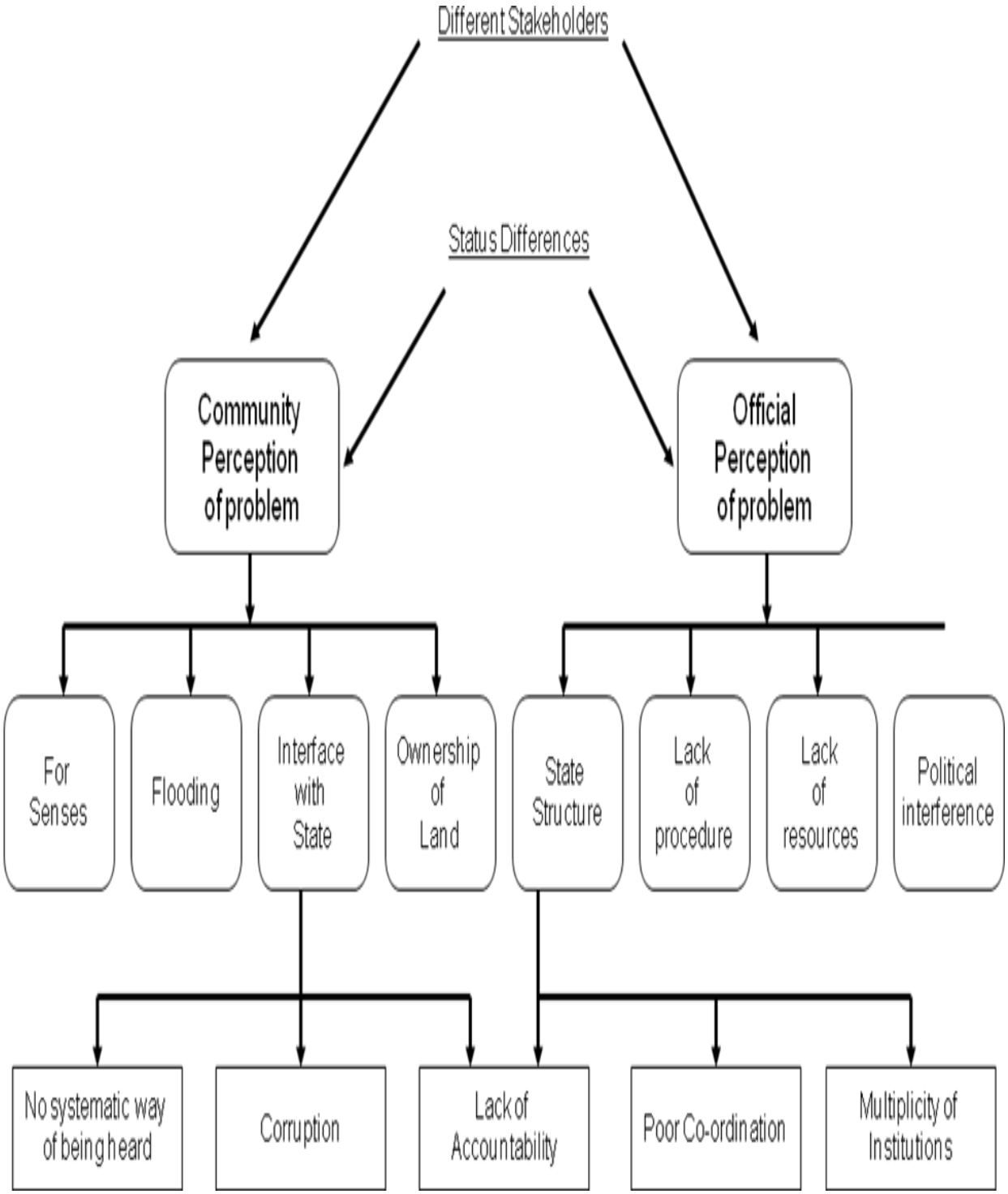
Section 1: the Meda Ela and Kandy

a) How pervasive is the problem of the pollution of the Meda Ela?
b) Why do people still use the Ela when it is so polluted, and continue to live along the murky canal?

Section 1.1: People's perceptions of the Ela; Section 2. The story of Malini

a) What is relationship between the community and officials? Is it problematic? What can be done about it?
b) Is the friction inevitable? To what extent are politicians to blame for the friction?
c) What allows 'Cushion Works' to continue its illegal occupation?
d) What can be done from the perspective of the officials to improve the situation?

Case Map: Unlike People, Meda Ela Does Not Complain



e) What can be done from the perspective of the community to improve the situation?
f) What is Malini's social status and how might it contribute to what she is describing?
g) Could her gender have an effect on what transpired?
h) viii Could her status as a displaced individual affect what transpired?
i) Is she the only victim in this situation?
j) Who is making her a victim?

Section 3: The official view: a system in need of repair

a) What are officials' perceptions of what might be contributing to the state of the Ela?
b) Do officials view this as a problem? Why might they feel this way?
c) Whom do they blame for this situation?

Section 3.1: The problems of dealing with pollution

a) What are the difficulties of dealing with pollution?
b) Are these difficulties real or only perceived?
c) What can be done to change the perceptions of such problems?
d) What are the limitations in planning in the system?
e) What do you think contributes to these problems?
f) How much of a problem is accountability in trying to improve the system?

Section 3.2: How corruption affects the Ela

a) Is corruption a problem in this situation?
b) Can corruption be minimised? How?

Section 3.3: Political pressure and pollution

a) Does political intervention have a positive or negative impact on the community's wellbeing?
b) How much of a problem is political intervention for policy implementation?
c) Would someone be worse off if not for political intervention? Would anyone be marginalised if political intervention was absent?

d) Who loses power because of political intervention?

e) What are the incentives for: Mailini, other members of the community, officers, and politicians?

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Support Material for Teachers on

The Tale of a Tank

by

C. Sivayoganathan

Learning Objectives

1. Comprehending the levels of participation of different stakeholders in the management of minor tanks.
2. Exploring the factors related to the levels of participation of the different stakeholders.
3. Identifying the multiple uses of the tank and factors contributing to inequity, if any.

Leading Questions

Section 1.1: Maintaining the minor irrigation tanks:

a) What were the systems of managements of the tanks?
b) Who were the decision-makers, implementers and beneficiaries in these systems?

Section 2.3: Reported inequity in use of the tank

a) What are the different types of uses and users of the tank water?
b) Who benefits more? What could be the reasons for this?

Section 2.4: Who really owns the tank?

a) How do people's perceptions of ownership of the tank differ?
b) What could be the reasons these different perceptions?

Section 3.3: Levels of participation

a) How does the participation of the stakeholders differ in the different tasks and types of work?

b) What could be the possible reasons for the different levels of participation?
c) What might be the possible connections between levels of participation and factors like economic conditions, social norms, and perceptions of ownership?
d) How could participation be equitably enhanced?

Related Reading

1. Department of Agrarian Development (2000), *Wevamunu 10,000 sanwardena wedasatahana kriyathmaka kireema pilibanda* updates. Department of Agrarian Development, Sri Lanka.
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4. Panabokke, CR, Sakthivel, R, Weerasinghe, AD (2002), Small tanks in Sri Lanka: Evolution, present status and issues. International Water Management Institute.
5. Sivayoganathan, C and Devaraj, K (2003), Minor tank development and its impact on livelihood of rural households in Sri Lanka. Journal of the Agricultural Engineering Society of Sri Lanka, 9: 1-12
6. Sivayoganathan, C, Devaraj, K and Robouchon, G (2003), Impact assessment of the minor tank development program. Integrated Food Security Program, Trincomalee, Sri Lanka.
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Support Material for Teachers on

Rural-Urban Water Transfer in Two Cities in Tamil Nadu

by

Prakash Nelliyat

1. **Central Theme**

   Issues and Challenges related to rural to urban water transfer

2. **What the case cover: Scope of the case with lists of learning objectives**

   This case study broadly examines the different socio-economic aspects related with groundwater transfer from rural to urban areas in two cities i.e., Chennai and Tiruppur in Tamil Nadu state of South India. The Chennai case primarily focuses on domestic water supply while the Tiruppur case on industrial water supply.

   The Chennai case covers:

   - The demographic expansion of the city
   - Current status of water supply
   - Significance of rural and peri-urban groundwater in the city water supply
   - Problems faced by the villagers and peri-urban communities
   - Conflicts related to water transfer

   The Tiruppur Case covers:

   - Description of the textile-led industrial growth and water demand
   - Features of the industrial water market
   - Impacts of the water market in villages and
   - The Tiruppur Area Development (water supply) Project.

The concluding section covers

- The emerging issues concerning rural to urban water transfer

3. The Learning Objectives

- Understanding the factors that lead to the transfer of groundwater from villages to the city.
- Investigating the socio-economic implications of water trading, particularly to the village poor.
- Understanding the importance of ecological and socio-economic sustainability with respect to water trading or in the context of depletion and degradation of groundwater.
- Understanding the implications of rural to urban water transfer to the various groups in the village.
- Gaining an awareness about the diverse water markets in Chennai and Tiruppur

4. Main Building Blocks

- Demand for water from the powerful urban consumers
- Structure and function of water transfer
- Impacts of water transfer (physical and socio-economic)
- Conflict related with water transfer
- Failure in water conflict management
- Need for conflict management and sustainable groundwater extraction

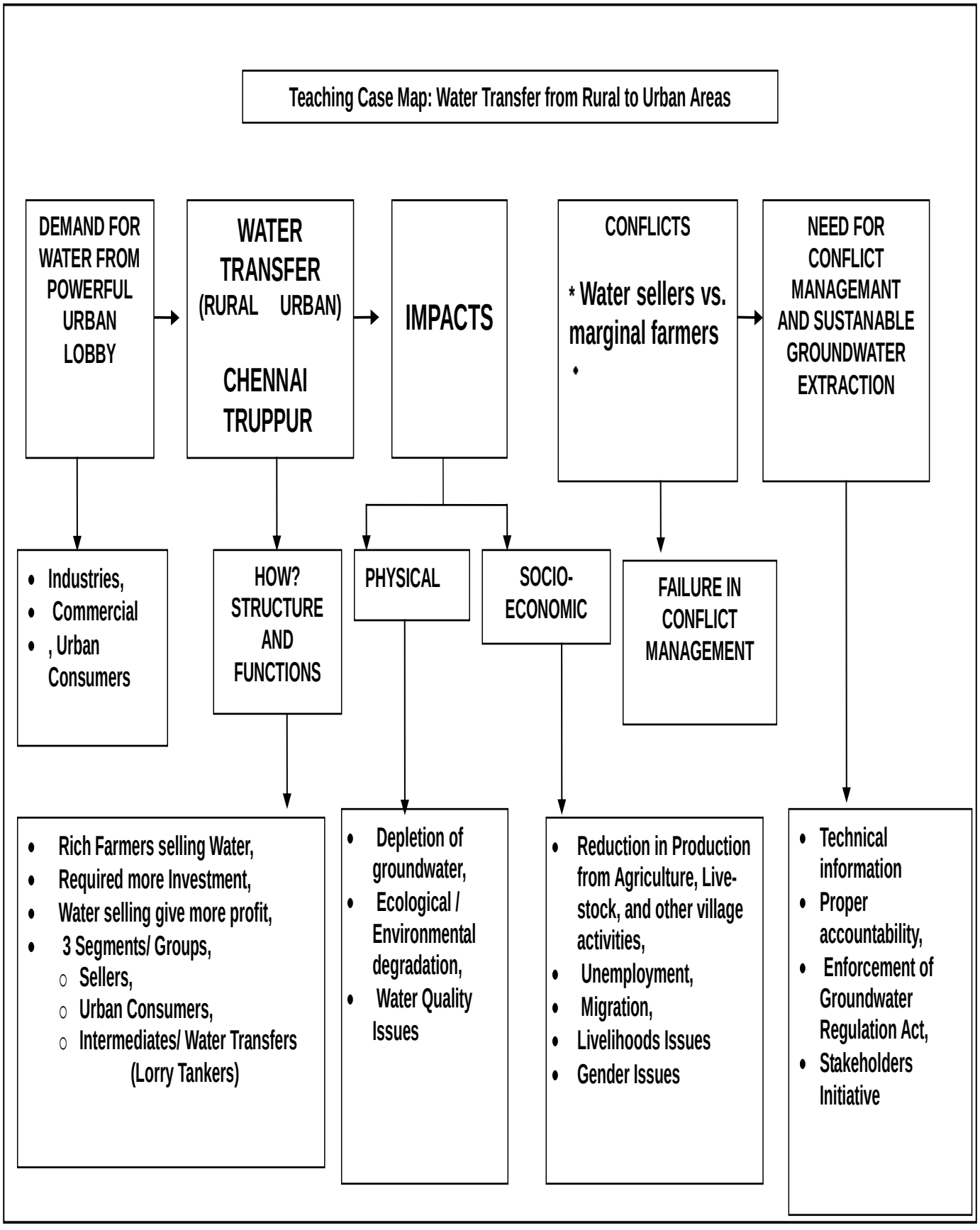
5. Points and Sub-points for each Building Block

Demand for water from the powerful urban consumers

- Industries
- Commercial
- Urban Consumers

Structure and function of water transfer

- Rich farmers selling the water
- Required more Investment for water selling business


Teaching Case Map: Water Transfer from Rural to Urban Areas
DEMAND FOR WATER FROM POWERFUL URBAN LOBBY
WATER TRANSFER (RURAL URBAN)
CHENNAI TRUPPUR
IMPACTS
CONFLICTS
* Water sellers vs. marginal farmers
NEED FOR CONFLICT MANAGEMANT AND SUSTANABLE GROUNDWATER EXTRACTION
Industries,
Commercial
, Urban Consumers
HOW? STRUCTURE AND FUNCTIONS
PHYSICAL
SOCIO-ECONOMIC
FAILURE IN CONFLICT MANAGEMENT
Rich Farmers selling Water,
Required more Investment,
Water selling give more profit,
3 Segments/ Groups,
Sellers,
Urban Consumers,
Intermediates/ Water Transfers (Lorry Tankers)
Depletion of groundwater,
Ecological / Environmental degradation,
Water Quality Issues
Reduction in Production from Agriculture, Live-stock, and other village activities,
Unemployment,
Migration,
Livelihoods Issues
Gender Issues
Technical information
Proper accountability,
Enforcement of Groundwater Regulation Act,
Stakeholders Initiative

- Water selling is more Profitable than agriculture
- 3 Segments/Groups
  Sellers
  Urban consumers (domestic sector, industrial and commercial)
  Intermediate group / water transfers (Lorry Tankers)

Impacts of Water Transfer

Physical

- Depletion of groundwater
- Ecological and environmental degradation
- Water quality issues

Socio-economic

- Reduction in agriculture, livestock and other village activities
- Unemployment
- Migration
- Livelihood issues
- Gender issues

Conflict related with water transfer

- Water sellers vs. marginal farmers
- Villagers vs. tankers / Water Board

Failure in water conflict management

- Lack of enforcement
- Political influence

Need for conflict management and sustainable groundwater extraction

- Technical information
- Proper accountability
- Enforcement of groundwater Regulation Act
- Stakeholders initiatives

6. Leading Questions

(a) How did urbanization and population growth influence Chennai's demand for water?

(b) What attempts were made to mitigate the water problems in Chennai?
(c) Why water transfer from rural areas to urban areas is significant?
(d) Who are the different actors involved in water market?
(e) What are the major socio-economic impacts of groundwater transfer (water markets)?
(f) What are the impacts of water market in Somangalam village?
(g) What are the impacts of water market in Valliyur village?
(h) How serious the water market related conflicts in Valliyur village?
(i) What are the reasons of different impacts of water markets in the above villages?
(j) Why is industrial water demand critical in Tiruppur?
(k) Why did water market (rural to urban water transfer) emerge in Tiruppur?
(l) What is the status of drinking water supply in Tiruppur?
(m) How does the water market operate in Tiruppur?
(n) What are the impacts of industrial water market?
(o) Why does the water market continue in Tiruppur even after the implementation of New Tiruppur Area Development Project?
(p) What are the impacts of industrial water market?
(q) What are the major emerging issues of rural to urban water market?

7. Case-specific Explanations / Clarifications / Practical Tips and Hints

Nothing specific

8. Concepts and Theoretical Propositions Illustrated through the Case

- Groundwater extraction
- Water markets
- Groundwater depletion
- Socio-economic impacts
- Conflicts

The case study argues the need for sustainability in groundwater extraction, that is, the water market should not affect the various village economic activities and livelihood of the village people. The theoretical

framework of the case study is the environmentally sustainable development (urbanization / industrialization).

9. Suggested Readings

John Butterworth, Raphaele Ducrot, Nicolas Faysse and S Janakarajan (2007) “Peri-urban water conflicts: supporting dialogue and negotiation”, International Water and Sanitation Centre, The Netherlands.

Nelliyat Prakash (2007) “Public-Private Partnership in Urban Water Management: The Case of Tiruppur”, in Barun Mitra, Kendra Okonski and Mohit Satyanand (ed.) ‘*Keeping the Water Flowing: Understanding the Role of Institutions, Incentives, Economics and Entrepreneurship in Ensuring Access and Optimizing Utilization of Water’*, pp 149-160, Academic Foundation, New Delhi.

Veeralakshmi V (2009) “Water market in Chennai: a study of water transfer from peri-urban villages kovilambakkam and nanmangalam” Master Thesis (IWRM), Centre for Water Resources, Anna University, Chennai.

Vishal Narain and Shilpa Nischal (2007) “The peri-urban interface in Shahpur Khurd and Karnera, India”, *Environment and Urbanisation*, Vol 19 (1) 261-273

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Support Material for Teachers on

Pollution Seeped into Lives of People of Orthapalayam

by

R. Saravanan and Prakash Nelliyat

1. Central Theme

The case highlights conflicts between industrialization and ecological sustainability between industrial development and peoples livelihoods and the need to achieve a balance.

2. What the case covers? Or Scope of the Case

The dependency on groundwater particularly in the developing counties like India has been increased to a great extent due to increase in population, industrialization and new agricultural practices. However, domestic and industrial wastes disposed both in liquid and solid forms in land and water bodies percolate into the groundwater and get transported in the direction of groundwater flow. As a result, different pollutants reach into the groundwater system and pose a threat to groundwater quality, which ultimately affects the socio-economic life of the people, who depend on groundwater for various purposes. The people living in a village downstream of Tiruppur have been taken as a classic example. In Tiruppur, there are about 750 dyeing and bleaching units located in Tiruppur which discharges around 85 mld (million liter per day) of untreated or partially treated effluents into the Orthapalayam reservoir was constructed in 1992 across the river Noyyal, around 30 kilometers downstream of Tiruppur. In course of time, this reservoir continuously received textile industrial effluents from the Tiruppur area and became highly polluted and the water stored at reservoir was rendered unfit for irrigation and fisheries owing to the high TDS and other pollutants. Hence, a study was carried out to study the socio economic consequences of the groundwater pollution, particularly the poor and the socially deprived communities. The quality of groundwater was analyzed in and around the reservoir which reveals that it falls under highly polluted zone. The socio economic impact due to groundwater pollution was analyzed through focus

group discussion and questioner survey. The analysis indicated that groundwater pollution has affected rural economic activities like agriculture, livestock, fisheries, unemployment and migration.

3. Main Building Blocks (BB) in logical order

1. Untreated Effluent Discharge
2. Groundwater Pollution in Orathapalayam Village
3. Socio – economic Impact of Pollution
4. Right holders
5. Responsible holders

4. List Main Points and Sub-Points for each Building Block

- Untreated Effluent Discharge
  - Cause of pollution
  - Textile industries

- Groundwater Pollution in Orathapalayam Village
  - Untreated Effluent Discharge by the textile industries
  - Continues storage of textile effluent in the reservoir

- Socio – economic Impact of Pollution
  - Domestic Water
  - Health
  - Agriculture
  - Live stock
  - Unemployment & migration
  - Fisheries
  - Gender

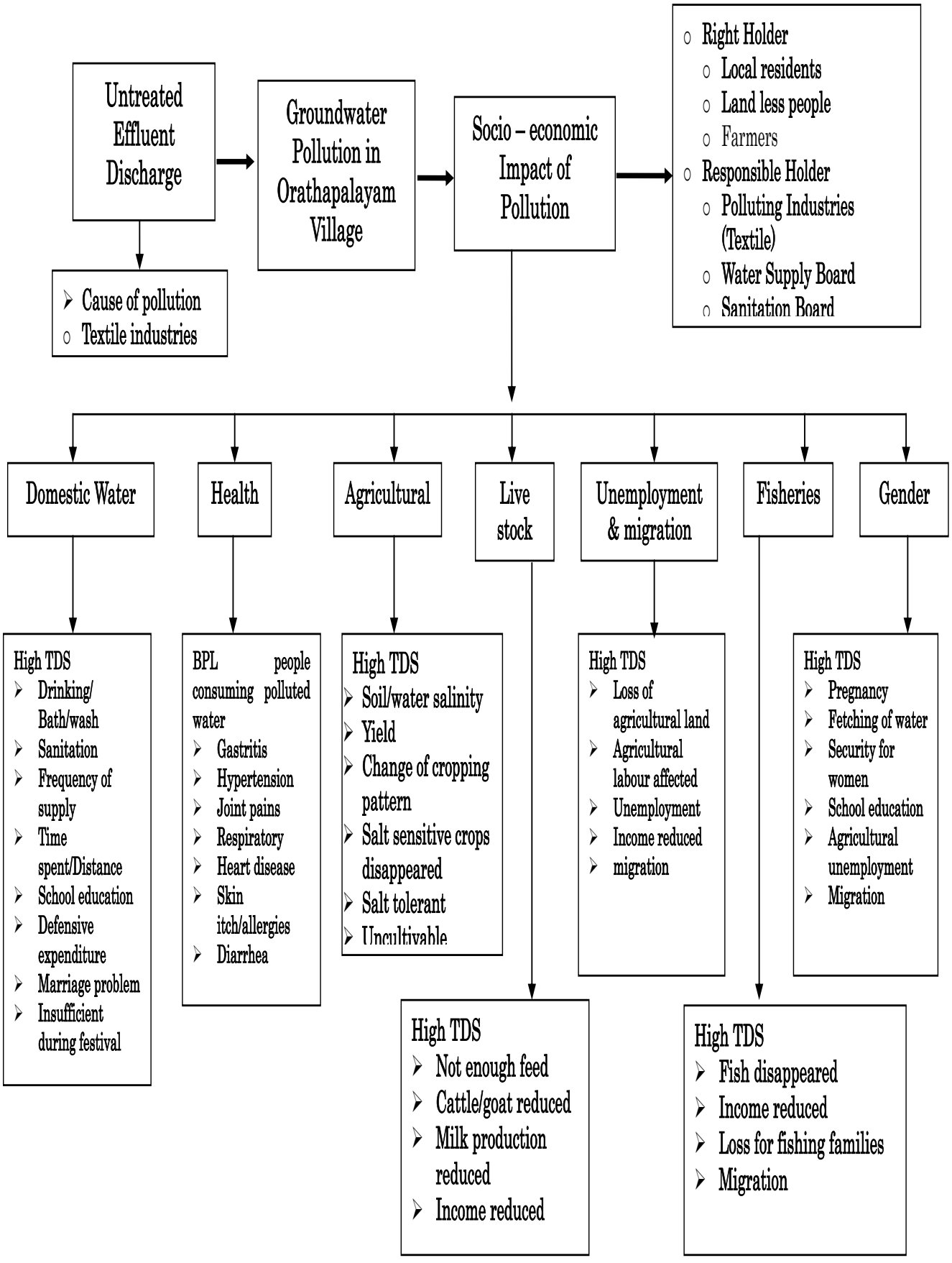
- Right Holder
  - Local residents
  - Land less people
  - Farmers

- Responsible Holder
  - Polluting Industries (Textile)
  - Water Supply Board
  - Sanitation Board
  - Fisheries Department

5. Leading Questions

a) What is the significance of the activities of the industries n the economy of Tiruppur?

Case Map for Case of Pollution of Orthapalayam Village



b) What is the contribution in terms of financial returns from these units to the local economy?

c) Is it necessary to construct a reservoir where the rainfall s low?

d) Did the construction of the reservoir improve the socio-economic status of the people in surrounding villages?

e) What is the importance of groundwater?

f) How groundwater does get polluted?

g) What is the impact of industrial effluent on the quality of groundwater in the villages surrounding the reservoir?

h) How vulnerable is the hydrological cycle to human intervention?

i) How do activities and pollution upstream severely and adversely affect the lives and livelihood activities of people living downstream?

j) How do people cope with these types of problems?

k) What is the impact of the pollution on agriculture, livestock and fisheries?

l) How does the quality of groundwater affect domestic water?

m) What are the coping mechanisms adopted by the villagers to deal with pollution?

n) Which alternative sources of water were explored by the villagers?

o) How do high-value economic activities cause ecological destruction and the destruction of people's habitat and livelihood?

p) What are the implications of the reduced employment opportunities?

q) Are migration and the quality of groundwater linked?

r) Have the ETPs established achieved the purpose of controlling pollution?

s) Why and how are polluters allowed to avoid responsibilities, while the victims are forced to depend on the polluters for their livelihoods?

t) Why does the government fail to protect water sources as well as people, despite having the responsibility and the power?

6. Case-specific Explanations

- Nothing specific

7. Concepts and Theoretical Proposition Illustrated through the Case

- Importance of groundwater
- Effect of untreated textile effluent
- Socio economic impact
- Livelihood loss
- Right holders and responsible holders

8. Suggested readings (optional)

[1] Saravanan. R., Anuthaman. N.G., Karthikeyan. M.S., and Navaneetha Gopalakrishnan. A., *"Quantity Assessment and Demarcation of Groundwater Protection Zones in Textile Area - A Case Study"*, Journal of Applied Hydrology, Association of Hydrologists of India Department of Geophysics, Andhra University, Visakhapatnam, India, Vol. XX, No.3, 2007.

[2] Nambirajan, J., 2007, Optimization of Pump and Treat System for contaminated aquifer using Genetic Algorithm, M E thesis, Centre for water resources, Anna University, Chennai -25

[3] Nelliyat Prakash 2005, Industrial Growth and Environmental Degradation: A Case Study of Industrial Pollution in Tiruppur, Unpublished Ph D Thesis, University of Madras, Chennai.

[4] Venkata Suresh. K., 2006, Groundwater Contaminant Transport Modeling for Lower Part of Noyyal River Basin, M E thesis, Centre for water resources, Anna University, Chennai -25

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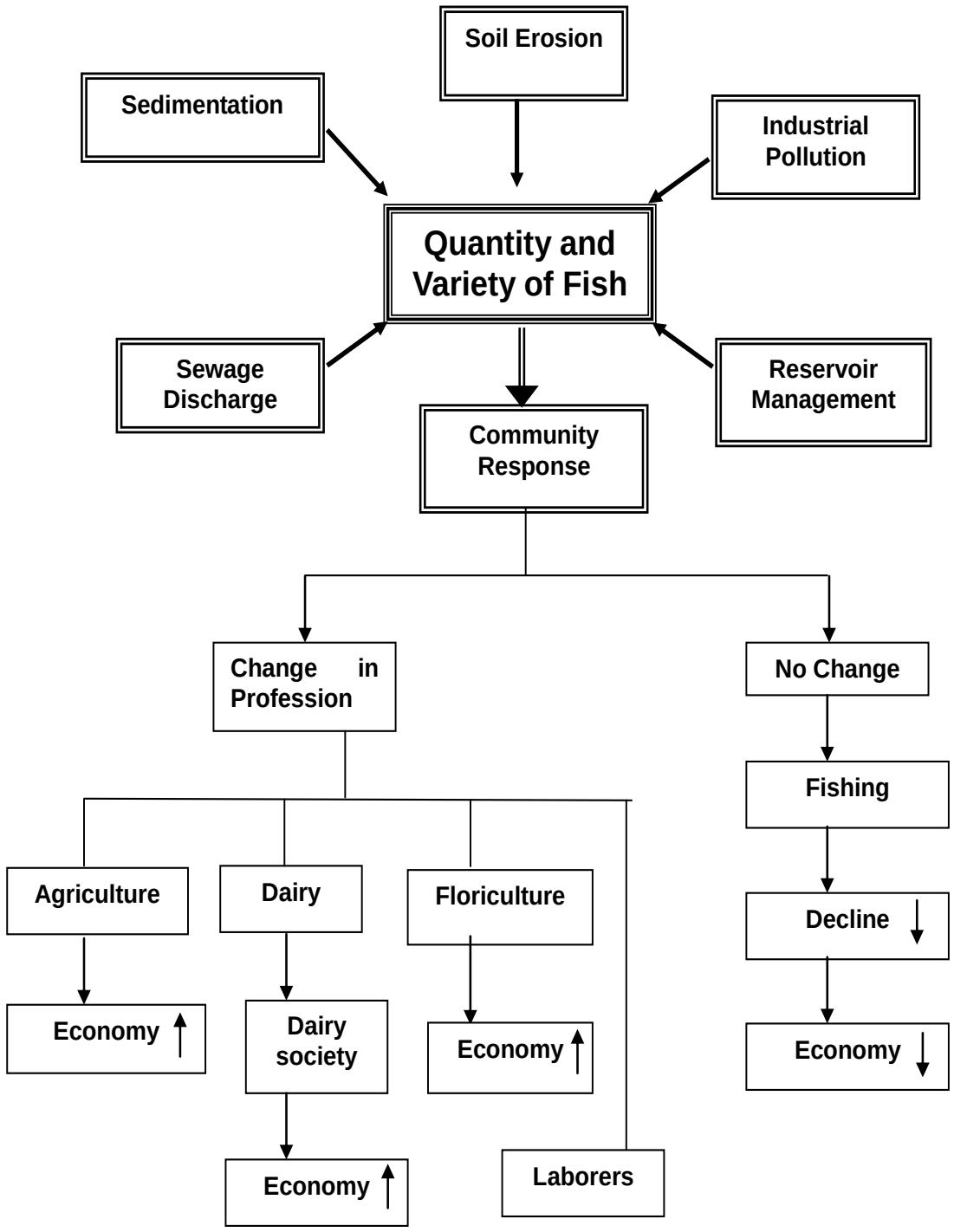
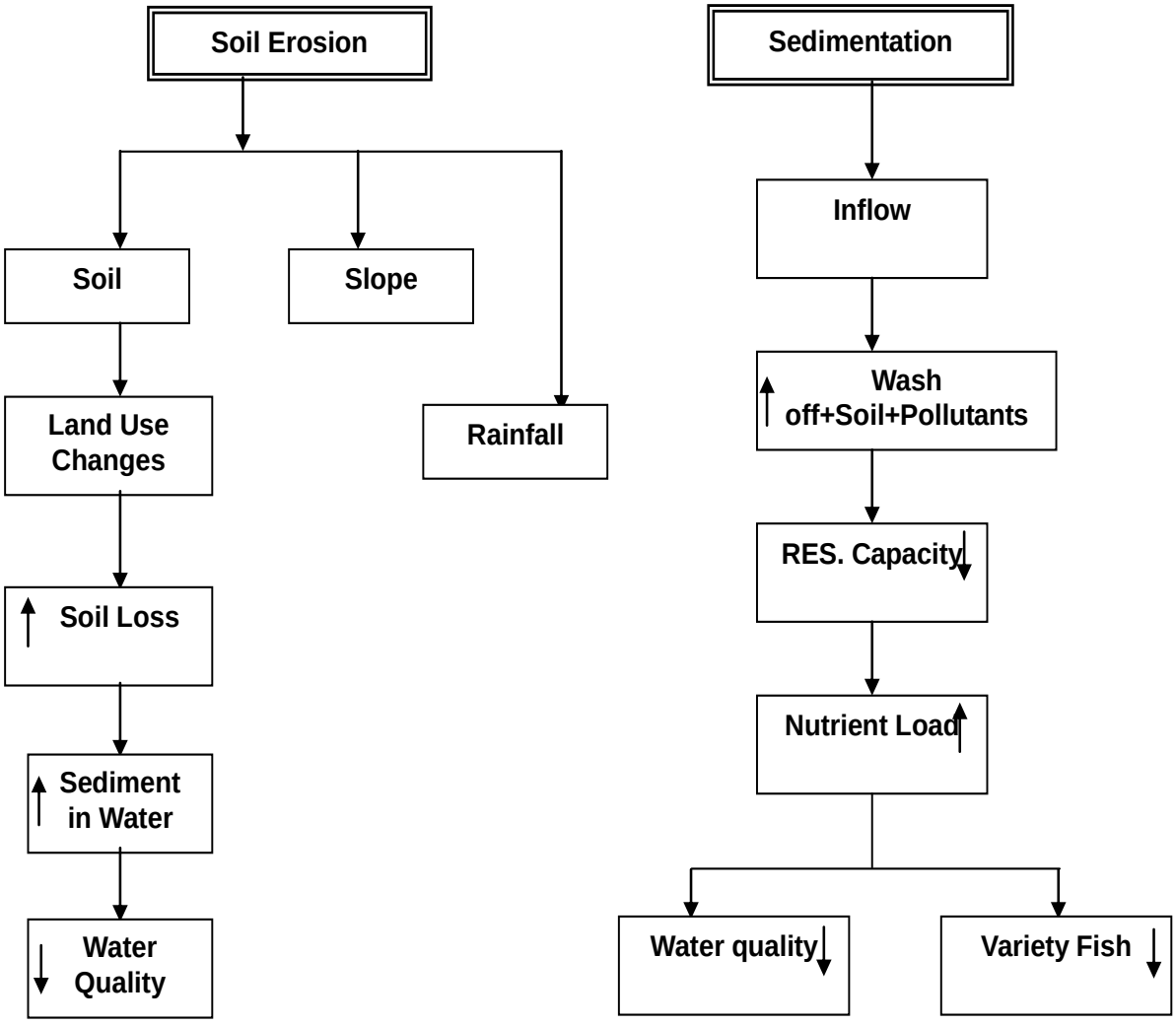
Support Material for Teachers on

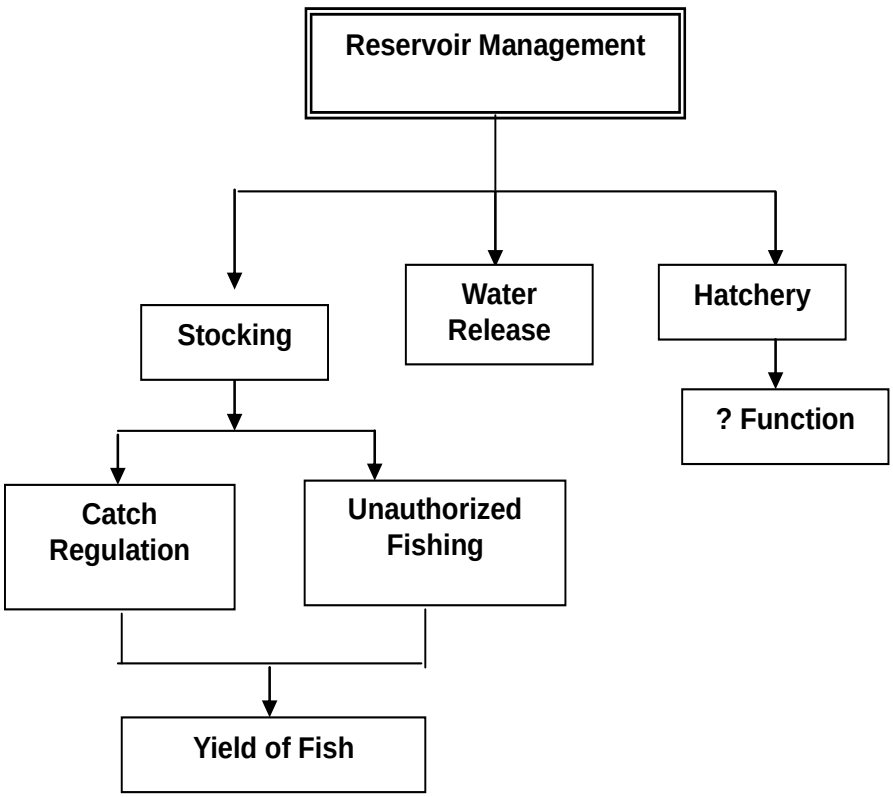
Where Have Fish from the Krishnagiri Reservoir Gone?

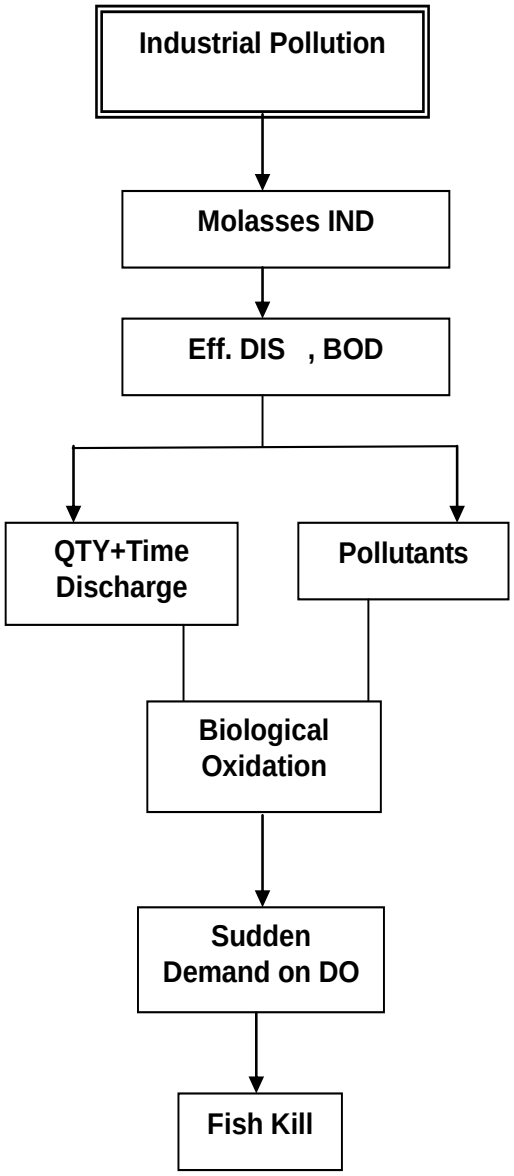
by

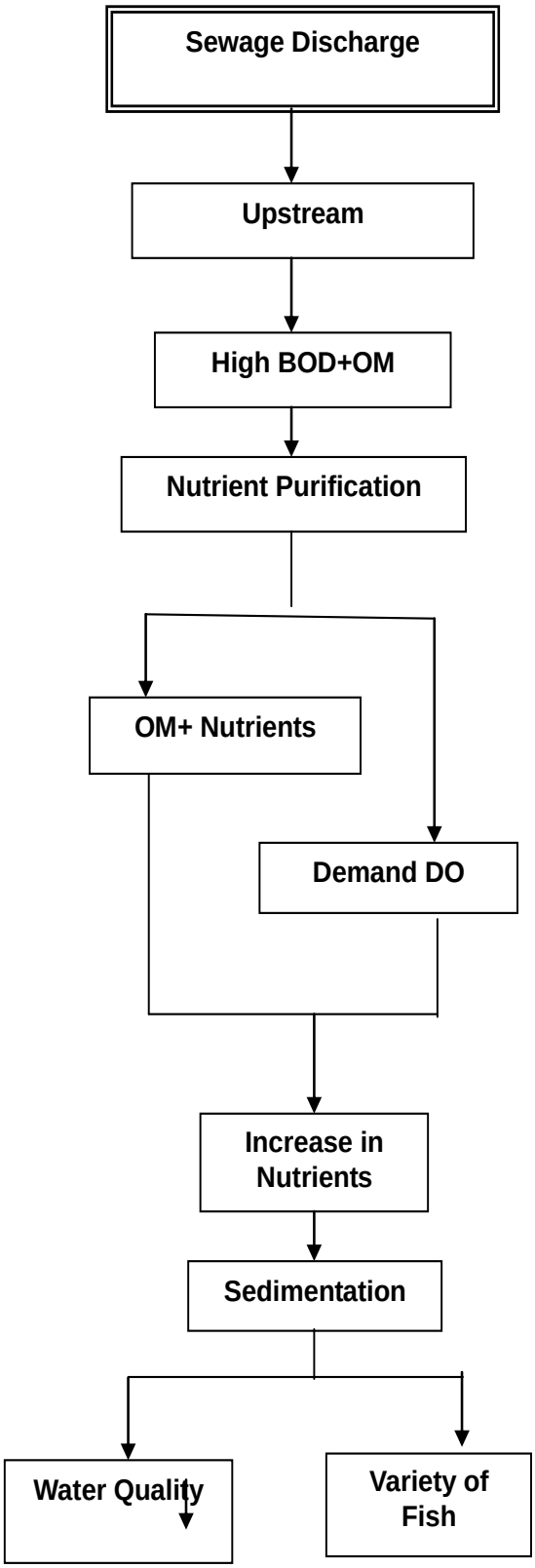
S. Ravichandran




Soil Erosion
Soil
Slope
Rainfall
Land Use Changes
Soil Loss
Sediment in Water
Water Quality
Sedimentation
Inflow
Wash off+Soil+Pollutants
RES. Capacity
Nutrient Load
Water quality
Variety Fish


Reservoir Management
Stocking
Water Release
Hatchery
? Function
Catch Regulation
Unauthorized Fishing
Yield of Fish


Industrial Pollution
Molasses IND
Eff. DIS , BOD
QTY+Time Discharge
Pollutants
Biological Oxidation
Sudden Demand on DO
Fish Kill


Sewage Discharge
Upstream
High BOD+OM
Nutrient Purification
OM+ Nutrients
Demand DO
Increase in Nutrients
Sedimentation
Water Quality
Variety of Fish

Support Material for Teachers on

Embedding Social Equity in Governance of the Irrigation System

By

Ashutosh Shukla

1. Central Issue Addressed in the Case

The teaching case presented hereunder intends to illustrate the linkages among governance challenges, governance structure and governance functions in a Farmer Managed Irrigation System and the observed equity in the irrigation governance. The case, which has been in operation for more than 170 years, intends to illustrate that its abilities to addressing equity and embedding the equity concerns in the irrigation governance has been the key to sustained functioning of the system over a long period of time.

2. Scope of the Case

The case narration includes following information:

a. Historical context of the irrigation system and the changes in the social, economic and ecological attributes at different periods of time.
b. Governance challenges resulting from size and structural complexities and transactions (water allocation, distribution and resource mobilization) at different levels of the irrigation system.
c. Governance structure developed to respond to the structural complexities and transactions at different levels.
d. Governance functions in the systems in terms of water allocation and distribution, repair and maintenance, resource mobilization, decision making, communication and conflict management.

The case narration was developed based on a review of secondary sources of information and a field study carried out by the authors.

3. Learning Objectives

a. Developing understanding on **structure of irrigation governance** consistent to structural complexities of the system and transactions occurring at different levels. In intending to developing this understanding, focus on following elements of governance expected ***(Refer to Sections 1 and 2 of the Narrative)***

- What are specific structural complexities in the case system with regards to size, water sharing arrangements, water allocation and repair and maintenance needs?

- How do these complexities pose governance challenges?
- How have the governance structure evolved to address the stated challenges?
- What specific governance challenges emerge when two systems with different institutional arrangements share water from a common intake, and how are these challenges addressed in the context of the case system?

b. Developing understanding on embedded equity concerns in governance functions with regards to water allocation, distribution, resource mobilization and decision making. In doing so, understanding on ways and means of operationalizing and realizing equity in each of following irrigation management activities intended"

i. **Water Allocation and Distribution *(Refer to Section 3.1 of the Narrative)***

- How equity concerns translate into decision making relating to water allocation and distribution?
- Who are involved in decision making relating to water allocation and distribution at different levels?
- How is equity in water allocation and distribution realized?

ii. **Repair and Maintenance *(Refer to section 3.2 of the Narrative):***

- What is the annual and recurrent repair and maintenance needs of the system at different levels?
- Who makes decision pertaining to execution of repair and maintenance and how?
- How equity concerns emerges in undertaking the repair and maintenance tasks at different levels in the system?
- How are the equity concerns addressed in the execution of repair and maintenance?

iii. **Resource Mobilization *(Refer to sections 3.2 and 3.3 of the Narrative)*:**

- What are different forms of resources needed towards operation and management of the case system at different levels?
- How do equity concerns emerge with regards to resource mobilization at different levels?
- How do the perceptions of equity differ with different groups of users (e.g., original inhabitants and migrants in the case system)?
- How is the equity in resource mobilization realized in the case system?

iv. **Decision Making *(Refer to sections 3.1, 3.2, 3.3 and 3.4 of the Narrative):***

- What are different arenas of decision making in the context of the case system and how are the linkages in different arenas established?
- What are the relevance of different decision making arenas considering the physical/structural complexities and the transactions at different levels?
- How are the equity concerns in decision making addressed in the case system?

v. **Communication *(Refer to section 3.4 of the Narrative)*:**

- How is communication an important element to governance in an irrigation scheme?
- What is the relevance of communication with regards to physical/structural complexity and effective irrigation service delivery in the case system?
- How communication, in the context of the case system, contributes in realizing the equity concerns?

vi. **Conflict Management *(Refer to section 3.5 of the Narrative):***

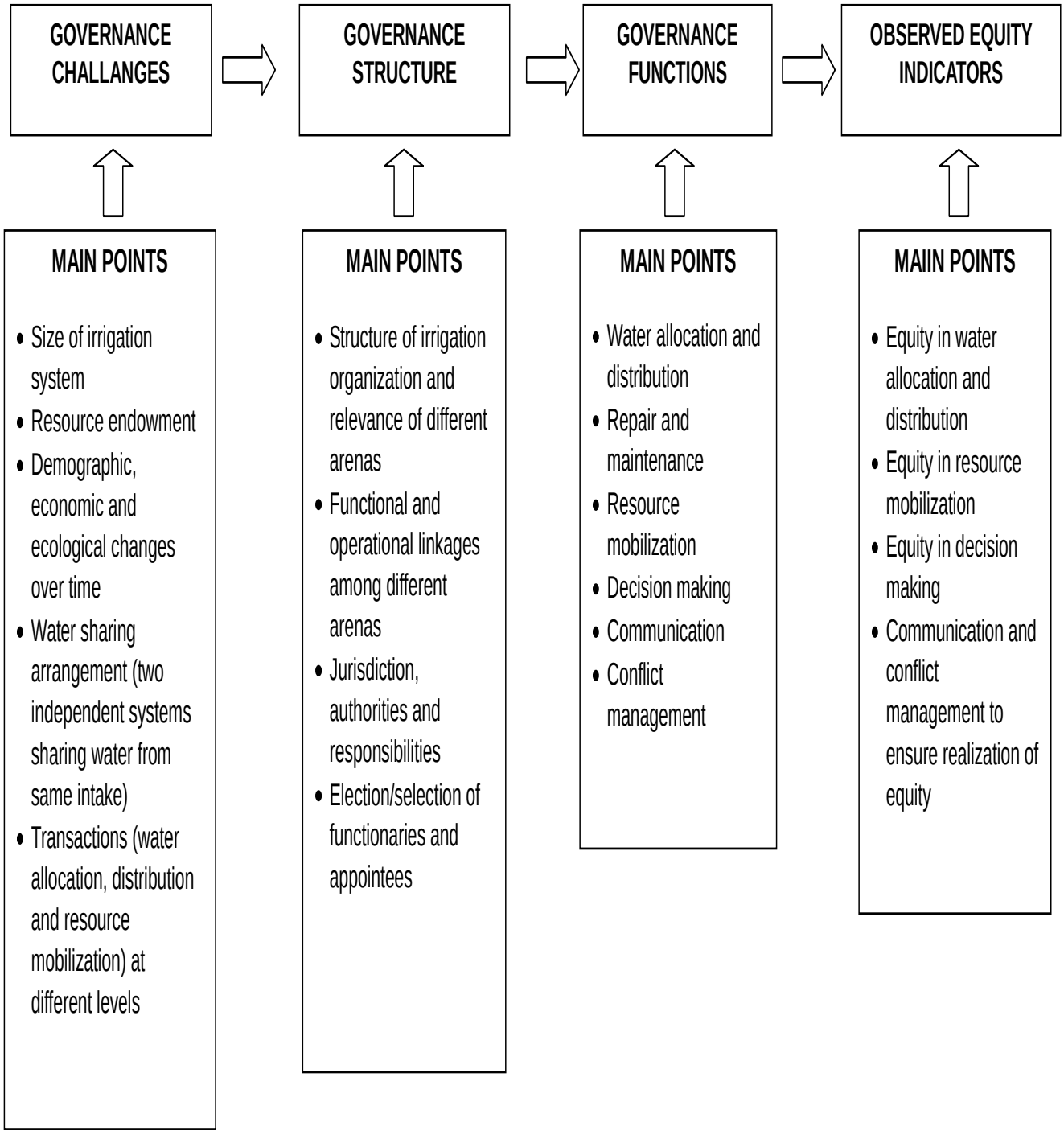
- What are the kinds of defaults and aberrant behaviors of irrigators translating to conflicts at different levels?
- How is the conflict management an important element of governance?
- How have the abilities to conflict management contributed to realizing and ensuring equity concerns in the case system?

c. Can the sustained functioning of the case system, which has been operational for more than 170 years, attributed to abilities of the system in embedding equity in the irrigation governance (The central issue in the case to be analyzed).

3. Case Map

The topology suggested for the teaching of the case is illustrated in Fig. 1. The four building blocks of knowledge leading to the analysis of the case are: i) Governance Challenges, ii) Governance Structure, iii) Governance Functions, and iv) Observed Equity Indicators. The main points to be included in the analysis/discussion leading to each of the knowledge building blocks are also outlined for the reference to the case teachers.

Case Map: Governance of the Irrigation System



4. Concept and Theories that Can be Referred to

Institutional Analysis and Development (IDA) Framework proposed by Elinor Ostrom (1990) to look into the governance of common property resources. The framework is essentially based on rational choice theory.

5. Suggested Readings

i. Ostrom, Elinor, 1990. Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge University Press, New York.

ii. Ostrom, Elinor. 1992. Crafting Institutions for Self-Governing Irrigation Systems. ICS Press, Sac Fransisco, California.

6. Lead Questions

The lead questions that may be used by the case teachers in leading the discussion, specific to each of the four knowledge building blocks, consistent to the three learning objectives are outlined in section- 2.

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Support Material for Teachers on

Establishing Claims on Water in Chitwan, Nepal

by

Rupak Bastola and Ashutosh Shukla

1. Central Issue Addressed in the case

This case study aims to illustrating the attempts made by the users in establishing claims on the water source in the water scarce situation and the processes of emergence of contestation and conflict thereof. The case also illustrates the formal and informal mechanisms available to the users for conflict resolution and the processes of the users seeking the support of hierarchy of these institutions at different stages of conflict. The case study presents three farmer managed irrigation systems sharing water from the same source and the quest among them in establishing claims on water at the source that is deficient in available supply.

2. Scope of the Case

The case narration includes following sequential information:

i. Contextual variables including the history of settlement, resource endowment and local level initiatives that led to evolution of the three irrigation systems included in the case study.
ii. Factors that led to quest among the three systems to establish claims on water at the source
iii. Processes that led to transformation of quest into contestation.
iv. Transformation of contestation into conflict.
v. Hierarchy of formal and informal institutions and the mechanisms available to the users for conflict resolution and the sequences of users approaching these institutions.

The case writing has been done based on review of secondary sources of information and also a field study that was carried out by a team of researchers from Nepal Engineering College.

3. Learning Objectives

The case study intends to develop understanding on:

1. the quest among the irrigation systems sharing water from a common source, deficit in available supply, in establishing claims on the source water.
2. the processes and stages of the quest translating into contestation and the contestation transforming into conflict.
3. the formal and informal mechanisms in place, their jurisdiction and roles in addressing the conflicts.
4. possible reasons for formal legal institutions coming up with divergent verdicts on same conflict at different levels.

4. Case Map

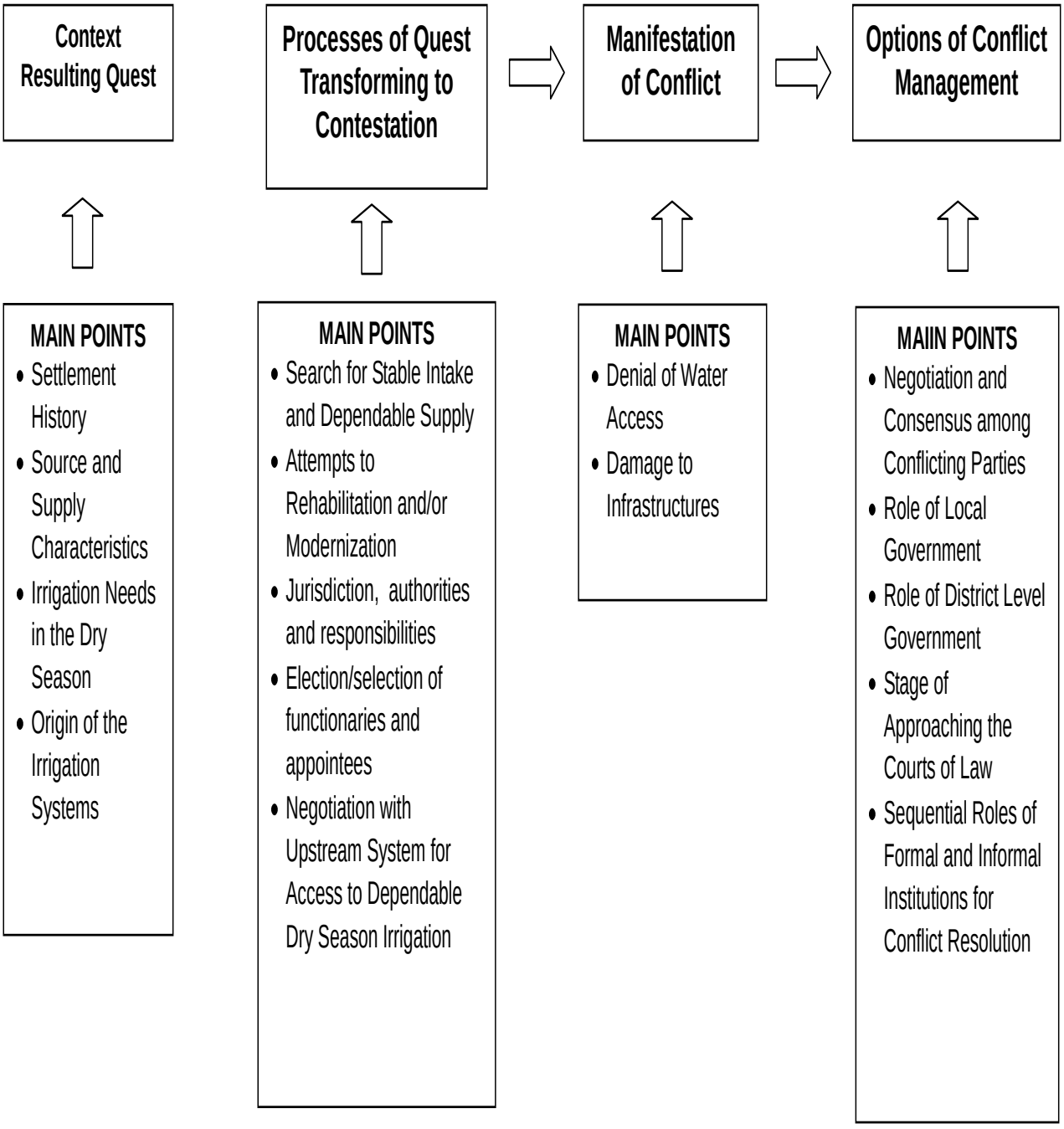
The Case Map suggested to teaching the case in the class room is provided in Fig. 1. The four knowledge building blocks identified to proceed with the discussion/analysis of the case are: i) Account of contextual variables setting the environment for quest, ii) Process of quest transforming to contestation, iii) Manifestation of contestation into conflict, and iv) Institutional alternatives for conflict management. The topology also includes the main points to be included under each building blocks to lead to logical thinking and analysis and linking the analysis from one block to another.

5. Lead Questions

The lead questions suggested initiating the discussion among the students and analyses of the case are:

i. What have been the behaviors of the users in the three systems sharing water from the source, which is typically a water deficit source in the dry season?

Fig. 1: Case Map: Contestation to Conflict: Case of Three Irrigation Systems in Chitwan District, Nepal



ii. Can these behaviors be generalized to other situations where more than one irrigation systems share a common source?

iii. How did the continued quest for water led to contestation?

iv. What have been the factors and processes that led to transforming the contestation into conflict?

v. What has been the hierarchy of formal and informal institutions and mechanisms available to the users for conflict resolution and what have been the sequences for the users approaching these mechanisms and institutions for conflict resolution?

vi. Do the users approach the formal legal institutions only when the informal and local institutions fail the resolve the conflict?

vii. What could be the reasons for the formal court of low issuing differential verdict at different levels?

6. Case-Specific Explanations and Clarifications

In the case narration several terms used in local parlance have been used. The meanings of these terms are as under:

- Khola in Nepali means river or stream.
- Kulo in Nepali means irrigation canal.
- Village Development Committee (VDC) is the village level governance structure constituted by elected representatives. The Decentralization and Local Self Governance Act of Nepal has empowered the VDCs as custodian of natural resources within the VDC boundary. The VDCs are function as quasi-judicial bodies and empowered to issue verdict and fine the defaulters.
- Nepal is divided into 75 Districts. Each District has a District Administration Office headed by a Chief District Officer who is the administrative head of the District.

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Support Material for Teachers on

Contesting Claims and Sharing Water of Begnas Lake

by

Mohan Bikram Prajapati and Ashutosh Shukla

1. Central Issue Addressed in the Case

This case study illustrates multiple use of water from a lake that exists as a common pool resource though there is no institutional mechanism in place for the governance and management of the lake and associated resources. The role of different groups of users is limited to the extraction of the products and services from the lake for their own economic gains, and they, as such, do not have defined obligations for conservation and management of the lake. The contestation among different groups of users, resulting from continued free access of the resource, is apparent though this is yet to transform to potential conflict.

2. Scope of the Case

This case study, in attempt to illustrating the contestation resulting from multiple use of water, focuses to: i) situation that led to creating opportunity for multiple water use from the lake, ii) linkages and interaction among different groups of stakeholders and their stake on the lake's resources, iii) elements of contestation among different groups of users, and iv) initiatives on part of the users in containing the contestation.

3. Learning Objectives

The case study intends to develop understanding on:

1. The situation creating possibility of multiple water use from the lake and its watershed and the significance of different uses to the livelihood of different groups of users.
2. Forms and level of use of resources by different groups of users and the linkages and interactions among them for resource sharing.
3. Contestation resulting from multiple water use and the situations favouring contestation.
4. Incentives for creating an institutional mechanism for governance and management of the lake and associated resources.

4. Case Map

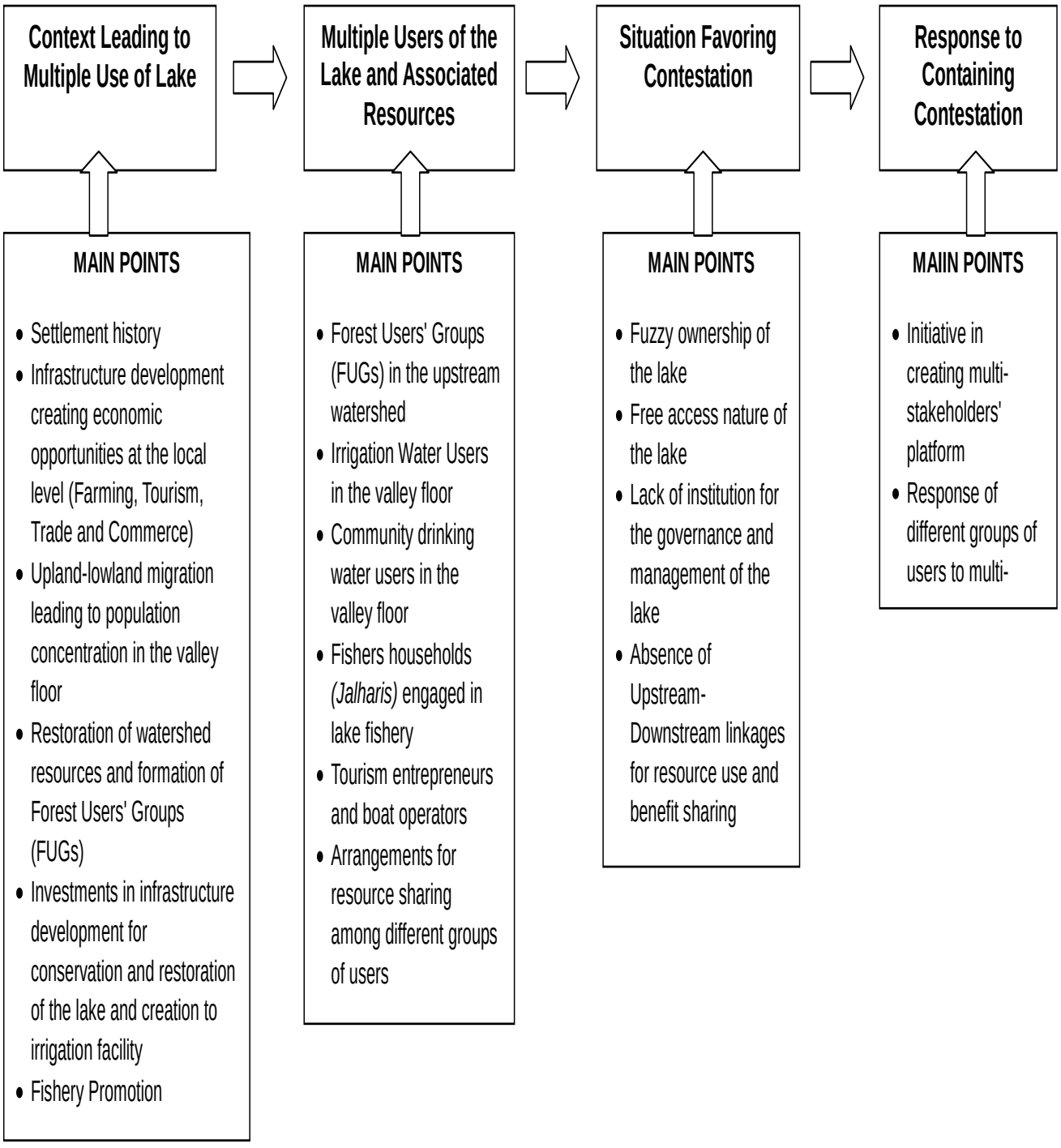
The case teaching map suggested to proceed with the discussion/analysis of the case is illustrated in Fig. 1. The four knowledge building blocks in the case analysis are: Contextual analysis leading to multiple use of the lake and associated resources, ii) Significance and forms of water uses among multiple groups of users; iii) Analysis of situations favoring contestation, and iv) Response to containing the contestation. Main points to be included in each of the knowledge building block to lead to logical thinking process and discussion have also been identified.

5. Lead Questions

Following are the suggested lead questions that might be put to the students in the class to respond to in the process of the case analysis:

i. What have been existing uses of lake and associated resources? What have been the traditional and newer uses and how have these uses evolved with time?
ii. Who are different groups of the users and how are their livelihoods linked to the lake's resources?
iii. What is the status of the ownership of the lake and associated resources and what is the status of right of different groups of users for using the lake's resources?

Case Map: Contestation in Multiple Water Use in Begnas Lake



iv. What are the existing arrangements of resource sharing among different groups of users? Can the existing resource and benefit sharing be called "just"?

v. Can the lake be called a free access resource? What could be the reasons for the non-existence of institution for the conservation and management of lake's resources?

vi. What are the nature and levels of contestation between and across different groups of users?

vii. What are the current levels of threats for the contestation transforming to conflict?

viii. What are the incentives for different groups of users in developing collective institution for the governance and management of the lake?

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Illustrative Cases for Teaching IWRM (Volume II)

Support Material for Teachers

The South Asia Consortium for Interdisciplinary Water Resources Studies, is committed to bringing about structural changes in the dominant water resources management paradigm in South Asia. Within that, SaciWATERs focuses on transforming water resources knowledge systems. Key ideas are an interdisciplinary approach to understanding water resources issues, from a pro-poor, human development perspective, with an emphasis on exchange, interaction and collaboration at South Asia level. The Crossing Boundaries (CB) project presently implemented by six partners from four South Asian countries is a partnership-based programme for capacity building of water professionals on IWRM and Gender & Water. The idea is to strengthen integrated and gender-sensitive water resources management policy and practice in South Asia through a regional, collaborative, partnership-based capacity building programme for active water professionals through higher education, innovation-focussed research 'research with an impact', knowledge base development, and outreach and advocacy. For more details visit the website www.saciwaters.org

SaciWATERs