

**Reforming Institutions for Sustainable
Water Management**

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Reports and Working Papers 6/2002

Bonn, August 2002



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ISBN 3-88985-244-0

Contents

Abbreviations

Prologue 1

Institutional Reform in the Irrigation Sector 5

The Cases of Turkey and Pakistan

Waltina Scheumann

1	Introduction	5
2	Reforms are not Politically Neutral	5
3	Turkey and Pakistan: Institutional Similarities and Differences at the Outset of the Reform Process	6
4	Driving Factors and Actors for Institutional Change	8
5	Risks of the Reform Concepts	13
6	Conclusions: Facilitating Conditions and Constraining Factors Compared	15

The Role of Elites in Changing Water Institutions at the Local Level in Uzbekistan 19

Kai Wegerich

1	Introduction	19
2	Institutional Rules	19
3	Institutional Change	21
4	The Influence of Elites on Institutional Change	21
5	The Case of Water User Associations in Uzbekistan	22
6	Developing the Theory	27
7	Conclusion	28

Ghana's Water Institutions in the Process of Reform: from the International to the Local Level 31

Annette van Edig / Stefanie Engel / Wolfram Laube

1	Introduction	31
2	The Volta Basin	32
3	The International Level	32
4	The National Level: the Water Resources Commission	35
5	Interlocking the International and the National Level	36
6	From National to Local: Interlocking Water Resource Commission, River Basin Commissions and Local Actors in Ghanaian Water Reform	37
7	Management of Irrigation Schemes at the Community Level: What Determines the Results of Participatory Management?	42
8	Conclusions and Issues for Future Research	48

New Perspectives on Water Management: Rent-seeking in Irrigated Agriculture **51**

Jochen Renger

1	Introduction	51
2	New Perspectives on Water Management	51
3	Rent-seeking: Striving for Profit from Transfers	52
4	Rent-seeking in Irrigated Agriculture	54
5	The Impact of Rent-seeking on Irrigated Agriculture	56
6	Institutional Approaches to Combating Rent-seeking	57

Efficient Inefficiency: Principal-Agent Problems in Irrigation Management **61**

Walter Huppert

1	Introduction	61
2	Service Provision in Irrigation	61
3	Fundamental Principal-Agent Problems	62
4	Principal-Agent Problems in State-administered Irrigation Systems	64
5	Principal-Agent Problems in Water User-managed Irrigation Systems	66
6	Options to Solve Principal-Agent Problems	67
7	Conclusions	69

River Basin Management and the Economic Theory of Federalism **71**

Two Basic Concepts and their Applicability to Water Policy

Axel Klaphake

1	Introduction	71
2	Two Faces of the Economic Theory of Federalism	72
3	Perspectives for Further Research	78

The German Water and Land Management Associations and their Alternatives **81**

Economic Criteria for Comparative Institutional Analysis

Jan Monsees

1	Introduction	81
2	The German Water and Land Management Associations	81
3	Classification of Water and Land Management Associations in Economic Theories and Concepts	84
4	Comparing the Water and Land Management Associations with Alternative Institutions	86
5	Conclusion and Outlook	88

Water Harvesting: Challenges and Opportunities for Community-based Management	91
A Case Study from India	
<i>Hannah Büttner</i>	
1 Introduction	91
2 Perspectives and Conceptual Framework	92
3 Case Study of the District of Purulia	94
4 Conclusion	99
Institutional Change in Smallholder Irrigated Agriculture	103
A Case Study from South Africa	
<i>Bettina Hedden-Dunkhorst</i>	
1 Introduction	103
2 Smallholder Irrigation Farming in South Africa	103
3 Legal and Institutional Innovations Affecting Smallholder Irrigation	103
4 Policies and Implementation Strategies for Transformation and Recent Effects on Smallholder Irrigation	107
5 Conclusions and Policy Implications	108
Household Strategies to Cope with Institutionally Induced Supply Constraints	109
The Case of Jordan	
<i>Maria Iskandarani</i>	
1 Background	109
2 Intersectional Water Allocation in Jordan	109
3 Institutional Framework of the Water Sector in Jordan	110
4 Dealing with Water Scarcity in Jordan: Household Choice between Formal and Informal Water Sources	111
5 How do Households Value Water Supply Reliability?	113
6 Intra-household Water Conservation Behaviour	113
7 Conclusion with Perspectives on Household Water Security in Jordan	115
Wastewater Reuse in Agriculture – A Challenge for Administrative Coordination and Implementation	117
<i>Susanne Neubert</i>	
1 Introduction	117
2 Basic Considerations and the Need for Institutionalization	118
3 Anticipated Risks and Benefits for Sectors and Actors Involved	119
4 Health Risks and Possibilities of Regulating them	121
5 Environmental Risks and the Use of Nutrients in Wastewater	123
6 The Farmers' Perspective	125
7 Conclusion and Outlook	126

Low-quality Water Resources and Their Impact on Regional Supply and Intersectoral Water Allocation in the Jordan Valley	129
The Framework of a Research Programme in the Near East	
<i>Heinz-Peter Wolff / Werner Doppler</i>	
1 Introduction	129
2 Institutional Aspects of the Present Approach	130
3 Work Packages in Research on Technical Issues and People's Attitudes	130
4 Work Packages in Research on Socio-economics and Formal Institutions	132
5 Situation of the Research Programme and Preliminary Results	134
Editors and Authors	137

Abbreviations

A+T	Accountability and Transparency
AED	Academy of Educational Development
bcm	billion cubic meters
BMBF	<i>Bundesministerium für Bildung und Forschung</i> / German Ministry of Education and Research
BOD ₅	Biological sum parameter
CA	Competent authority
CACG	<i>Compagnie d'Aménagement des Coteaux de Gascogne</i>
COD	Chemical sum parameter
CPR	Common Property Research
crit.	criteria
DA	District Assembly
DMC	Damsite Management Committee
DO	District Office of the Environmental Protection Agency
DSI	General Directorate for State Hydraulic Works
DSS	Decision Support System
DWAF	Department of Water Affairs and Forestry (Republic of South Africa)
EEF	Environmental Entitlements Framework
EPA	Environmental Protection Agency
FAO	UN Food and Agriculture Organization
FO	Farm Organizations
FOCJ	Functional – Overlapping – Competition – Jurisdictions
GLOWA	<i>Globaler Wasserkreislauf</i>
GTZ	<i>Deutsche Gesellschaft für Technische Zusammenarbeit</i>
ha	hectares
HIPC	Highly Indebted Poor Countries
ICOUR	Irrigation Company of the Upper Region
IDA	Irrigation Development Authority
IFPRI	International Food Policy Research Institute
IHP	International Hydrological Programme
IMF	International Monetary Fund
IMT	Irrigation Management Transfer
IWC	International Waters Committee
IWRM	Integrated Water Resources Management
JVA	Jordan Valley Authority
KZV	<i>Kommunaler Zweckverband</i>

LACOSREP	Land Conservation and Smallholder Rehabilitation Project
LEMA	<i>Lyonnaise des Eaux</i> – Montgomery Watson and Arabtech Jardaneh
LOQWA	Low-quality Water Resources
MENA	Middle East and North Africa
MOWI	Ministry of Water and Irrigation
NGO	Non Governmental Organization
NIE	New Institutional Economics
O&M	Operation and Maintenance
ONAS	<i>Office National de l'Assainissement</i>
PAD	Provincial Agriculture
PE	Political Ecology
PID	Provincial Irrigation Departments
PIDA	Provincial Irrigation and Drainage Authorities
PPP	Public-Private-Partnership
PSP	Private Sector Participation
PURC	Public Utilities Regulatory Commission
RBC	River Basin Commission
RBM	River Basin Management
SANIRII	Central Asia Scientific Research Institute for Irrigation
SCARP	Salinity Control and Reclamation Projects
SWV	<i>Sondergesetzlicher Wasserverband</i>
UER	Upper East Region
UFW	Unaccounted for Water
UNDP	United Nations Development Programme
VALCO	Enterprise Henry J. Kaiser, known as VALCO
WAJ	Water Authority of Jordan
WAPDA	Water and Power Development Authority
WHO	World Health Organization
WLMA	Water and Land Management Association(s)
WRC	Water Resource Commission
WUA	Water User Association
WuBV	<i>Wasser- und Bodenverband</i>
WVG	<i>Gesetz über Wasser- und Bodenverbände</i>
ZEF	<i>Zentrum für Entwicklungsforschung</i> / Center of Development Research

Prologue

Reforming institutions for sustainable water management was the theme of the Third Water Workshop held in Bonn in October 2001¹ and organised by Susanne Neubert (German Development Institute, GDI, Bonn), Waltina Scheumann (Institute for Management in Environmental Planning, IMUP, Technical University Berlin), and Annette van Edig (Center for Development Research, ZEF, Bonn). Participants from various academic disciplines, namely economists, political and social scientists, and practitioners from the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) concurred not only in their opinion that sustainable water management calls for the design of 'adequate' institutions for governance and management but also in the view that the process of institutional reform is a research item on its own. What is simply labelled *institutional reform* in actual fact covers a wide range of issues such as changes in policies, law, government organisations and the role of the private sector and civil society.

During the 1970s and 1980s the perception of water scarcity was dominated by an engineering approach: national and international water policy would, it was thought, overcome water shortage by enlarging technical infrastructure, thus expanding supply, and this was to be financed mainly from public sources. The disillusioning results of the International Water and Sanitation Decade (1981-1990) induced water experts to develop a more comprehensive approach to water management, including institutional and economic aspects. In this respect, the Dublin Principles (1992) – one of the clearest, most comprehensive, and far reaching statements made thus far – already contained some essential institutional principles for sustainable water management: management needs to be participatory, with responsibilities assigned

"at the lowest appropriate level" and greater involvement of non-governmental organisations, the private sector, and water users. The Dublin Principles pointed to institutional weaknesses and malfunctions as major causes of ineffective, inefficient, and unsustainable water services, and called for urgent attention to be paid to institutional capacity-building.

As an input to RIO + 10, the Ministerial Declaration adopted by a ministerial meeting at the *International Conference on Freshwater* in Bonn in December 2001 calls for applicable arrangements for the governance of water affairs at all levels, demanding that governments should, where appropriate, accelerate water-sector reforms, including decentralisation and deregulation as major items. Water institutions need to become more effective and would have to change their focus and methods of addressing challenges. Changes in policies, law, and government organisations are regarded as crucial prerequisites for creating an enabling environment for sustainable water management.²

The Dublin Principles as well as subsequent international events have created a climate conducive to reforms in the water sector, and many countries have started to formulate and implement reform agendas. More and more policy-makers and water managers have now recognised the need for 'soft' solutions such as improved institutions, better management, and use of incentives. However, while the economic and institutional view on water scarcity and water management is in general rarely questioned, real progress lags behind the rhetoric.

One reason for this time lag is the enormous gap in funding investments in water infrastructure, maintenance, training and capacity-building. Another reason is that the vision of integrated and sustainable water resources management must be translated into substantial policy and institutional changes, because in most developing countries and some industrialised countries policies are still

1 The first workshop dealt with *Water Conflicts and Water Management in the Jordan Basin* (Cf. Libiszewsky / Schiffler, 1995, GDI, Berlin), and the second workshop was concerned with *Water in the Middle East: Potential for Conflicts and Prospects for Co-operation* (Cf. Scheumann / Schiffler (eds.), 1998, Berlin: Springer).

2 United Nations Economic and Social Council, E/CN.17/2002/PC.2/10, 15 January 2002.

supply-dominated; water demand management approaches are still in their infancy; and administrative structures are fragmented and rarely coordinated. In successfully devising and implementing political strategies, political and administrative systems move into the focus of attention. For instance, a World Water Council report (2000) presented *ten recommendations*, some of which demand that governments would have to initiate change.³

However, instead of taking an innovative and proactive stance, governments and bureaucracies tend to behave like an inert mass. As institutional reforms change the status quo of vested interests, be they political, bureaucratic, or social in nature, both support for and opposition to the reform agendas may be expected from the various groups affected. It is these political, administrative, and social dimensions that make actual reforms – political, institutional, and economic – in the water sector difficult. This is why the means for enhancing water use efficiency and sustainable water development and management still await implementation.

The workshop addressed some of these issues. Its intention was to network German researchers and practitioners from different disciplines and to link research on theoretical and methodological themes with policy-oriented issues. The presentations covered a variety of on-going research projects, addressing objectives, methodologies, and preliminary results.

The Present Volume is Structured as Follows:

Scheumann and Wegerich analyse institutional reforms in the irrigation sectors, specifically of Turkey, Pakistan, and Uzbekistan. **Scheumann** compares the role of the actors involved in Turkey

and Pakistan in the international and national arenas, the design and scope of reform concepts, noting that the final outcome will depend on interactions between the relevant actors as well as on their relative power. **Wegerich** – based on theoretical approaches to institutional hierarchies, institutional change, and elites – analyses water reforms in Uzbekistan at the local level of water management. There land reform is combined with decentralisation of water allocation and the introduction of farmers organisations and water users associations. The outcomes of the reform agendas differ considerably: in Uzbekistan, the top-down approach to introducing participatory associations has been obstructed by former stakeholders who feared losing their influence over newly independent farmers. Turkey has benefited from factors that were not subject to immediate policy-led changes, such as commercialised farms, legal regulations, and a general climate towards liberalisation; more importantly, the state bureaucracy has played a proactive and supportive role here. In Pakistan, reform has been more ambitious, covering the entire irrigation sector, with its many bureaucratic establishments; the initial aim here was a reallocation of property rights to irrigation water, including separation of rights to land and water, and change of the relationship between federal and provincial agencies in terms of power and finances as well as of the power basis of influential farmers. In all countries, elites – both bureaucratic and social – have been the key to success, or failure.

Van Edig / Engel / Laube analyse water-sector reform in Ghana, where, since 1994, a basic reorganisation has been taking place under the auspices of the World Bank. This rearrangement pursues different objectives from the international, national and local perspective. At the international level, the aim is to achieve utilisation arrangements for riparian states with a view to avoiding possible conflicts over water development and use patterns. Within the national context, reform is geared to achieving a concerted, efficient, and sustainable water resource management across different interest groups by setting up a Water Resources Commission and formulating consistent water rights. At the district level, decentralised,

3 Cited from Dinar (2001): Reforming ourselves rather than our water resources. Politics of water scarcity at local, national and international levels, *Gutachten im Auftrag des Bundesministeriums für wirtschaftliche Zusammenarbeit und Entwicklung*, German Development Institute, Bonn, p. 3.

participatory, and demand-oriented approaches are to be used to increase the role of local governments and communities in water management decisions. Interestingly, while the newly established water institutions at the district level seem less effective, informal institutions such as 'Chiefs' and 'Lords of the Land / Water' show strengths in implementing water-policy objectives. However, creation of a new set of formal institutions covering a wide range of functions has failed to incorporate informal structures. Finally, the paper discusses some factors that influence success in the devolution of irrigation management to users groups.

Poor performance in state-managed irrigation systems is the starting point of the contributions of Huppert and Renger. **Renger** interprets poor performance in irrigated system management as the result of rent-seeking behaviour. Actors, it is noted, focus no longer on economic and development goals but on political and bargaining efficiency. As a result, exorbitant costs, water waste, and low productivity are common features of irrigation schemes. **Huppert** analyses the asymmetrical relationships in the governance and management structure of irrigation systems, relying on the 'principal-agent' approach of the New Institutional Economics. Lack of accountability and transparency in governance and management and the absence of incentives for good performance work to the disadvantage of clients, in particular farmers towards the tail-end of distribution canals. This is most prevalent in state-administered irrigation systems; however, asymmetries and principal-agent relations are also characteristic of irrigation systems managed by users associations. Both authors discuss institutional approaches to combating rent-seeking and claim that built-in incentives as well as accountability and transparency mechanisms could serve to counteract principal-agent problems.

Klaphake focuses on a different level of water management: he points to and discusses approaches to analysing river basin management in multi-level political systems (e.g. the United States, Germany, Australia), focusing on the economic theory of federalism, which deals with the effi-

cient allocation of competences in political systems. While the theoretical models have occasionally been applied to environmental policy in general terms, explicit application to water policy is still in its infancy. In particular, the political and academic debates on river basin management are rarely seen in connection with basic theoretical arguments. Against this background, the author discusses two strands of the economic theory of federalism – fiscal federalism and the FOCJ concept (*Functional Overlapping Competing Jurisdiction*) – with a view to illustrating their analytic fruitfulness in the framework of water policy and identifying perspectives for future research.

Monsees analyses the German Water and Land Management Associations (WLMA) that are regarded as positive examples of durable local and user-managed water institutions. He compares the German WLMA with their institutional alternatives – including different types of associations – in terms of how, in economic terms, they come to terms with the maintenance of watercourses. His concept is based on economic criteria and analytical approaches in economics (i.e. the theory of collective goods, club theory, the theories of parafisci, federalism and infrastructure, and the New Institutional Economics). The author specifies a NIE efficiency criterion and sets out evaluative criteria such as institutional congruence, economies of scale and scope, transaction costs, and incentive structures.

Although institutional aspects have gained wide recognition as an important factor for water management, conflicts involved in community management as well as support services such as markets and agricultural sector policies in general are often not really taken into account. **Büttner's** study identifies the complex factors involved in the governance, management and allocation of water-harvesting infrastructure and water by local communities. She explores areas of tension and conflict in a drought-prone district of East India. The analytical framework used is based on three approaches from the social sciences: Common Property Research, Political Ecology and the Environmental Entitlements Framework. **Hedden-Dunkhorst** is interested in institutional change in

smallholder irrigation in South Africa. In the context of the transformation of smallholder irrigation, she first outlines the factors which impact on the performance of smallholder irrigation, including access to financial markets, information and technology, ownership rights, and collective action. She analyses how recent policies and implementation strategies impact on smallholder irrigation. Her conclusions highlight the need for timing and co-ordination of implementation strategies as well as the importance of information and training for smallholders.

Iskanderani, Neubert, and Wolff / Doppler are concerned with the water-scarce Middle East and North African region. **Iskanderani** analyses user strategies to cope with institutionally induced water shortages in Jordan, one of the most water-scarce countries in the world. There, attainment of water security is questionable if no rethinking is forthcoming in national water management policy. Increasing water demand and shortfalls in water management have led to an overexploitation of water resources. Moreover, water shortage and the present sectoral water allocation policy, which *de facto* favours the agricultural sector, is resulting in rationing of public water supply by means of intermittent supply, particularly in the summer season, when water is most scarce. Based on a comprehensive household survey, the author analyses household strategies aimed at coping with water supply constraints and satisfying water needs. Her study shows that households use various strategies to overcome water insecurity, some of which involve high opportunity costs. While the water demand of urban areas challenges water consumption in the irrigation sector, wastewater reuse is currently experiencing a renaissance in many arid and semiarid countries. **Neubert** claims that many countries still lack "good" practice; institutionalisation, she notes, would be imperative to minimise environmental and health risks and, at the same time, to diffuse and enhance benefits. However, institutionalisation hinges on a number of preconditions such as the legal framework, improvement of databases – including data transparency – development of management systems, and introduction of quality-oriented water tariffs. In view of the large number of measures and cross-

sectoral shifts in spheres of responsibility, it is no wonder that many countries are hesitant. Some members of the group of newly industrializing countries, like Tunisia, are pursuing wastewater reuse in agriculture as a strategic objective and are translating the objective into systematic practice. Neubert's paper serves as preparatory work aimed at determining whether the strategy pursued by Tunisia is one that might serve as a model for other countries. **Wolff / Doppler** present a research program which is currently under implementation in co-operation with partner universities from Middle East countries. The economic, social, and political implications of growing water scarcity call for a restructuring of inter-sector water allocation and the use of low-quality water resources, at least in the mid-term. The research objectives are to analyse and model potential policies and strategies for reducing water stress by using treated wastewater. The project focuses on the socio-economics of households and enterprises and analyses and projects market developments, consumer behaviour, and cross-border effects. While the development of technical solutions for the non-hazardous treatment and application of wastewater have already yielded operational results, institutional changes aimed at developing and using wastewater resources are still in their initial stages. The consequences are sub-optimal distribution of freshwater resources between economic sectors and an insufficiently controlled use of wastewater in agriculture. Apart from political reasons, lack of knowledge on options and realistic solutions in the distribution of all available water resources is a major obstacle to institutional change.

We gratefully acknowledge the support provided by the German Development Institute (GDI-DIE) in Bonn, which made it possible to convene the workshop and to publish its results.

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Institutional Reform in the Irrigation Sector

The Cases of Turkey and Pakistan

Waltina Scheumann

1 Introduction

For a long time the development of water resources in most developing countries was dominated by the state, and governments often used infrastructure financing to stimulate economic development. It was believed that state bureaucracies would best be able to administer water allocation, maintain the infrastructure and limit free-riding behaviour. However, state-governed and -managed irrigation systems have not validated these positive assumptions; misallocation of resources, poor performance in supplying water and deterioration of infrastructure have raised the question of the government role in the irrigation sector.

As early as in 1974, the Philippines' National Irrigation Administration moved towards self-financing, and for a long time, it served as a model for agency-farmer management. While the relationship between state agency and farmers was still asymmetrical, with the state controlling the technical expertise and subsidizing maintenance, a second approach was developed in Mexico at the beginning of the 1990s.¹ Since then, governments in many developing countries have transferred the management of irrigation systems to user organizations, largely driven by their inability to raise sufficient revenues. Turkey and Pakistan have been among those countries, though these two cases have differed in terms of their concepts and their successes. In Turkey irrigation management transfer started in 1993 / 94 and was successfully completed only a few years later. In Pakistan dis-

cussions on reforming irrigation and drainage institutions also started in the early 1990s, but evidently progress has been slow.

The present paper will identify some key factors and difficulties involved in the devolution of state responsibilities to user organizations in the cases of Turkey and Pakistan;² it will analyse how the interactions between external and internal actors have influenced reform concepts and processes. For analytical purposes, two negotiation arenas are distinguished:³ the international arena, where negotiations are conducted between two key players, the governments and the World Bank; and the national arena, where interactions between domestic players such as governments, state agencies, farmers and their organizations are crucial.

2 Reforms are not Politically Neutral

The often-mentioned political will to reform, or in the World Bank's language, the *deep and sustainable demand for institutional reform on the part of the borrowers*,⁴ is a necessary but by no means sufficient condition for success in implementing institutional change. As reforms are generally associated with higher water charges either for agricultural or for urban users, one can expect opposition to reform agendas from affected groups. Reforms also may touch upon vested political and bureaucratic interests, and there is evidence of resistance from within the political-administrative system, even when there is strong commitment to institutional reform on the part of governments. Struggles over power between and among political and bureaucratic decision-makers, and coalitions between social agents and the bureaucratic /

The author would like to thank Savas Uskay and Mehmood ul-Hassan for their comments on a draft version of this paper.

1 Cf. Groenfeldt (2001), pp. 3 - 4.

2 In Turkey, field research was conducted in the Lower Seyhan plain and the Gediz basin irrigation systems (Scheumann / ul-Hassan [2001]; Scheumann [1997]); in Pakistan, federal and provincial institutions, and Farmers Organizations were visited in 1999 and 2000.

3 Cf. Rinaudo / Tahir (1999), pp. 5 - 6.

4 Cf. World Bank (2000), p. 1.

political elite are characteristics of reform processes because some actors are threatened with loss of influence, positions and power; past balances of costs and benefits are challenged and redistributed, with winners and losers, and uncertain outcomes. Dinar and others⁵ must be credited with having argued that the process of creating new institutions is politically not neutral and with having pointed to compensation as an important mechanism that can be used to avert negative impacts of reform on the actors eventually on the losing side – and to prevent them from obstructing reform agendas.

Reform objectives already are a matter of contention and political controversy among the goal-seeking key players, and what may seem an appropriate arrangement or good design to one group may not satisfy the other. Since reforms have no *single designer* but involve a number of actors, it inevitably follows that the interactions between the intentional actors are crucial.⁶ These actors are endowed with heterogeneous resources and capacities, and inhibit varying means for purposefully influencing the process. Leaders, be they political, bureaucratic or social, are in a strategic position to ensure, or to seek to use their influence to ensure, that innovations will be congruent with their interests and that change will mean benefits for them.⁷

In many developing countries, the World Bank is playing an important role in initiating institutional change. It has called on such countries to reduce their public expenditure in the irrigated agriculture sector, to restrict the role of the public sector, to reorient the functions and organizations of state agencies, and to enhance farmers' participation and strengthen the role of the private sector. However, whether the World Bank's initiative for public sector reforms will achieve the intended objectives largely depends on the agenda of state bureaucracies. Bureaucracy has critically affected the design

and implementation of reforms – as will be demonstrated in the cases of Turkey and Pakistan.

3 Turkey and Pakistan: Institutional Similarities and Differences at the Outset of the Reform Process

Prior to reform initiatives, the institutional setting for irrigation system management in both countries showed a number of similarities: The large-scale irrigation systems were operated and maintained (O&M) by financially dependent state agencies that received their O&M budgets from national and provincial treasuries, which rarely met the actual demands of the bureaucracies concerned. Legally, O&M costs were to be recovered through water charges levied on irrigators, but when discussion on management transfer started, the charges levied and assessed were not sufficient to recover recurrent costs, let alone capital costs. However, the state agencies were not dependent on the charges they collected but received their budgets irrespective of their actual performance. Operation and maintenance of the head works, the main and secondary irrigation and drainage canals were the responsibility of government agencies, while the tertiary level irrigation infrastructure was operated and maintained by either formal or informal farmers groups.

The differences between these countries' irrigation sectors relate to overall water availability per area irrigated. Service provision was poor in both cases, though, for several reasons, it differed in the two settings.

Service Provision in Turkish Irrigation Systems

The General Directorate for State Hydraulic Works (DSI) with its Regional Directorates⁸ were

5 Cf. Dinar (2001); Dinar (2000); Dinar et al. (1998); Wambia (2000).

6 Cf. Godding (1996), pp. 1 - 53.

7 Cf. Feeny (1988), pp. 182 - 191.

8 Regional Directorates are organized along major river basins.

the principle actors involved in the planning, designing, investment, execution and managing of irrigation and drainage systems. Operation and maintenance of irrigation and drainage infrastructure in irrigation projects were both under the O&M units of the Regional Directorates. Seen in terms of international standards, DSI has employed skilled and experienced personnel, and the size of the DSI establishment has not been exaggerated in relation to its tasks.

As early as in 1981, DSI initiated the establishment of Irrigators' Groups,⁹ which then contributed towards O&M of the tertiary irrigation infrastructure (see Table 1). The Irrigators' Groups were based on elected administration units, either village headmen or town councils. They entered into contracts and agreements with the state agency DSI, which defined their responsibilities and rewards. The groups organized manual maintenance such as the de-silting and de-weeding of tertiary canals, and their ditch riders played an important role in water distribution by monitoring water schedules and reporting illegal water withdrawals. As a result, the irrigation ratio increased and maintenance improved, although the groups had only limited responsibility.

Still, centralized control over irrigation water and the provision of services meant little flexibility in meeting differentiated local demands stemming e.g. from diversified cropping patterns, and the need to effectively enforce water allocations and preventing free-riding behaviour proved almost impossible (cost recovery reached 10 % only). One major problem was the incompatibility between the working hours of DSI's staff and the operation time of the delivery system, the inadequacy of the government-owned and -operated machinery, and low labour productivity. As budget allocations declined, the major share of the agency's O&M budget shifted to personnel costs, a factor that led to poor maintenance, of drainage infrastructure in particular. But operation was also affected when, in the early 1990s, it was decided that staff over-

time would no longer be paid for. Thus budget constraints and unionised labour led to a situation in which the agency was no longer able to provide services at a satisfactory level.

Service Provision in the Irrigation Systems of Pakistan

While planning, investment and execution of irrigation and drainage systems in Pakistan came under the responsibility of the federal Water and Power Development Authority (WAPDA), the Provincial Irrigation Departments (PID) were the major actors in irrigation and drainage system management. Within the PIDs, operation and maintenance of the public tube wells in Salinity Control and Reclamation Projects (SCARP), the irrigation infrastructure and the drainage canals were fragmented and assigned to separate units (SE SCARP, SE Irrigation Circles, SE Drainage Circles) that had rarely coordinated the operations involved in distributing water.¹⁰ When priority was given to operating and maintaining SCARP tube wells, their O&M costs consumed by far the greatest share of the budget (e.g. in the 1980s 50 %). The gap between O&M expenditure and recoveries through water charges had been increasing, reaching more than 44 % in 1992 - 93, 62 % in 1994 - 95 and slightly increased in the following years.¹¹ However, the water charges collected did not go into PIDs' budget but became part of the Provinces' revenues.

Mainly due to O&M of SCARP tube wells and increasing establishment expenditures (i.e. staff salaries, operational costs), funds for irrigation and drainage infrastructure were increasingly limited, and the operational impacts of deferred canal maintenance were discernable, in particular, towards the tail-ends of either distributary's (secondary) canals or watercourses.¹² In addition, irrigation service provision was affected by the extraction of

9 Unlike Irrigation Associations, Irrigators' Groups have assumed only limited responsibility at the tertiary level.

10 Cf. van der Velde / Tirmizi (1999).

11 Cf. e.g. World Bank (1993); ul-Hassan (1999).

12 For details, cf. ul-Hassan (1999).

illegal rents, i.e. some irrigators received irrigation water while others did not. Lack of financial discipline in the form of corruption emerged as the most prominent issue, and this led to widespread mistrust between irrigation staff and farmers. Corruption was prevalent in the assessment and collection of revenues, construction and maintenance works, and water allocation and distribution.¹³

At the watercourse level, farmers participated in operation and maintenance activities such as desilting and de-weeding of watercourses, monitoring and enforcing the *warabandi* rotation schedule.¹⁴ These informal groups were quite successful in organizing collective works in watercourse command areas where farmers belong to one tribe or where farms are socially more or less homogenous.¹⁵

All in all, O&M service provision remained poor for many reasons such as e.g. budget constraints, priority for SCARP tube wells, lack of skilled personnel, poor coordination between PID circles, rent-seeking, to mention only the most prominent.

4 Driving Factors and Actors for Institutional Change

High subsidies and thus the burden on national and provincial treasuries was one of the driving forces behind institutional reform, while poor performance, economic losses due to resource depletion were others. The scope and objective of the reform concepts differed fundamentally in the two countries, as did the role played by the various actors, i.e. the World Bank, federal and pro-

vincial governments, irrigation agencies, and the farmers.

The Process in Turkey: the Proactive Role of the State Agency

In Turkey subsidies reached about 90 % of O&M costs in the Lower Seyhan irrigation system against the Turkish average of 60 % (in 1993). In the 1970s, attempts to substantially raise water charges had failed, and the ex post funding procedure was never changed in order to adapt water charges to the goal of meeting actual costs.¹⁶ Recurrent cost recovery was a source of disagreement between the World Bank and the Turkish Government. Early proposals for cost recovery comprising higher charges and stricter penalties on non-payers were supported by the state agency DSI, but not by the Turkish Government, which, largely on political grounds, never officially adopted these proposals. Only the formation of Irrigation Cooperatives found political support, but at that point in time farmers were reluctant to join. The World Bank representatives making repeated probes during the 1970s without success, rated the Lower Seyhan project as a *problem project*. When funds for the stage III project of the Lower Seyhan irrigation system were denied, the Government of Turkey decided to finance it out of national resources (see Table 1).

In 1985, the World Bank and the Turkish Government agreed on the Agricultural Sector Adjustment Loan, part of which was the *Core Program of Priority Drainage and On-farm Development Works*. At that time, DSI had stressed the point that cost recovery would be impossible to attain under the prevalent legal and institutional setting. Legally, on-farm drains are subsidized, and investment in and O&M of off-farm drainage infrastructure are expected to be recovered through capital and recurrent water charges, respectively. In mid-1993, a World Bank review revealed some enabling factors for irrigation management transfer, among others that officials of

13 Cf. Bandaragoda / Firdousi (1992); Rinaudo / Tahir (1999); cf. also Huppert and Renger in this volume.

14 Warabandi is a system by which irrigation water is made available in rotated turns to farmers on a weekly basis, on certain days at certain hours, with specified number of minutes of water flow (based on number of acres owned by farmers).

15 Cf. Terpstra (1998); uz-Zaman (1998); Bandaragoda et al. (1997).

16 Cf. Scheumann (1997), pp. 138 - 145.

	International arena	National arena
1963 - 1968	WB and Govt. TU agreed on Lower Seyhan Irrigation Project, Stage I without commitment to any special form of farmer participation.	(1967ff.) Attempts to establish Irrigation Cooperatives and Irrigation Associations failed.
1969 - 1977	WB and Govt. TU agreed on Lower Seyhan Irrigation Project, Stage II; — WB proposed raising water charges to reach cost recovery. — WB rated this a problem project; no funds for Stage III.	DSI accepted terms, except levy of a uniform charge, Govt. TU refused.
1976 - 1986	(1985) WB and Govt. TU agreed on Agricultural Sector Adjustment Loan.	Govt. TU financed Lower Seyhan Irrigation Project, Stage III, out of own resources. (1981ff) On DSI's initiative, Irrigators Groups were established in almost all villages.
1993 1997	WB and Govt. TU agreed on management transfer. WB funded Participatory Privatisation of Irrigation Management and Investment Project (16525-TU).	DSI took initiative of establishing Irrigation Associations.

the state agency DSI supported the transfer of DSI-managed large-scale irrigation systems, whenever possible, to water users organizations. The World Bank organized a workshop in Mexico in which 60 high-level officials from DSI headquarters and regional offices participated, visiting irrigation districts in Northwest and Central Mexico. This visit had a substantial effect in further encouraging DSI staff to pursue the transfer program.¹⁷ The transfer option was already provided for in DSI establishment Law No 6200 (1953) and Law No 7457 (1960) of the General Directorate for Soil and Water. Based on positive experience with local groups elsewhere in irrigation systems, DSI staff took the initiative for the transfer. For the purpose of management transfer, the scope of the World Bank-funded Drainage and On-farm Development Project (2663-TU) was expanded, and the Bank credited the Participatory Privatisation of Irrigation Management and Investment Project (1998 - 2002) to strengthen the newly established Irrigation Associations by providing them adequate equipment; total project costs were

US \$ 58.78, and the contribution were made up as follows: Irrigation Associations US \$ 37.4 4 millions, the Turkish Govt. US \$ 1.34 millions, and IBRD US \$ 20.00 millions.¹⁸

The majority of the farmers' leaders responded positively to the DSI-initiative, taking advantage of legal regulations and pursuing a flexible strategy. The establishment of Irrigation Associations is based on the Turkish Municipality Law, which allows for variations in organizational set-ups.

While Irrigation Associations have a three-tier system in the Lower Seyhan, in the Gediz basin they have a four-tier system because here Irrigators' Groups were incorporated, a demand raised by farmers.¹⁹ The law encourages village and municipal institutions to take over management and provides to farmer representation in the general assemblies by village headmen, mayors or chosen

17 Cf. Plusquellec (1995); Mohamadi / Uskay (1994).

18 World Bank (1997a); for details, cf. Project Coordination Unit (2000).

19 For details, cf. Scheumann / ul-Hassan (2001); Svendsen / Nott (1999).

delegates. In the Lower Seyhan Plain, where Irrigators' Groups were less consolidated, a higher degree of direct farmer participation can be observed. However, transfer of management in one form or the other has entailed flexible responses to local conditions and demands.

Nevertheless, the legal basis of the Irrigation Associations is regarded by DSI and most of the associations as inadequate, and a new law has been drafted. Major points of concern are that Irrigation Associations should not be based on the Municipality Law, because in this case they would be required to follow the same procedures as municipalities in hiring and firing staff, and they would also need approval to purchase machinery and be subject to control and auditing by the Ministry of the Interior. Incorporation of Irrigators' Groups into Irrigation Associations places politically elected people, i.e. village headmen and mayors, in a powerful position. There is evidence that village headmen have misused collected water charges, given relatives positions and exempted them from fines in cases of illegal water withdrawal. Thus far, this problem has been solved through internal reorganization, but the arrangement is in need of legal support.

In the years following the period of formation, DSI continued to provide strong support in assisting the associations to attain self-sufficiency. DSI has provided basic management and training by working together with the associations. Budgeting advice is available from DSI, and now most associations have gained experience in preparing budgets of their own. Besides, and more importantly, DSI envisions it's a future role for itself in continuing to assist associations and has appointed staff for this purpose within its O&M Departments at all levels, i.e. General Directorate, Regional Directorates and sub-basin units.

The Process in Pakistan: Political Support and the Resistance of Elites

Due to the poor performance of public SCARP tube wells, SCARP transition projects (1987) encouraged farmer participation in good-quality

groundwater areas by transferring them to Tubewell Groups. A second institutional shift came with the On-Farm Water Management Projects that addressed the significant water losses, up to 40 %, at the watercourse level.²⁰ These projects were implemented by the newly established On-Farm Water Management Directorates of the Provincial Agriculture Departments (PAD). Farmers were to participate in project implementation through Water Users Associations that would replace informal farmer activities in the project areas. Although this was not evident at the time, van der Velde / Tirmizi assume that the Provincial Irrigation Departments' refusal to take over these responsibilities – which were then taken over by PADs – challenged the PIDs' primacy in irrigation matters, just as WAPDA already had succeeded in doing at the national level. Most civil engineers and other professionals were attracted to careers with WAPDA, and this led to a decline in the quality and professionalism of the Provincial Irrigation Departments.²¹

However, the radical institutional reform process came about on the initiative of the World Bank.²² (see Table 2) The World Bank document *Pakistan: Irrigation and Drainage: Issues and Options* (1993) pointed to poor irrigation performance that together with the lack of an efficient drainage system would have caused widespread water logging and salinity on irrigated land, inefficient water delivery and use, inequitable water distribution, and overexploitation of good-quality groundwater. The World Bank demanded that present government irrigation policies be abandoned and recommended that *water should be commercialised and later privatised*.²³ It advocated a phased implementation in pilot projects in canal commands in which public utilities would be set up, a strengthening of federal water agencies and provincial water authorities, and a phase-

20 Components include lining of watercourses and remodeling of outlets.

21 Cf. van der Velde / Tirmizi (1999), p. 3.

22 This section relies heavily on Dinar et al. (1998), van der Velde / Tirmizi (1999), Wambia (2000).

23 World Bank (1993).

Table 2: The Process in Pakistan^a		
	International arena	National arena
1993	WB draft version of sector report.	
1994	WB proposal to Govt. PAK: Institutional reform as a condition for releasing an investment loan for its National Drainage Program.	During workshops attended by World Bank, federal and provincial agencies, professionals and farmers organizations, reservations expressed concerning: — unfeasibility of water trading; — Farmers Organizations only at watercourse level; — funds from taxes instead of loan.
1995	Letter by WAPDA agreeing to reorient functions of its Water Wing. Govt. PAK sent Sector Development Policy Letters to WB; modified draft legislation PIDA Act for approval to WB. WB rejected due to lack of commitment to privatisation and water rights; PIDAs are not covered by Companies Ordinance.	At seminars with provincial authorities, administrations and farmers: Provinces and PIDOs opposed to institutional reform. PIDA modified draft legislation for approval to provinces.
1996	Govt. PAK signalled WB to proceed. Multilateral lenders set firm deadline that PIDAs must be established in all provinces by end-December. Interim Govt. PAK resumed negotiations with WB.	Reservations of Farmers Associates of Pakistan and Pakistan Kissan Board at a meeting with President and Prime Minister: — farmers' representation in PIDA and AWB inadequate; — demand not to raise water charges. High-level meeting with President, Prime Minister and four Provincial Chiefs agreed on version of draft legislation.
1997	Govt. PAK and WB signed NDP project (1997 – 2004); first tranche of loan released.	New Prime Minister re-imposed PIDA ordinance. Provincial Assemblies approved PIDA Acts.
1999 ff		Acts were translated into PIDA regulations for establishing FOs, registering FOs and for management transfer. First two distributary canals were transferred to FOs outside the pilot canal selected for AWB.
a Compiled from Rinaudo / Tahir (1999); van der Velde / Tirmizi (1999); World Bank (1993; 1997b).		

out of subsidies for O&M in seven to ten years time. Farmers Organizations were to be established at the watercourse and subsequent hydraulic levels to manage the infrastructure and facilitate water markets.

In 1995, the Government of Pakistan had communicated to the World Bank a different strategy that envisaged that Provincial Irrigation Departments would be transformed into autonomous Provincial Irrigation and Drainage Authorities (PIDA) with regulatory functions, with canal commands man-

aged by Area Water Boards and Farmers Organizations operating and maintaining irrigation and drainage systems at the distributary's level as well as at the minor and watercourse levels. Due to the great number of farmers involved, Farmers Organizations were to be tested in pilot areas. According to Rinaudo / Tahir, the Government of Pakistan *did not explicitly rule out the possibility of privatisation, neither did it exclude the possi-*

*bility to create tradable water rights that would be de-linked from land property.*²⁴

In negotiations between the donors and the Government of Pakistan over a draft of the new legislation, the Provincial Irrigation Departments *flatly rejected* the privatisation of the canal system and the separation of water from land so that the former could be sold or traded as a commodity. Even after the then President of Pakistan declared that there would be no such privatisation, the criticism continued because

*"It was evident by this time that opposition to the reforms was now wide-spread and deeply rooted among the national farmers organizations dominated by large and influential landowners, provincial and national politicians, the officer cadres of the provincial irrigation departments, and professional engineering societies".*²⁵

A coalition against privatisation emerged between large influential farmers and many small subsistence farmers; the latter joined the protest in the absence of any organized effort to inform them about the content and objectives of the proposed reform. When the PIDA draft legislation had been modified by the Government of Pakistan in response to the protests (see Table 2), this gave rise to disagreements between the donors and the Federal Government. While the latter perceived the draft legislation, as going as far as was possible at the time, the multilateral lenders criticized it as too narrow because it focused only on the transformation of PIDs into PIDAs, not on the irrigation sector as a whole. When the Government of Pakistan was confronted with the conditionality set by the World Bank and the Asian Development Bank that far-reaching legislation had to be adopted before the loans were finalized, negotiations came to a halt.

In the end, an agreement was endorsed by the Government of Pakistan, including the President, the Prime Minister, the four Provincial Chief Ministers, Cabinet officials and the lenders, at the highest political level. However, the commitment of the Provinces was crucial because according to the constitution, only the Province Governments and Assemblies are entitled to modify irrigation management, not the Federal Government. In June 1997, the Punjab Irrigation and Drainage Authority Act was enacted by the Provincial Government and the Provincial Assembly of Punjab; other provinces followed. While the Punjab ordinance specifies the powers and duties of PIDA, it requires the Government of Punjab establish Area Water Boards and Farmers Organizations and to assign such power and functions to them *as it may deem fit*. The selection of pilot areas for initial reform implementation and the powers assigned to Farmers Organizations were a matter of continuous contention, as was the cooperation between PID's staff and Farmers Organizations in the pilot areas. Although there has been strong commitment to the reform at the highest political levels, including the first appointed Managing Directors of PIDA, implementation of the reform has progressed only slowly and has led observers to note that the newly established PIDA is following a de facto policy of avoidance and delay when it comes to the key irrigation reforms bound up with creating autonomous Area Water Boards and powerful Farmers Organizations.

The new institutional hierarchy that was then agreed between the World Bank and the Federal and Provincial Governments has been designed as follows:²⁶

- The federal Water and Power Development Authority (WAPDA) with its Water Wing has been re-oriented away from intra-provincial construction to a wider spectrum of inter-provincial functions.

24 Rinaudo / Tahir (1999), p. 8.

25 Van der Velde / Tirmizi (1999), pp. 8-9; cf. footnotes 14 and 15.

26 Cf. Dinar / Balakrishnan / Wambia (1998), pp. 12 - 13.

	Turkey	Pakistan
World Bank	Promoter; Credit for associations	Pressure (joined by major lenders); Conditionality for National Drainage Program Project
Governments	Positive attitude	Positive attitude at federal level; support at provincial level after modification
Irrigation agency	Proactive, initiator, support; Retains essential functions; No retrenchments due to transfer	Slow-down and obstruction; Losses of power and rents, future role unclear
Farmers	Sceptical but majority of leading farmers support the reform	Sceptical to positive attitude
Results	Successful transfer	Slow progress

- Provincial Irrigation Departments have been transformed into autonomous Provincial Irrigation and Drainage Authorities with responsibility for intra-provincial aspects, e.g. from the barrages to canal head works, main drains that cross canal commands, and drainage to inter-provincial drains that are under WAP-DA’s responsibility.
- Self-accounting Area Water Boards operate and maintain irrigation and drainage systems at canal command level from canal head works to distributaries / minors operated by Farmers Organizations, and from branch drains operated by Farmers Organizations to main drains that are operated by PIDA.
- Finally, Farmers Organizations operate and maintain irrigation and drainage systems below the distributaries / minors and sub-drains feeding into branch drains that are under the Area Water Boards.

At the end of 1997, the Government of Pakistan and the multilateral lenders finally agreed that the first phase of the 25-year National Drainage Program would further institutional change, provide for a remodelling of irrigation and drainage infrastructure, and assume responsibility for the construction of new drains. Funds for the project were to come from the International Development Association, the Japan Overseas Bank for International Cooperation, the Asian Development Bank,

the Government of Pakistan, the Provinces and farmers.²⁷

5 Risks of the Reform Concepts

The actors involved in the design of the reform concepts and the reform objectives have been fundamentally different in the two countries. Thus the risks were not the same for the players and therefore have caused some to support the process while others have opposed it (see Table 3).

Irrigation Management Transfer in Turkey

The Turkish state agency DSI has promoted the transfer of irrigation management to various kinds of users organizations only in irrigation systems where Irrigators Groups already had been contributing towards O&M at the tertiary level. There, DSI gradually has withdrawn from the operative level but continues to operate those parts of the hydraulic infrastructure that the newly established Irrigation Associations have refused to take over, or in cases in which the infrastructure serves more than one association (i.e. operation of dams, head

27 Cf. Wambia (2000), p. 366.

works, main canals if serve two or more associations, and to the main drainage canals). Importantly, changes in the procedures that assign user rights to irrigation water have not been debated in principle. In general, the ways in which irrigation systems are operated and maintained do not deviate fundamentally from the DSI rules previously in effect. The reform concept was not concerned with whether umbrella associations will be established and been given greater power, whether there would be a board with representatives from all sectors and stakeholders, and whether and which regulatory functions DSI would assume.

The state agency has taken over the role of a facilitator of and advisor in the change process. At all levels, i.e. central, regional and sub-basins, engineering cadres were appointed to guide the transfer process, which has become a new management task of the O&M departments. DSI has reduced the number of its employed staff and given up some tasks at the local level, but it still holds its vital functions in the planning, design, construction and management of new irrigation – and hydropower – projects. O&M staff has been reduced by retirement but there were no dismissals due to the transfer (staff members were assured of job security beforehand).

Fundamental Institutional Change in Pakistan

In Pakistan, institutional reform has affected many groups of actors, who have perceived the World Bank-proposed reform package as a threat to their established interests. The most pronounced opposition to the modified reform package came from large and powerful landlords as well as from the staff of irrigation departments. While the former were reluctant to share water and perceived the reform as a threat to their economic and political power, irrigation bureaucrats with financial ties to these interests had benefited from the ante-reform status. The PIDs as a whole had to change: staff from Irrigation Departments are faced with budget constraints, financial transparency and scrutiny, be accountable towards Farmers Organizations, thus losing power, authority and rent-seeking op-

portunities. The reform has been a major threat to thousands of non-professional staff for whom there are few job opportunities.

Although some see the restructuring of WAPDA as entailing a diminished role for the agency as it lost control over the Provinces development budgets from which infrastructure construction was financed, the chairman of WAPDA is committed to reorienting its organization and functions; and WAPDA will now refrain from the planning and construction of intra-province activities that are assigned to e.g. provincial authorities.

There has been visible bureaucratic rivalry between the Provincial Agriculture (PAD) and Irrigation Departments (PID), since a proposal has been made that PADs' On-farm Water Management Directorates should become formally designated members of the PIDs as facilitators for the formation of Farmers Organizations – and this was seen by PIDs as interference by PADs in its area of responsibility. From the farmers' side, support has been evident in some pilot areas, while in others farmers have been concerned with retaining the status quo because of poor social mobilization.

While discussion is ongoing on a number of crucial issues such as the assignment of responsibility and authority to Farmers Organizations, recovery of O&M costs and how to allocate the water charges collected between the Farmers Organizations and Area Water Boards, resistance has continued among leading bureaucrats and PID's large staff, in particular, at the level of the Divisions and Sub-Divisions. To solve the latter problem, it has been proposed that the provinces should retain their interim responsibility for financing these inefficiency costs, because, for political reasons, staff may not be laid off.²⁸

28 Cf. Wambia (2000), p. 371.

6 Conclusions: Facilitating Conditions and Constraining Factors Compared

There are factors that have facilitated success, or slowed the progress, of the irrigation reforms that are not subject to immediate policy-led changes. For instance, the overall political climate of liberalization and the local democratic political system have been supportive of reforms in Turkey, a situation that has failed to materialize in rural Pakistan. Other differences have to do with the higher degree of commercialisation and market orientation of Turkish agriculture as compared to Pakistan.

The World Bank played a prominent role in Turkey as well as in Pakistan. It stressed cost recovery and raising water charges prior to the 1990s reforms, which continued to be an issue for the reforms that then got underway. While the World Bank had acted as a facilitator in Turkey by supporting the exchange of experience abroad for Turkish leading agency staff and promising credits to the Turkish Irrigation Associations for the purchase of equipment, the institutional component of the National Drainage Program Project for Pakistan was a conditionality for the overall release of credits – one with which other lenders agreed. A recent World Bank mission reiterated the need to ensure full compliance with the PIDA Acts and legal documents, including the operationalization of PIDA, pilot Area Water Boards and Farmers Organizations, and added that *all future foreign assistance in the water sector is conditional on the satisfactory implementation of the reform agenda.*²⁹

One fundamental difference was the objective and scope of the reform concepts, which the World Bank influenced, in particular in Pakistan. There, the reform package was quite ambitious, covering the whole irrigation sector with its many bureaucratic establishments at the federal and provincial level; aims included a reallocation of property rights to irrigation water, including separation of land and water, and a change in the relationship

between federal agencies and provinces in terms of power and finances. The irrigation management transfer process in Turkey was designed and implemented by the state agency DSI, and this has, so far, only affected the role of its O&M departments in regions where the transfer has taken place. Management transfer has not challenged DSI in any vital way; but the case was different in Pakistan.

In Pakistan the role played by the Provinces has been crucial: According to the constitution, irrigation management falls under their responsibility and is financed from Province revenues. Irrigation management can be altered only by Provincial Assemblies or Provincial Governments. In Turkey there is no such political and administrative level in charge of irrigation management. Prior to reform, the General Directorate for State Hydraulic Works operated and maintained irrigation and drainage systems in the provinces through its Regional Directorates.

In Turkey, the state agency DSI was able to gain support from leading farmers. Both groups of actors agreed in principle on the direction of the transfer process, i.e. the disengagement of the state agency at the operative level. The ministry responsible and DSI pursued a strategy that prevented the issue from becoming politically instrumental. In addition and importantly, none of the state agency's staff was dismissed, and these persons were assured job security beforehand. The state agency has successfully defined its new role as a facilitator of management transfer and provider of assistance to the associations.

While in the initial phase the Provincial Irrigation Departments in Pakistan rejected the reform, some of its leaders committed later in time. However, many have remained hesitant and sceptical. Leading bureaucrats feared losing power, authority and opportunities for rent-seeking, and field staff expected to lose their jobs. The issue could become politicised due to the World Bank's early emphasis on privatisation of canal commands and on delinking water rights from land ownership, a position that was later modified. Influential farmers and bureaucrats formed a coalition against reform.

29 Emphasis added. Hussain / ul-Haq (2000), p. 29.

In Turkey, legal regulations had already supported local organizations as recipients of O&M responsibility, and it was at first not necessary to change the law for the purpose of irrigation management transfer. Management transfer benefited from more or less experienced and consolidated Irrigators' Groups that was engaged in collective action at the tertiary level prior to transfer. The new leaders of the Irrigation Associations, i.e. local administrators and influential farmers, had led initiatives and were able gain support from the majority of the farmers. The formation of farmers organizations has been more costly in Pakistan, where the great number of farmers involved and the lower number of existing farmers groups has been a major challenge to devolve responsibility. However, success in establishing groups was evident, and when and where farmers and their organizations became active in favour of the reform, bureaucrats engaged in a de facto policy of avoidance and delay.

The fact that irrigation reform has meant higher irrigation water costs for farmers, either because charges are raised to recover recurrent costs or because now the Turkish Irrigation Associations enforce payment of water bills, has not led to resistance among farmers. Nor was this a prime reason why influential farmers in Pakistan objected; instead they feared losing their control over water, and their privileges.

Thus far, the analysis has shown that state bureaucracies are a key to success, along with state governments. While governments might easier agree on credits because they need them for easing out balance of payment, this is of no concern for bureaucrats. In this respect, several factors have been crucial in either facilitating or impeding institutional change:

- whether the strategy designed can be made congruent with the interests of decisive and influential political decision-makers and bureaucrats, thus making reform politically feasible;
- whether political and bureaucratic leaders are able to coordinate efforts and balance rivalries;

- whether incentives are introduced to stipulate bureaucrats to implement reform;
- whether it proves possible to use compensation mechanisms to avert negative impacts of reforms on various actors. This may not be so difficult for staff retrenchment and increased costs of irrigation water, but it proves more difficult in case of power losses for bureaucratic establishments. If reforms touch upon vested interests of large influential land holdings and rent-seeking opportunities of agency staff, compensation may prove to be neither feasible nor desirable;
- whether social mobilization efforts are an integral part of the reform process when subsistence farmers lack education and influential farmers heavily influence public opinion.

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The Role of Elites in Changing Water Institutions at the Local Level in Uzbekistan

Kai Wegerich

1 Introduction

In 2000 Uzbekistan privatized unprofitable collective farms and introduced a top-down approach that included Water Users Associations (WUA). Visits to the Autonomous Republic of Karakalpakstan and the Province Khorezm, both in Uzbekistan, in 2000 and 2001 indicate that the associations established were not participatory and that there was neither collective decision-making on water allocation nor equal water distribution. Furthermore, it was noted that the old structure of the collective farm organization was still in power. The present paper evaluates the reforms in Uzbekistan.

The paper applies Ostrom's theoretical approach on institutional hierarchies to analyze the reforms. In addition to her approach, theories of institutional change and of elites are employed as well. The combination of these theoretical approaches makes it possible to come up with a more holistic explanation of the changes occurring during the reform process.

Following the theoretical framework, the paper provides a short description of the reform in Uzbekistan and the outcomes of the reform on land distribution as well as on the current organization of water allocation and water distribution. This is followed by a brief evaluation, which aims to open a debate on the lack of explanatory power of Ostrom's model of institutional hierarchy. The paper concludes with a modified model of Ostrom's theory of institutional hierarchy, which presents a framework more applicable to the case study of Uzbekistan.

2 Institutional Rules

Institutions are not only constraints on behavior but also roles and organizations. What is similar in all three is that they both enable and constrain actor behavior. While all three can be called institutions, the present paper makes a conscious effort to keep these differences distinct. Hence the term institution here means structures that exhibit "*sets of rules, compliance procedures, and moral and ethical behavioral norms designed to constrain the behavior of individuals.*"¹ In the debate on institutional change it has been noted that not all institutions are equal, and that institutions are structured in a hierarchy.² Ostrom argues, "*all rules are nested in another set of rules that define how the first set of rules can be changed.*"³ Even if this is the case for organizations, it is questionable whether the approach is applicable to all institutions.

The assumption of a hierarchy means that the transaction costs of changing some rules are lower than others. North argues that the higher hierarchical levels are more costly to change than lower levels.⁴ Ostrom complements North by stating, "*changes in deeper level rules usually are more difficult and more costly to accomplish.*"⁵

While North does not specify different levels of institutions, Ostrom distinguishes between three different levels of institutional rules: operational rules, collective-choice rules, and constitutional-choice rules (Figure 1).⁶ It is important to bear in mind here that "*it is usually the case that operational rules are easier to change than collective-choice rules, and collective-choice rules are easier*

1 Cf. North cited in Feeny (1988), p. 171.

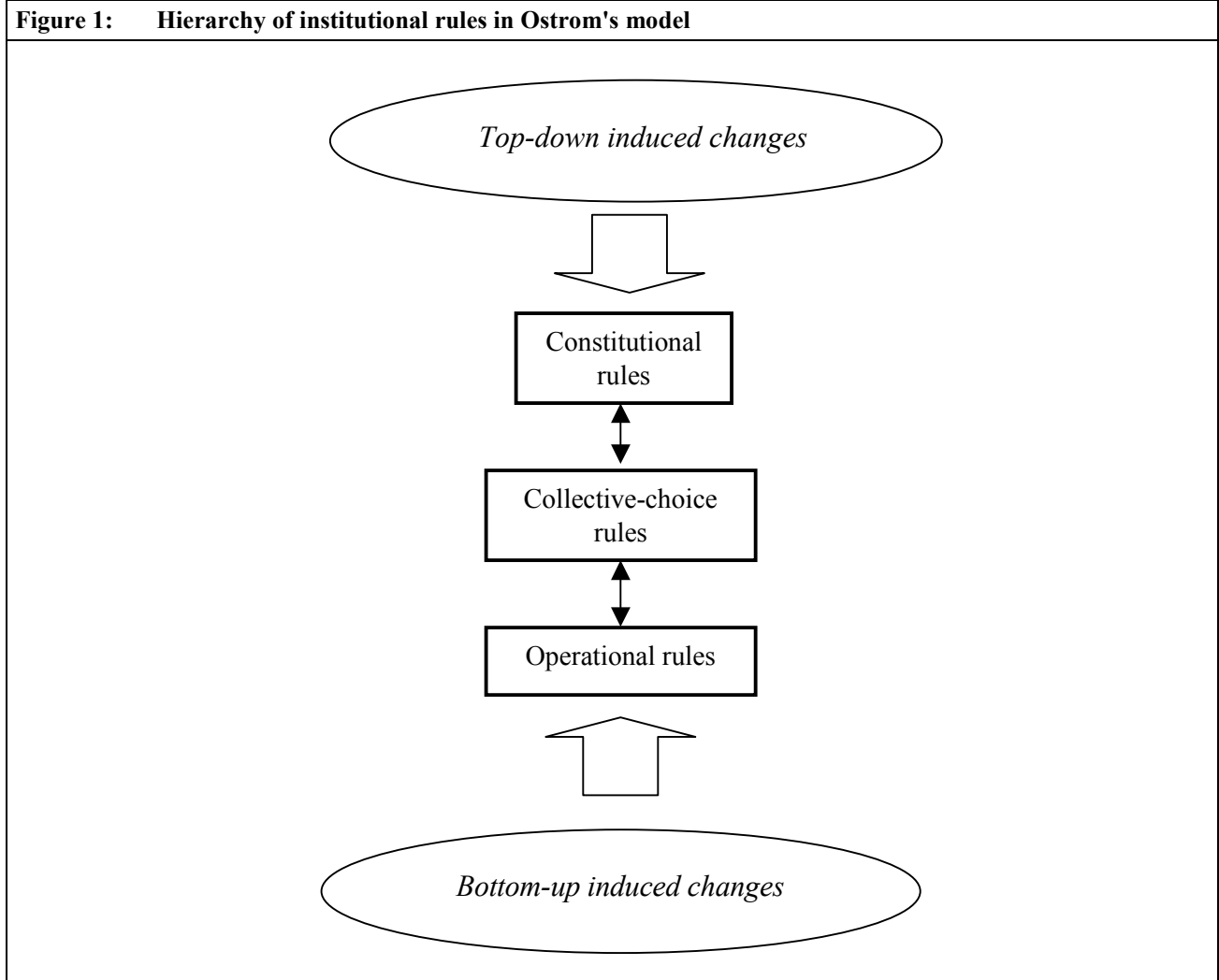
2 Cf. North (1990); Ostrom / Gardener / Walker (1994); Hobley / Shields (2000).

3 Ostrom (1990) p. 51.

4 Cf. North (1990).

5 Ostrom (1990), p. 52.

6 Cf. Ostrom et al. (1994), p. 46.



to change than constitutional-choice rules".⁷ Hence constitutional-level rules are at the deepest level.

Ostrom distinguishes between the following rule types:

- *Operational* rules directly affect the day-to-day decisions made by appropriators on when, where, and how to withdraw resource units; who should monitor the actions of others and how; what information must be exchanged or withheld; and what rewards or sanctions will be assigned to different combinations of actions and outcomes.
- *Collective-choice* rules indirectly affect operational choices. These are the rules that are used by appropriators, their officials, or external authorities in making policies – the operational rules – on how a common-pool resource could be managed.
- *Constitutional-choice* rules affect operational activities and results through their affects in determining who is eligible and determining the specific rules to be used in crafting the set of collective-choice rules that in turn affect the set of operational rules.

According to Ostrom, operational rules are influenced by informal and formal rules. Ostrom argues "*in many common-pool resource settings,*

⁷ Ostrom (1990), p. 54.

the working rules used by appropriators may differ considerably from legislative, administrative, or court regulations".⁸

3 Institutional Change

The discourse on institutional change is driven by demand (bottom-up) and supply (top-down) approaches. Institutional change occurs both through change in relative prices or a shift in knowledge and ideas. North argues that in a bottom-up approach "*changes in relative prices are the most important source*"⁹ of institutional change. The theory of supply-driven change is led by Binswanger, who reasons, "*institutional change may occur as a result of advances in the supply of knowledge.*"¹⁰ North argues strictly for relative prices as stimulators of change but has to agree that changes of ideas influences institutions, thus leading to institutional change.¹¹

How does the theory of demand- and supply-induced change relate to the distinction between different institutional levels? Demand-induced changes take place at the lower level of the rule hierarchy and influence the daily routine of the actor, hence they occur at the level of the operational rules. However, demand-induced changes could also affect higher levels. According to Ostrom's theory, changes at one level can affect other levels, and hence even changes at the bottom can trigger changes at higher levels.

On the other hand, supply-induced changes may occur at different levels, depending on the knowledge or idea supplied. The change could occur at any of the three levels. Supplied at any given level, changes could induce other changes at higher or lower levels. Assuming that Ostrom's

theory of institutional hierarchy, with its different costs of change for different levels, is applicable for bottom-up and top-down changes, it would be possible to reason that it would be easier to trigger changes at different levels if the change is supplied at a higher institutional level. Top-down institutional level changes are especially interesting because of irrigation management transfer, which is coordinated in a top-down approach. Within the framework of rules and their *nestedness* in higher-level rules, high-level change would have a domino effect on lower-level rules. However, because actors are enabling or inhibiting change a domino effect would not apply.

4 The Influence of Elites on Institutional Change

It is not clear why certain changes from the top or from the grassroots are successful in influencing the institutional system and others are not. What are the push or pull factors that are sufficient to induce institutional change? The main answer, which is not subject to cultural relativism, is the influence or power position of stakeholders and elite (see below) who gain or lose from these changes.¹² According to this reasoning, introduction of change from the bottom or the topside is only successful if it is supported by powerful stakeholders / elites. This reasoning is used in different theoretical approaches such as international relations and institutional theory. Feeny states bluntly that the "*political and economic costs and benefits to the ruling elite are a key to explaining the nature and scope of change.*"¹³ Adams argues, "*If a particular reform engenders enough opposition among social stakeholder groups with large political weights, that reform will be delayed and / or not implemented.*"¹⁴ While Adams focuses on different elites in society, here the emphasis is on

8 Ostrom (1990), p. 51.

9 North (1990), p. 84.

10 Binswanger (1978), p. 334.

11 Cf. North (1990), pp. 84 - 85.

12 Cf. Keohane (1994), Feeny (1988).

13 Feeny (1988), p. 168.

14 Adams (2001), p. 3.

different stakeholders in institutions and organizations. If institutional change is prevented or encouraged by elites, who are these elites, what is their role, and how can they be induced to support changes?

Adams uses the term stakeholder. He looks at different groups with political power who influence political decisions. However, the term stakeholder is very broad. Ramirez defines stakeholders as individuals or groups *"that have an interest, or are active players, in a system"*.¹⁵ The term elite is understood to mean individuals or groups dominating a system or parts of a system. Elites participate in, or influence, the making of decisions that allocate resources within and among social units. Putnam defines elites *"in terms of power over outcome"*.¹⁶ Even though not necessarily stakeholders, elites have a dominating influence on the system. They have influence in terms of information flow, resource allocation, and decision-making.

5 The Case of Water User Associations in Uzbekistan

Uzbekistan gained independence in 1991 along with the other Central Asian states. Independence led to land reforms. While Kyrgyzstan or Kazakhstan opted to reform the agrarian sector towards a market-oriented economic trajectory, Uzbekistan and Turkmenistan chose a path of top-down reform that regulated the supply of and demand for agricultural inputs and products.

Changing from State and Collective Farms to Farm Organizations and Water User Associations in Uzbekistan

Uzbekistan underwent two land reforms after independence. The first involved transformation of

the state and collective farms into different economic organizations, which continued to function like the former collective farms. Only a small amount of the land held by the state and collective farms was privatized. The privatized farms depended on the collective farms for water allocation and distribution. In the second land reform, which is still ongoing, collective farms were abandoned, collective farm land was leased to farmers, and WUAs were introduced. Here, the focus is only on the second land reform.

The second reform started in 1996, with the government contracting the Central Asian Irrigation Research Institute (SANIIRI) to establish a framework for Water Users Associations in Uzbekistan. Three years later, at the end of 1999, SANIIRI completed its research on establishing WUAs.

The second wave of land distribution took place at the beginning 2000. Unprofitable collective farms were privatized, and their land was distributed to the former employees of these collective farms. Privatization of the land was accompanied by irrigation management transfers and the introduction of Farm Organizations (FO) and WUAs on these farms. Both organizations have been established in a top-down approach.

Thus far only a few collective farms have been privatized. These collective farms are in the northwestern regions of Uzbekistan, which are close to the Aral Sea. By 2001 only twelve farms had been privatized, six in Khorezm and six in Karakalpakstan. FOs and WUAs have been established on their land. In 2000 SANIIRI experts already anticipated that collective farms would be privatized and that FOs and WUAs would be set up on their land. The process of founding WUAs has been slow, because their establishment was linked to privatization of collective farms. In addition to the slow set-up process, the process of implementing WUAs has been slow as well. To that extent, the organizations created are not real WUAs but tend more to be a continuation of the old water management units of the former collective farms. The next section will attempt to ex-

15 Ramirez (1999).

16 Putnam (1976), p. 5.

plain the slow implementation by examining the role of local power structures.

Land Distribution and Power Relations

Farm employees wanting to be independent farmers were required to apply for collective farm land. The application process was complicated and involved different collective farm and state bureaucracies, such as the economic council and the collective farm council, the commune, a surveyor and an 'architect' of the commune, the Commission for the Realization of Economic reforms, and the district governor.

While the collective farm manager decides on land allocation, it is the district governor who finalizes applications. On the other hand, Lerman points out that *"the village council and the district authorities will not move on a new applicant for land without the consent of the farm manager, who is expected to allocate a physical tract of irrigated land to the new peasant farm out of the lands that his farm manages."*¹⁷ However, according to Renger, *"the President appoints the Hokims (i.e. governors) and Deputy-Hokims who are directly subordinated to him."*¹⁸ Eckert confirms this, stating that the governors *"are nominated by the president."*¹⁹ Because of the direct link from President to province and district governor, it seems likely that the governors are far higher in the hierarchy and that the farm manager therefore is subordinate to their authority. Hence, even though the collective farm manager allocates the agricultural land, the district governor may influence land allocation.

Land should have been distributed on a competitive but equal basis. However, evidence from field visits indicates that the competitive process of application was not the main reason for land allocation. It is suggested that the dominant reason for

land allocations was informal and formal networks with district and local elites. Spoor argues, *"with the system of allotting land through the powerful [collective farm managers and governors], vested private interests in the public sector promote land to the benefit of the nomenclature."*²⁰

Bektemirov argued that prior to land reform land with favorable conditions belonged, informally, to the governor, and the land reform formalized the informal arrangements, creating security for people in power positions.²¹ An example from the Kegeili district show how former collective farm managers took over land favorable in terms of access to water. The field visit to the WUA in Kegeili indicated that the manager was one of the few farmers who had access to water during the drought in 2001. While the manager had access to the main irrigation canal, the other farmers depended on water from the secondary canal, which was without water.

In addition to the fact that new independent farmers are dependent for land on the former collective farm manager, this dependency has been reinforced by the system of water distribution. The district water institution was responsible for delivering water to the boundary of the collective farm. The collective farm was responsible for the on-farm irrigation system, *"that is: the distribution of water and the maintenance of the irrigation canals on its land."* Still, *"private farmers have so far no individual contracts with district water organization but depend"* on the old collective farm structure.²² This dependence on the old structure has prevented farmers from placing applications. Eckert points out *"there were farmers who refrained from applying for a lease because they said it was too difficult to obtain water from the collective farm or directly from the district water organization."*²³ This was based on experience from the first reform in which collective farms

17 Lerman et al. (1996), p. 163.

18 Renger (1998), p. 17.

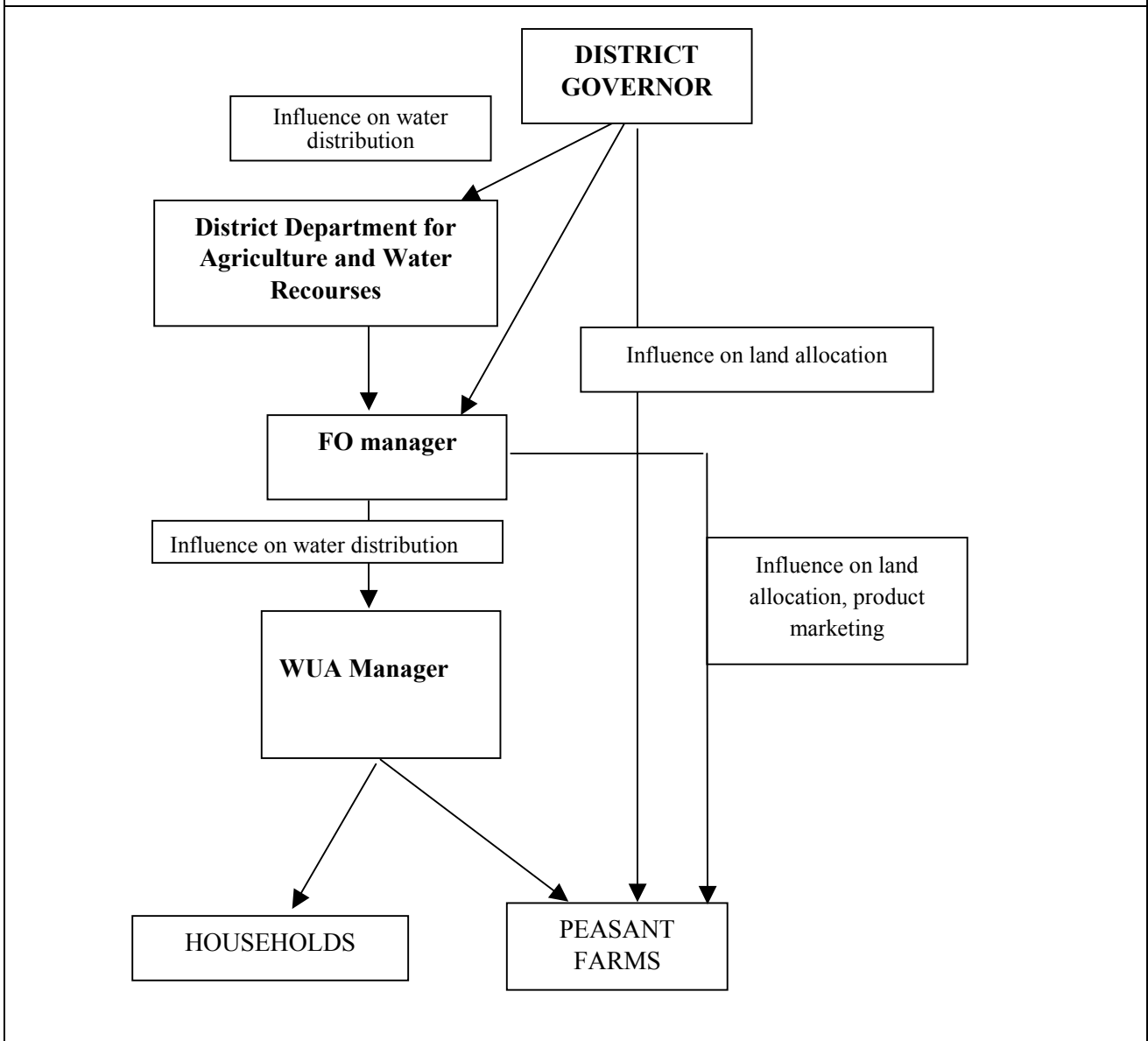
19 Eckert / Elwert (2000), p. 12.

20 Spoor (1995), p. 53.

21 Informal interview, Bektemirov 27 July 2001.

22 Cf. Eckert / Elwert (2000), p. 31.

23 Eckert / Elwert (2000), p. 32.

Figure 2: Power and influence of stakeholders during the second land reform

took advantage of the few peasant farmers. Egamberdi, describing the water dependence situation after the first reform, states that collective farms *"take advantage of their control over the current shortage of water. They use their distribution power to impose their will on [...] farmers by withholding water."*²⁴

Old Structures with New Names

The associations visited were integrated into a larger organizational framework, the Farm Organization (FO). A FO has been established on every former collective farm and taken over the duties of the former collective farm. Eckert states *"the associations of [peasant] farmers were founded by [the district governors] apparently on demand of the farmers."*²⁵ However, Pomfret argues that these organizations *"were introduced on*

24 Egamberdi et al. (2001), p. 241.

25 Eckert / Elwert (2000), p. 13.

*a top-down basis and were not regarded by peasant farmers as their organizations.*²⁶ Eckert states that the FOs *"are headed by members of the local administration nominated by the [governors]."*²⁷ Her statement confirms Pomfret's argument on a top-down introduction. However, it does not verify whether the farmers consider the organization as their own.

Eckert argued that the FOs *"are supposed to (a) advise the private farmers on farming questions, e.g. when and what should be planted; and (b) to assist them in organizing transport and marketing, e.g. procurement of the contracts with the canning factory, the grain mill or the cotton plant."*²⁸ However, giving advice and assistance to the farmers has not changed the farmers' perception of the organizational structure and the way the organization was introduced. Pomfret states that farmers did not perceive the FOs as organizations that *"could be mobilized in support of their interests."*²⁹ Hence the organizations were still perceived as reflections of the old-style top-down organizations. Furthermore, as stated above, the former management 'ordered' the farmers what to produce and where to market their products.

In a way similar to the establishment of the FOs, the national level 'ordered' the formation of WUAs. Farmers did not demand the establishment of WUAs, yet they had no other choice but to become members of the WUA. Information and guidelines for WUAs were distributed through the FO managers. They had to inform farmers about WUAs, organize elections and inform the farmers about their duties and responsibilities as new members of the WUAs. That WUAs were established from above and within a hierarchical structure suggests that they do not represent local movements or initiatives.

The introduction of the FOs did not change the former structure of the collective farm but reconfirmed the old structure; this was also the case for the WUAs. While on the collective farm hydro-technicians were responsible for water distribution, the head of the WUA took over these responsibilities. In all the WUAs visited, the former head of the hydro-technical unit became the manager of the WUA. However, as indicated, the hydro-technicians were former employees of the collective farm and directly subordinate to the collective farm manager.

Functioning Water Users Associations?

According to the rules governing a WUA, the water has to be distributed between members on an equal and fair basis. Hence all members should have a share of the available water resources. This would imply the formulation of an irrigation plan, which determines who is to receive water, and when and how much water is to be distributed to farmers. The WUA rules stipulate that information is to be shared and that members are to be involved in the decision-making process. However, in the WUAs visited there was no bottom-up flow of information and therefore no participation in WUA decision-making. Furthermore, the actions of a WUA manager have to be transparent for the community of farmers, with the manager accountable to them. However, neither transparency nor accountability was observable. Farmers lacked knowledge about the duties and rights of WUA members and their representatives.

Even though water distribution varied among the different WUA, one similarity observed in the WUAs in Karakalpakstan was that the managers continued with a top-down approach to the delivery of water. Not the community of farmers but the manager decided who was to receive and when and how much water was delivered to a farm. According to the WUA manager, the fields of the former collective farm were inspected on a day-to-day basis. Based on the WUA manager's estimation, it was decided which fields needed water immediately. However, this decision-making did not involve the farmers, and it was not

26 Pomfret (2000), p. 281, footnote 9.

27 Eckert / Elwert (2000), p. 13.

28 Eckert / Elwert (2000), p. 13.

29 Pomfret (2000), p. 281, footnote 9.

evident whether all the farmers received the same amount of water or whether former stakeholders such as the former collective farm managers were able to exploit their status within the community to receive more water.

Both the old organizational hierarchy and the top-down approach, learned during the collective farm period, were still in place. There was no attempt to make water distribution more participatory.

O'Hara states, "*most farmers have spent their lives as employees of large farms and were allocated specific tasks. Consequently, they took no part in irrigation and even when they did, decisions on when and how much to irrigate land were often made by others or by committee.*"³⁰ Hence newly independent farmers would have required training. During the initial fieldwork in 2000, in the WUA in the province of Syr Darya as well as the WUA in Khiva, it was claimed that initial training sessions for farmers had taken place. However, during interviews it became evident that not all farmers had participated in the training sessions. No training was given to farmers who joined the WUA at a later date. Even though in Khiva it was claimed that training had taken place, in an interview with a farmer it was stated that no training had been provided. In addition, it was stated that farmers did not need training as such; and that the new farmers had already become agricultural experts by living on and working the land.

The visit to Karakalpakstan in 2001 indicated that no training was given to the farmers. Because of their lack of training and experience farmers were more dependent on FO and WUA staff. This lack of knowledge encouraged informal arrangements and corruption. In informal interviews, it was stated that farmers pay, on an informal basis, hydro-technicians for irrigation work on their fields.

Why was the Top-down Change Unsuccessful?

The previous section has demonstrated that the old power structures at the local level have survived the reform by adapting successfully to the ongoing changes. During the adaptation process the influence of former stakeholders did not decrease.

How was it possible for the managers to retain a dominant role? In the era of state farm management, the farm manager was in charge of all state-farm activities and in control of resource and information flows. The employees were specialized farm workers, with no experience in managing a farm independently. This unequal relationship continued after privatization. Because of their position and established connections, the former managers were able to utilize the process of land reform to their advantage. They influenced the distribution of land, in terms of which received land and the location of the land distributed. In addition to the fact that they were given better land, the social status of the old management has not decreased either. Both the Farm Organizations and the associations enable the elite to reinforce its social status and the wealth in its social network.

During interviews with farmers it appeared that the official changes were not reflected in the language used; farmers still referred to FO managers as manager of the collective farm; the case was similar with hydro-technicians. In discussions it appeared that the change in effect was a change in name only, but not a real change. The FO manager was still perceived as powerful and not as a farmer among farmers. This was also reflected in the behavior of farmers towards the former farm manager, and vice versa. Former farm managers were still in control and in a position to dominate.

Participation and empowerment are unable to materialize in the newly established WUAs. Even though the legal framework of the WUAs allows collective decisions on management structure and water distribution, the actors in power, i.e. responsible for management and water distribution, pre-

30 O'Hara (2000), p. 368.

vent collective decision-making. Furthermore, because these actors are responsible for training farmers to operate the system, their manipulation prevents working rules for farmers from becoming established. It appears that informal rules and patterns of behavior, which were formal rules in the old system, have continued. These informal rules include absence of criticism of authority and avoidance of responsibility. Hence these old informal rules are prolonging the old structure and preventing the emergence of new formal changes.

6 Developing the Theory

Analysis of the reforms in Uzbekistan indicates that in addition to informal and formal rules, day-to-day interaction is also determined by habits. Bourdieu uses the term habitus (practices of behavior); Ostrom the term 'habits'. She appears to distinguish between rules and habits, arguing, "*following a rule may become a 'social habit'*"³¹ which can even continue after formal and informal rules have changed. It seems that habits are different from operational rules. It could be argued that habits are either in conformity or non-conformity with these rules, though in either case they influence day-to-day activities. While according to Bourdieu, the habitus derives "*disproportionate weight [from] early experience.*"³² Ostrom argues that "*individuals can consciously decide to adopt a different rule and change their behavior to conform to such a decision. Over time, behavior in conformance with a new rule may itself become habitual.*"³³ Ostrom thus appears to interpret habits as strategies that have become behavior. However, not all habits are rule-based. And habits can change or remain constant, independently of rules. Hence a shift in rules need not necessarily affect habits. Furthermore, because some habits, which were previously re-

garded as negative (such as criticism and independence) are now positive and desirable. Hence certain habits become emphasized and de-emphasized with rules, though they are never rules themselves.

In addition, Ostrom acknowledges, "*rules are formulated in human language,*" and she argues that "*rules share the problem of lack of clarity, misunderstanding, and change that typifies and language-based phenomena.*"³⁴ However, language is facilitator for discourse and a tool to further collective action. "*With a repeated chance to see and talk with others, a participant can assess whether they trust others sufficiently to try to reach a simple contingent agreement regarding the level of joint effort and its allocation.*"³⁵ Hence action situations and even rules can change through interaction. Hajer, who argues that rules-in-use change through discourse, also asserts this.³⁶ While Hajer argues that these rules change when the implicit meaning of terms used in communication change, discourse can enhance trust and reciprocity and therefore not only change meaning but also facilitate changes in interaction and the perceptions of different actors. Consequently, discourse influences and even changes rules.

Furthermore, Ostrom argues that operational choice rules are monitored and enforced through formal and informal collective choice arenas.³⁷ However, her analysis of rule change does not provide enough details of how formal constitutional and collective choice rule changes affect informal collective choice and constitutional rule settings. The evidence from Uzbekistan suggests that formal rule changes, introduced in a top-down approach, may push former hierarchies and rules into informal arrangements that encourage corruption. However, these findings are only preliminary and would need further study.

31 Ostrom et al. (1994), p. 40.

32 Bourdieu (1990), p. 54.

33 Ostrom et al. (1994), p. 40.

34 Ostrom et al. (1994), p. 40.

35 Ostrom (1998), p. 13.

36 Hajer (1995).

37 Ostrom (1990), p. 53.

7 Conclusion

The chapter has utilized Ostrom's theoretical approach to institutional hierarchy in combination with theoretical approaches to institutional change and the influence of elites on institutional and organizational change. The case study of land reform in Uzbekistan has demonstrated that even though the formal constitutional rules have changed, the operational rules have not. The evidence shows that the actors implementing the top-down rule changes have obstructed the implementation of rules. The former formal rules of top-down approaches have shifted to informal arrangements, which are stronger than the new formal rules in place. The rule shift has caused insecurity for the main actors, who have sought successfully to manipulate change and retain their control and status.

The case study of Uzbekistan shows that top-down rule changes can fail to reach the day-to-day rules of the individuals. This suggests that a change of laws does not necessarily work its way down to the operational rules at the bottom. If successful changes were to be implemented, these would have to be supported from a lower level. However, this would imply that social capital (promoting these changes) is always given, and this is a positive albeit not realistic assumption, and even if social capital is given, it may not have the power or influence to implement such changes.

The political implication for the establishment of Water Users Associations in Uzbekistan is that merely changing the laws and the political will at the top to create participatory associations may not be sufficient. Ensminger and Knight argue that a change of bargaining power enables the powerless to demand and to make changes of the rules of society.³⁸ Clearly the shift from collective farm management to WUA management was not a real change and has not increased the bargaining power of the newly established farmers. It appears that the local level in Uzbekistan needs support to

create the necessary bargaining power, which allows the top-down changes to take place. Here, bargaining power could imply transparency during the reforms or organizations that are not tied to the old structures implementing the reforms.

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38 Cf. Ensminger / Knight (1997).

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Ghana's Water Institutions in the Process of Reform: from the International to the Local Level

Annette van Edig / Stefanie Engel / Wolfram Laube

1 Introduction

Ghana and Burkina Faso are classified as countries that will face water stress by the year 2025.¹ Population growth and economic development are causing relatively rapid increases in water demand in the domestic, agricultural, mining and industrial sectors, as well as for hydropower generation. These uses conflict with each other. Additionally, municipal and industrial pollution is reducing the availability of water as a resource. Political and economic management strategies are called for to increase water use efficiency. As in many other developing countries in the world, water reforms have been initiated in Ghana with a view to bringing about improvements in water management and water-related institutions.

In order to identify the main weaknesses of the water management sector in Ghana, the World Bank and the Ghanaian Ministry of Works and Housing initiated the Water Resources Management Study in 1995, which was partially funded by various international donors. Consequently, concepts for institutional water reforms were introduced in Ghana, extending from the international to the local level.

No efficient water management is possible at the international level if corresponding regulations are not also implemented at the local level. Among the different levels of an administrative system, the so-called *meso*-level is of special importance in ensuring the implementation of formal regulations, for it is at this level that formal and informal institutions meet. The main objective of the present article is to

highlight the strengths and weaknesses of the Ghanaian approach and to call attention to the difficulties that may arise when objectives need to be coordinated across different levels. The example of irrigated agriculture in the Volta basin is used to illustrate this.

The paper is structured as follows: background information on the study area is presented in Section 2. Sections 3 and 4 describe the general (top-down) reforms of the Ghanaian water sector at the international and the national level respectively, and Section 5 discusses issues arising from the coordination of these two levels. In Section 6, the example of irrigated agriculture in the Volta Basin is used to highlight institutional changes occurring at the *meso*- and the local level and to demonstrate that informal institutions, including local regulations and authorities, are of crucial importance for the implementation of formal reforms and regulations. It will be shown that, at the district level, cooperation with local authorities and integration of their management approaches into the formal regulations is possible, though rarely undertaken. Without taking informal institutions at the local level into consideration, it is not possible to implement reforms in a top-down approach. Based on this observation, Section 7 takes a closer look at the management and operation of irrigation schemes at the community level and describes how current trends towards devolution and participatory management are affecting decision-making at the community level. It goes on to discuss some factors determining the success of community-based irrigation management. It is argued that lessons learned at the community level may provide useful insights for decision-making at the higher levels. Finally, conclusions and issues for further research are presented in Section 8.

The present article looks at two different research projects working on water policy issues in the Volta Basin and attempts to link them. One is the GLOWA-Volta (*Globaler Wasserkreislauf*) project, funded by the German Ministry of Education and Research (BMBF), which seeks to develop a scientifically sound decision support system (DSS) for the management of water resources in the Volta Basin. The DSS simulates water availability and

1 Cf. Hirji (1998).

demand throughout the basin under different global change scenarios and helps define optimal resource management strategies to achieve desired goals. The institutional analysis presented in Sections 2 through 6 by Annette van Edig and Wolfram Laube seeks to define realistic new water-policy scenarios based on the institutional settings and rules in the riparian countries of the Volta Basin. The second research project, led by Stefanie Engel and funded by the Robert-Bosch Foundation, analyses the impacts of decentralization and of devolution on natural resource management at the local level. The part of the project focusing on participatory irrigation management in Ghana provides the basis for Section 7 of the present article.

2 The Volta Basin

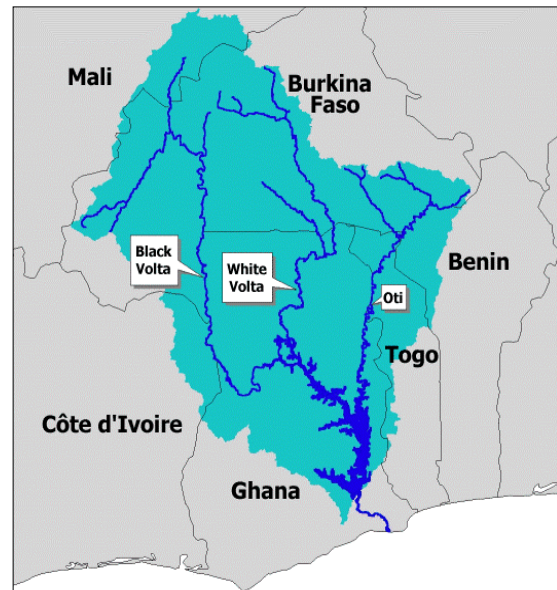
The Volta Basin covers 398.000 km² of the sub-humid to semi-arid West African savannah zone. The Volta Basin is an international catchment area shared by six riparian countries. Three Volta tributaries, the Red, White and Black Volta, feed the Akosombo dam (see Figure 1).

The wet season in the south of the catchment area extends from May to October, and from May / June to September in the north. The inter-annual variability is high for given locations, and the variability within a rainy season is very large due to the convective nature of most rainfall events.

River flow is highly sensitive to rainfall: relatively small changes in yearly rainfall cause large changes in river flow, and surface water resources in the basin are therefore very vulnerable to droughts. This has important implications for agronomic planning, but also for energy supply.

Water use and land use choices made in riparian countries and their effects on transboundary river flows are already an issue between the two major riparian countries, Ghana and Burkina Faso. Ghana is the most downstream riparian country; Ivory Coast is situated upstream from Ghana and downstream from Burkina Faso, which, along with Mali,

Figure 1: The Volta Basin



Source: <http://www.glowa-volta.de>

Benin and Togo, compose the upper riparian countries.

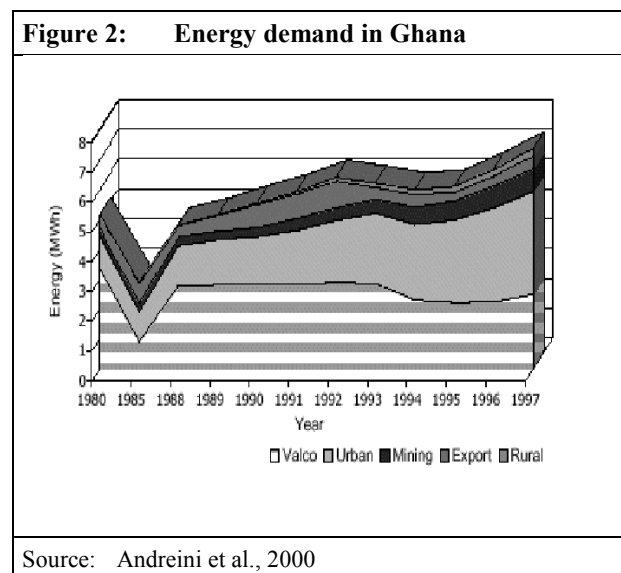
3 The International Level

Water Use Sectors and Water-related Projects in the Volta Basin

The economic development of the riparian countries in the Volta Basin and the associated increasing demand for water of their industrial, agricultural and energy sectors are a possible source of international conflict. On the other hand, national needs may also be an incentive for a riparian country to take the initiative in international cooperation, which is what Ghana has done.

The largest project in the Volta Basin is the Akosombo dam in Ghana, built in 1965. The dam reaches a height of 134 m and forms Lake Volta, which is one of the world's largest artificial lakes, covering 3.5 % of Ghana's surface area. When the dam was built, one of the main problems was the financial aspect. To help finance the project, the

Ghanaian government signed an agreement with the US aluminium-producing enterprise Henry J. Kaiser, known as VALCO in Ghana. In exchange, VALCO was granted special tax breaks and low energy tariffs for 50 years to produce energy-



intensive aluminium.² It currently consumes 45 % of the energy produced in Ghana (see Figure 2).

Presently, the hydropower station at the dam produces 912 MW, and production is projected to increase by 15 % in the next five years. As demand for electricity is rising, new possibilities of hydropower production are being explored.³ Presently, only one dam construction project is being seriously discussed: a hydropower station on the Black Volta near Bui George. The energy produced by this dam is intended to satisfy national consumption in the north and to cover potential energy exports to Burkina Faso, Mali and Ivory Coast. However, construction of the Bui dam is being debated at both national and international levels, primarily for environmental reasons, as the construction site is located in a national park and could cause serious ecological damage.

The concept of integrated water management has only very recently been introduced in Ghana, but it is being used in the pilot study of the Densu Basin. To date, water management in Ghana has consisted of supplying water on a sectoral basis. Institutions reflected this type of management in their arrangement, in which different institutions were responsible for different sectors.

Particularly in Ghana, the major water user is *energy production*, and energy demand presently far exceeds production. Of the energy produced, 45 % is sold to VALCO and 48 % consumed by households, though only 5 % of this is consumed by rural households. Demand will rise further as the government realizes its plans to supply electricity to every household in Ghana, including those in rural areas.⁴

Severe energy crises have hit Ghana in times of droughts, with the last major national crisis taking place in 1998, and regional crises reported in 2001. During an energy crisis, the country only has 12 hours of electrical power per day. This has severe impacts on the national economy, and daily power failures have become common in urban areas like Accra. Other factors, like institutional failure, undoubtedly contribute to the poor reliability of the energy supply.

To counter its inability to produce enough energy for national needs, Ghana imports energy from Ivory Coast on a regular basis, from 6 to 10 p.m. In addition, it increasingly has to import energy during other periods of high consumption. The Volta River Authority, responsible for hydropower production and the management of the Akosombo dam, already owes Ivory Coast over US\$ 34 million for power imports. Paradoxically, current energy prices for consumers are lower than production costs and Togo and Benin import energy from Ghana, except in times of drought. However, it may be assumed that these energy-importing countries will realize hydropower projects of their own in the future. For example, Burkina Faso plans to build three dams

2 Cf. World River Review, Drought Dims Ghana's Hydroelectric Power. At: <http://www.irn.org/pubs/wrr/9511wrr.html>, p. 4.

3 Cf. *ibid*, p. 5.

4 Cf. Ofuso-Ahenkorah (1999), p. 4, and Ministry of Works and Housing (1998 a).

along the Volta, two of them to supply the capital Ouagadougou with water and one for irrigation and hydropower generation. The total amount of stored water will not be more than 149 Million cubic meters (MCM), or 3.75 % of Lake Volta⁵, but many smaller dams for household and agricultural purposes have already been constructed.⁶

In 1998, latent conflicts between Ghana and Burkina Faso surfaced when drought and the energy crisis hit Ghana. Burkina Faso's water consumption was suspected of being the main cause of reduced water levels at the Akosombo dam. In response, Ghana offered to supply Burkina Faso with energy in order to prevent the country from building the dams on a Volta tributary, which were expected to considerably reduce water flow in the Volta. Burkina Faso rejected these plans, insisting on an autonomous national energy supply. Notions of national sovereignty and fears of flooding in northern Ghana caused by sudden water releases from dams in Burkina Faso are major concerns for Ghanaian water management.

The *household water sector* is important for the inhabitants of the riparian countries, but not so much in terms of water quantity as in terms of water quality. The same holds for agriculture. Irrigated agriculture is not really important in Ghana, and this sector currently consumes only moderate amounts of water (617 MCM). This may change with the realization of Ghana's Vision 2020, according to which the agricultural area under irrigation will be extended from 10,000 to 100,000 ha. This would imply a future water consumption of up to 4,114 MCM.⁷ At the same time, industry's share of GDP is expected to increase to 37 % by 2020 and demand for industrial and urban water is projected to rise from 63 MCM in 2000 to 272 MCM in 2020.⁸

Water demand figures are not available for all riparian countries in the region; however, projections see Ivory Coast's water demand rising to 9400 MCM by 2025 and that of Burkina Faso to 860 MCM by 2010. Benin's water demand was estimated to be 15 MCM in 1997.⁹

Agricultural sector water requirements could also increase considerably in the future: Burkina Faso, Ivory Coast and Mali are three of six West African countries that presently irrigate only a little over 10 % of their irrigable land area.¹⁰ The possible expansion of irrigated areas will certainly have consequences for water use in the Volta Basin.

Several measures have to be undertaken in order to prevent water use conflicts, the first and foremost would be the development of alternative energy sources. However, even if the energy problem were to be solved without the development of further hydropower projects in the Volta Basin, the watercourse still has to satisfy the needs of other water use sectors. Development of the river basin is essential for the economic and social progress of the respective countries, but this cannot be achieved without corresponding cooperation at international, national and local levels.

Legal and Institutional Background at the International Level

As the main conflicts are most likely to occur between Ghana and Burkina Faso, communication between these two countries was identified as a major goal of the Volta Basin Water Resources Management Initiative, an initiative launched by international donors. It has concentrated on capacity-building at the national and international levels of the two riparian countries. In 1996, first results were seen when Burkina Faso asked for Ghana's "no objection"¹¹ to plans its to build dams on the

5 Cf. Ghana World Wide Web (1998).

6 For further information on remote sensing and dam sites, cf. <http://www.glowa-volta.de>

7 Cf. Ministry of Works and Housing (1998a), p. 14.

8 Cf. Ministry of Works and Housing (1998b), p. 3.

9 Cf. *ibid*, p. 9.

10 Cf. World Water Council (2000), p. 7.

11 The no-objection rule is a principle of international law and it is also an operational rule of the World Bank Group

Ziga and Bagre rivers for hydropower and irrigation. This "no objection" by Ghana was given on the provision that Burkina Faso fulfilled certain conditions.¹² A detailed Memorandum of Understanding was signed, and a mechanism or institution will be put in place to facilitate communication between the two countries and to monitor the implementation of the terms of agreement. One major outcome of the initiative was the establishment of the Water Resources Commission in Ghana.

As national and international institutional capacity-building and initiatives are intertwined (for example in the field of data exchange), the Ghanaian Water Resources Commission (WRC), established in 1996, will deal with international and national management issues. Moreover, an International Waters Committee (IWC), part of the WRC, has been set up. The Strategy Document of the WRC identifies the three tasks of the IWC:¹³

- identifying international waters and drafting bilateral agreements;
- establishing mechanisms for informal discussions on a technical level with the riparian countries;
- examining the possibility of initiating a multinational regional agreement for the development of the Volta Basin.

A Volta River Basin Organization will be established in 2003, while various bilateral agreements are to be signed with Burkina Faso, Ivory Coast and Togo in the intervening years.¹⁴ To date, no agreements have been drafted or signed. However, according to the WRC, informal information exchanges on technical projects and the possible development of the Volta River take place frequently. The first step towards cooperation, namely mutual

trust-building between the main stakeholders, has thus been taken.

4 The National Level: the Water Resources Commission

The rationale for the reorganization of the Ghanaian water sector was a water management study initiated by several international donors in order to evaluate the efficiency of institutional arrangements in the water sector.

Based on the study's findings, the Water Resources Commission (WRC) was established in 1996 with the adoption of the Water Resources Act, and started operations in 1998. The WRC serves as an umbrella institution for national water policy in order to coordinate different government agencies and their different interests and management approaches, for example those in the private water sector (see Section 7). According to the newly drafted water policy, the WRC will have to:

- coordinate the water sector with special regard to development agencies and the exchange of data between the relevant institutions,
- work toward the integration of all stakeholders in the sector, while respecting traditional norms and customs,
- guarantee access to safe drinking water and sanitation,
- supervise water quality, and
- improve cooperation with the Public Utilities Regulatory Commission (PURC), which supervises water-pricing.

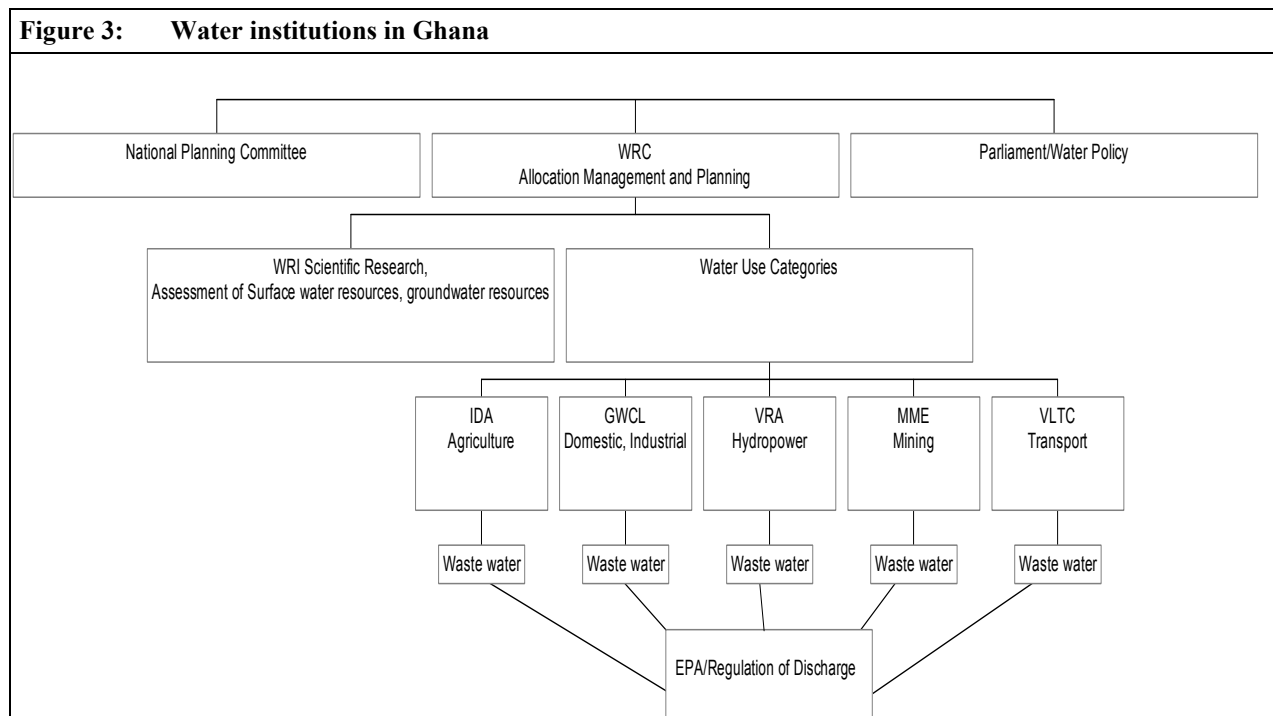
Government agencies formerly responsible for water use in their sector (irrigation, mining, hydropower generation, etc.) will now have to apply for a license from the WRC to use water. They will have to specify the amount of water to be used and apply for pollution licenses from the Environmental Protection Agency, which is now responsible for water discharges. This reorganization of institutions and the allocation of water use rights is not an easy task

to get the acceptance of every downstream riparian before financing a dam on an international watercourse.

12 Cf. Ministry of Works and Housing (1998b) p. 6.

13 Cf. Water Resources Commission Secretariat (2000), p. 11.

14 Cf. *ibid.*, p. 14.



as it implies reducing the power of other ministries and agencies that formerly managed water use in their sector on an autonomous basis.

The draft water policy contains all the principles identified at recent international conferences on water. Although the policy is meant to serve as a guideline and has yet to be implemented through institutional measures and laws, it remains broad and vague, setting out global objectives, such as good governance, establishment of a stable macro-economic environment, democratization of civil society and the rule of law. These are without a doubt important objectives, but it remains to be seen if they will in fact precede concrete actions and in what way they will be implemented in the water sector. One major institutional problem of government water institutions at the national level as well as at regional and local levels is capacity-building. Once trained, staff members often move into the private sector or to international NGOs. Attempts are therefore being made to develop a system of incentives to keep professionals in public service.

Apart from water policy, the WRC has drafted a water-use regulation according to which water use

permits are given to different water users. It is a detailed regulation involving investigations and public hearings on the licenses applied for, on registration procedures, and so forth. These regulations will be used by the WRC as the basis for the allocation of water-use rights to institutions and users, and because of it the WRC may encounter difficulties with other administrative levels over issues of water rights and water allocation.

It is clear that the WRC is unable to address all the different actors in the sectors using water. International donors as well as NGOs play an important role in reaching these actors, but they often follow their own rules and not the government's water policy. On the other hand, water users associations, initiated by international donors, are often not given the district level backing they need, for example in the form of by-laws. This has caused problems in irrigation programs. The same holds true for the integration of traditional authorities in projects and government programs.

5 Interlocking the International and the National Level

Now that we have presented the challenges facing the management of water at the international level and the relevance of the case study of Ghana for national level water institutions, the question that remains is: How do the international and national levels intertwine and what constraints or chances of cooperation between riparian countries can the international and national institutional setting reveal?

At the international level, the main task of cooperation and institution-building still remains to be tackled, beginning with informal cooperation and extending to the legal framework and the institutional set-up of international institutions. What preconditions have to be present at the national level of the riparian countries for international cooperation to take place?

If we compare Ghanaian national water management and the national water management of other riparian countries, we can observe that their set-up varies considerably. Ghana is in a favorable position as donors are heavily involved in its water sector reform. This has had a positive effect on water management and the implementation of reforms. In other countries, like Burkina Faso, water institutions operate in a somewhat uncoordinated manner, at least at the different administrative levels.¹⁵ In Mali, a colonial decree from 1928 concerning water resources is still in force. These varying stages of management and institution-building are an *obstacle to international cooperation*. Efficient national institutions are essential to implement the obligations agreed upon in international accords. For if international agreements and agreed water policy measures are to be implemented and institutional cooperation is to function, national institutions must have *counterparts in other riparian countries*, for example in the field of pollution prevention. Donors should not neglect this aspect and should also invest in institutional reforms in the other riparian countries.

When it comes to institution-building at the international level, it would be advisable to choose a step-by-step approach. National institutions or departments in the riparian countries could be identified for cooperation. They could then exchange information not only on management of international watercourses but also on institutional experience, in this way speeding up capacity-building. Once such cooperation is established, additional institutions could follow the example, so that the preconditions for efficient transboundary institutions will eventually be met. As personal contacts and information exchange intensify, trust between countries increases. This could help the parties involved to overcome narrow national thinking and to recognize that, in order to profit from the benefits of cooperation, it may be worthwhile and necessary to limit rights that are generally considered to be part of national sovereignty. At the moment, a wide gap exists between the ideal and the existing situation: the national management structures of the countries involved are in no way harmonized, and institutions do not even have counterparts to cooperate with. While the national WRC in Ghana is busy with its own national management tasks, international cooperation is undertaken – if at all – mainly with Burkina Faso. No international integration of water management is foreseeable. The same holds true for the national and the regional levels: the tendency at the moment is to overload regional districts with work related to water management. Employees at this level do not have the necessary skills and the Commissions lack the financial resources needed to carry out all of the monitoring work they are entrusted with.

6 From National to Local: Interlocking Water Resource Commission, River Basin Commissions and Local Actors in Ghanaian Water Reform

Thus far we have presented Ghana's water reform process at the national level and discussed what reforms are planned to help it address questions regarding internationally shared bodies of water and water distribution issues at the regional and local

15 Cf. Ministry of Works and Housing (1998b), p. 9.

levels. The following chapter, using examples from the irrigation sector, discusses how the different levels are to interlock and what difficulties the projected new water management is likely to encounter with its current design.

Current Developments within the Ghanaian Irrigation Sector

Since many changes are underway in Ghana's irrigation sector, it is one of the main focuses of the present paper. To date, irrigation has been of minor importance in the Ghanaian agricultural sector. Officially, only 10.000 ha of land are irrigated, which account for 1 % of Ghana's arable land and only about 1 % of its agricultural output. Nevertheless, this figure is incomplete, since it only accounts for areas irrigated under the irrigation schemes established by government bodies, such as the Irrigation Development Authority (IDA). There is no essential data available on small-scale private irrigation, and areas irrigated with run-off water, such as inland valleys and wetland rice production areas are not accounted for.

Due to concerns about high population growth rates (2.6 % annually) and the prospects of world climate change, which could make rain-fed agriculture, especially in Northern Ghana, even more insecure than it already is, the Ghanaian government has embarked on an ambitious policy of irrigation development. Based on Vision 2020, the government plans to put 136,000 ha of land under irrigation by 2020. For the Volta River Basin alone, this implies a six-fold increase in annual demand for irrigation water, from 0.565 km³ in 2000 to 3.605 km³ in 2020.¹⁶

To achieve this ambitious goal, some older and large irrigation schemes are to be rehabilitated and expanded, but the goal will mainly be achieved by the expansion of medium- and small-scale irrigation schemes. Several irrigation programs funded by

various international and bilateral donors exist and more are planned for in the near future.¹⁷

Expansion of irrigated farmland is not only promoted by the government and development agencies: in many villages, farmers, driven by the prospect of additional income during the dry season and of safer food supplies, are irrigating more and more. These efforts are necessarily small in scale, since farmers lack the capital to make major investments. Irrigation in these cases is most often done by bucket and involves high labor inputs (family or paid laborers). This development is only found along perennial rivers or where water is available from dams, dugouts or water holes in the riverbed during the dry season. Where water is available in larger amounts, it is possible to find commercial farmers who water their fields through pump irrigation and operate substantially bigger farms. Small-scale irrigators and commercial farmers are placing an increasing amount of land under irrigation and therefore need additional water. Basic data on this

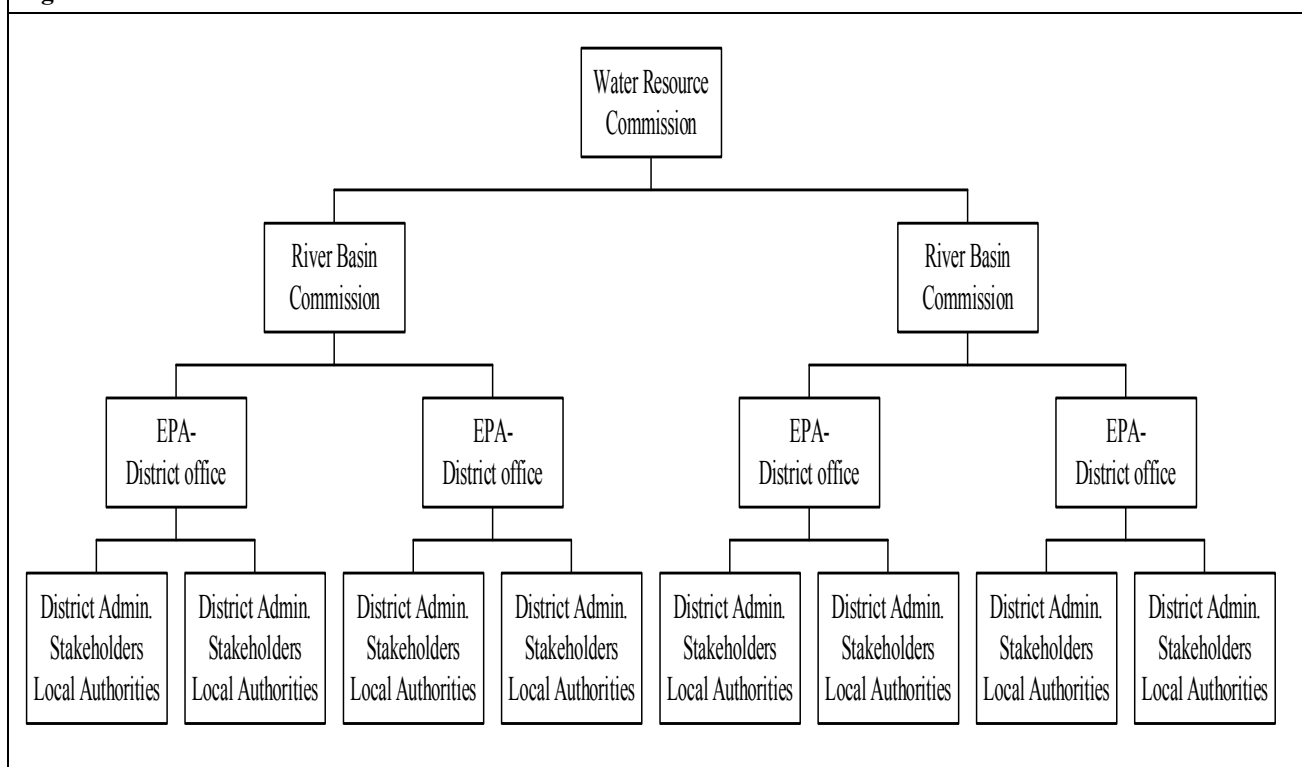
development are lacking, but remote sensing pictures have revealed changes in land use. This runs counter to experience of experts in development policy, who have attributed the failures of many irrigation projects in African countries to an underdeveloped culture of irrigation in this region. Currently, a shift in the habits of farmers can be observed, with farmers increasingly engaging in irrigated agriculture.

Interlocking the National, Regional and Local Levels

Now that the WRC has been successfully established, has formulated a new Ghanaian water policy, and has made efforts to harmonize the country's previously fragmented water laws, its next task will be to efficiently administer water use. To achieve this objective, it will be necessary to implement its regulations at the river basins level and at the ad-

16 Cf. Ministry of Works and Housing (1998a), p. 8.

17 Cf. Ministry of Works and Housing (1998b), p. 13.

Figure 4: Institutions at the national and district level

ministrative and political levels in the country's 110 districts.

In coping with this task, the WRC faces a dilemma: on the one hand, its duties and powers are far-reaching; on the other hand, its financial and human resources are limited. Its rights and responsibilities include the following:

- to formulate comprehensive plans for the utilization, conservation, development and management of water resources;
- to initiate, control and coordinate activities connected with the development and utilization of water resources, including those shared with other countries;
- to grant water rights;
- to collect, collate, store and disseminate data or information on water resources in Ghana;
- to require water user agencies to undertake scientific investigations, experiments or research into water resources in Ghana;
- to monitor and evaluate programs for the operation and maintenance of water resources in Ghana;

- to advise pollution control agencies in Ghana on matters concerning the management and control of pollution of water resources.¹⁸

Since the WRC has very limited human and financial resources, and is funded solely by the Ghanaian government – which is chronically short of money and has just signed a debt reduction agreement under the HIPC program¹⁹ – it is unlikely that the WRC will be able to fulfill all of the above-mentioned tasks. Currently the WRC only aims to establish River Basin Commissions (RBC), in accordance with internationally accepted water management principles (see Figure 4).²⁰ However, RBCs also lack the resources necessary to administer water resource planning and management and to decide on allocation of water resources through a participatory approach in which the *participation of communities, local and traditional authorities, District Assemblies, the private sector and NGOs* is an

18 Cf. Ministry of Works and Housing (2001), p. 2.

19 Cf. IFAD (1999); IHP (2000).

20 Cf. World Bank (1993).

important factor.²¹ This is especially true for the Volta River Basin, which is extremely large and covers about 70 % of Ghana's landmass.²²

The WRC therefore plans to establish partnerships with organizations and authorities operating at the district level to achieve its objectives. To date, the WRC plans to establish close cooperation with the District Offices (DO) of the Environmental Protection Agency (EPA)²³. The WRC is also cooperating with the EPA on water body protection and the issuing of EPA fluid waste discharge permits.

Cooperation between Formal and Informal Institutions at the Local Level

Cooperation between the WRC and the EPA at the district level has some obvious drawbacks: the EPA does not function effectively, and its DOs even less so. The lack of resources, environmental standards and, most importantly, power to enforce its regulations are preventing the EPA from realizing its objectives.²⁴

Since the EPA and especially its district-level branches are already performing poorly, if at all, it is questionable whether this organization is equipped to additionally monitor local water use and enforce the new water policy at the local level.

To assess the local water situation within the Volta Basin, a survey was conducted in 24 villages across seven regions. Twenty of these villages had surface water resources, and in 19 of these the local chiefs and politicians interviewed stated that surface water pollution was being controlled. Only once was the

EPA's District Office mentioned in connection with water pollution control. In fact, it was the traditional institutions: chiefs, religious leaders or lords of the land, who controlled the physical and spiritual protection of water bodies, often in cooperation with unit committees and assemblymen. Measures against physical pollution of bodies of water include controlling waste disposal, animal watering upstream of fetching points, washing of cars, defecation close to water bodies and fishing practices. The aim of these control measures is mainly to protect bodies of water used for human consumption. This demonstrates that traditional leaders and local politicians, often acting together, do control water pollution and enforce the regulations they put in place.

The role of traditional authorities is even more important in the domain of water rights. In twelve villages, the chiefs or lords of the land were said to own the water as custodians for the people; in six others, it was perceived that the community, or everybody, owned the water. The ownership of water resources was attributed to the government in only two villages. In four villages where conflicts over water resources were encountered, it was always the chiefs who solved the quarrels in cooperation with the unit committee. Varying from the south to the north of the Basin, it is mainly chiefs or lords of the land who directly or indirectly administer water user rights:²⁵ directly, by allocating water withdrawal or fishing rights, and indirectly, by allocating rights to land which lies adjacent to water. In the latter case, water withdrawal rights are implicitly included, since riparian water rights are commonly acknowledged in Ghana.

In the area under study here, irrigation systems existed in 10 of the villages surveyed. In four of the villages, officially organized irrigation schemes existed; in seven, irrigation was privately organized by local farmers, while one village had both types of irrigation schemes. In 5 of the 7 villages with privately owned irrigation systems, farmers indicated that the irrigated area was increasing. In the remaining villages where no irrigation was in use,

21 Cf. Ministry of Works and Housing (2001).

22 One example for participative water management on local level is the communally or privately organized and financed program IMT (irrigation management transfer), which will be introduced below in Section 7.

23 Information as presented at the National Water Policy Forum (Northern Sector) of the WRC at Kumasi, 11 June, 2001.

24 Cf. Ayee (1998); Ministry of Works and Housing (1998a).

25 Cf. Mensah (1999).

seven indicated that water for irrigation was unavailable, three lacked irrigation equipment such as pumps or found irrigation too expensive. Nine of these villages stated that they would engage in irrigation if they had the possibility.

In all villages with private irrigation, i.e. irrigation organized by farmers and without intervention from government, development agencies or NGOs, the land rights and implicitly the water rights were transferred through traditional institutions such as chiefs, lords of the land or clans. Sometimes farmers paid rent for irrigated land. The same phenomena can be found in a few cases of commercial private irrigation, where investors obtain land and water rights through traditional authorities, set-up irrigation schemes and in turn collect funds by renting the irrigated land to farmers.

There is no official land registration in Ghana, and patterns of land allocation and tenure vary from region to region, according to local custom. While chiefs are custodians of the land in the southern and northern regions, lords of the land assume this position in the upper regions. These traditional institutions perform rituals to ensure the fertility of the land, allocate unclaimed land and settle land conflicts.²⁶

The central position of traditional authorities in the allocation of water rights and the protection of water bodies has to be taken into account. The WRC is aware of this, but has adopted a dual policy on this issue. On the one hand, the WRC acknowledges that *customary law and practices in Ghana have existed over the years and cover the areas of water conservation, pollution control, protection of catchments and protection of fisheries*²⁷, and it attaches great importance to the accomplishments traditional authorities have made in these areas and wishes to make use of their enforcement power and local legitimacy as far as possible. On the other hand, the WRC plans to seize the water rights from these traditional authorities, without consultation them or compensation them for potential revenue losses.

In the absence of efficient state monitoring and local enforcement agencies, the WRC is counting on the work and cooperation of traditional authorities, while simultaneously weakening their position and powers. It is clear that the allocation of water rights through local institutions does not fit into the projected new water management, where the main objectives of integrated river basin management are the consideration of the overall economic benefits of competing water uses and the mediation of stakeholder interests. Nevertheless, given the current realities, the dual policy of the WRC towards traditional authorities seems risky, since it is their cooperation, and not resistance, that is needed. Instead of providing incentives for traditional institutions to cooperate, the WRC's policy of neglecting traditional practices of water rights allocation, which is backed by the current rule of law,²⁸ provides disincentives for cooperation by diminishing the chiefs' responsibilities and ability to collect funds. For beneficial outcomes, the integration of traditional chiefs in projects funded by international donors it is equally important (see Section 7).

However, care must be taken to not paint a romantic picture of traditional institutions, and to take into account the fact that chiefs sometimes behave to the detriment of society and the environment, granting excessive water rights, especially to the mining sector and to commercially irrigating farmers. In addition, the democratic legitimacy of informal institutions and the way disadvantaged or underprivileged social groups such as women, the poor, ethnic minorities or youths are represented and treated by traditional authorities poses an important problem. Furthermore, there is some hesitation in strengthening the position of traditional institutions, especially in view of their role within the system of indirect rule established by the British during colonial times.²⁹ Nevertheless, they occupy a constitutionally defined space in the Ghanaian political system and could be important partners of the WRC at the local level.

26 Cf. Dittoh, (1998); and Kasanga / Kotey (2001).

27 Ministry of Works and Housing (2001).

28 Cf. Water Resources Commission Act, Act 552 (1996).

29 Cf. Rathbone (2000).

The question of whether the centralized planning approach of the WRC fits into the decentralized political landscape of Ghana remains open. In 1989 Ghana embarked on a decentralization policy which has put many rights and responsibilities regarding administration and development in the hands of district administration and district assemblies. However imperfect this policy may be with regard to grass-roots participation, district financing and staff capabilities, the fact remains that many development and infrastructure projects are planned and implemented at the local level. Many of these projects have an impact on water resources and would therefore have to be approved by the WRC. How much of their decision-making power the 110 Ghanaian Districts are prepared to concede to the WRC's water plans in the absence of efficient monitoring bodies remains to be seen, especially when conflicting interests are involved. In this context, the issue of waste disposal in Ghana is of some significance. It is the district assemblies (DAs) that are responsible for the safe, hygienic and ecologically sound disposal of human waste. However, their performance remains very poor, and due to lack of efficient waste disposal controls, DAs actually jeopardize the quality of the soil as well as that of ground and surface water. Because both the WRC and the DAs have a vested interest in distributing water rights, their cooperation may be difficult. Not to mention the widespread phenomenon of rent-seeking and corruption in public administration, which adds to doubts about the viability of cooperation between the WRC and the DAs.

7 Management of Irrigation Schemes at the Community Level: What Determines the Results of Participatory Management?

Given the importance of local informal institutions and the role of local authorities as outlined above, this section looks at decision-making at the level of irrigation schemes (denoted below as the *community level*). The focus is on Ghana's Upper East Region, where irrigation is most prevalent. The considerations presented in this section are based on a

research project different from the one on which the previous sections are based. The links between the community-level analysis and the higher levels are two-fold: first, local-level decisions determine actual water use and pollution. If these are to be influenced in coordination with higher level objectives, it is crucial to understand the determinants of local-level decisions and the extent to which higher-level institutions and policies can affect these decisions. Second, sustainable use of irrigation schemes at the community level requires cooperation between water users or a strong hierarchical structure that acts in the interest of the community. In a sense, this is a microcosm with many parallels to institutional issues at higher levels. Thus, an analysis of the determinants of local-level outcomes may provide useful insights for decision-making and outcome forecasting at the regional, national and international levels. For example, Section 6 discusses the planned role of the RBCs in managing water allocation at the river basin level. However, little knowledge is available on how best to set up these committees with a view to assuring an efficient and equitable allocation. The experiences made with water users associations, discussed below, could be useful in setting up these committees. Similarly, as explained subsequently, participatory irrigation management at the community level requires the cooperation of different groups of water users. The same is true, in principle, at the international level. The only difference lies in the degree to which a higher-level authority may enforce overall objectives. While no such authority exists at the international level, district authorities may play such an enforcement role at the community-level. However, as discussed in the previous section and below, this enforcement potential has not necessarily been realized.

The Move towards Devolution and Participatory Management of Irrigation Schemes

In many countries, the past top-down administration of irrigation programs led to problems of rent-seeking and corruption, and to the rapid deterioration and declining productivity of irrigation systems due to poor maintenance. In Ghana, 37 % of the public investment funds not invested in cocoa pro-

duction were invested in irrigation development between 1984 and 1986, with little to show for it.³⁰ Institutional weaknesses led to high costs of irrigation development and inefficient operation of existing irrigation schemes. Moreover, farming in and poor maintenance of catchment areas led to deposition of sediments (siltation), erosion of embankments and spillways, and blockage of outlet valves, often resulting in a complete breakdown of the irrigation system.

Due to poor results of government management, together with reduced national budgets and a general move towards decentralization promoted by international donor agencies, many countries switched to participatory approaches for irrigation management and irrigation management transfer (IMT) programs starting in the 1980s. In these programs, the responsibility and authority for irrigation system management are transferred in varying degrees to water users associations or private-sector entities. Moreover, a certain preference for small-scale irrigation schemes rather than larger structures has emerged. The underlying idea is that, by increasing the involvement of local communities and water users in the construction and management of irrigation schemes, a sense of ownership can be created, making it possible to improve maintenance and rule enforcement, increase the availability of funds for operation and maintenance (O&M), and empower local farmers empowered. However, it is naïve to think of local communities as a homogeneous unit which – once given rights to a resource (i.e. irrigation scheme, water, land, etc.) – will automatically act to maximize the benefits of the group as a whole. In reality, effective irrigation management by local communities requires the cooperation of many different community members or subgroups. Such cooperation, in the interest of the whole, can be hampered by local hierarchies, different ethnic groups, or simply differences in interests and negotiating power between groups of users. Devolution may thus lead to rent-seeking activities by the more powerful and prevent the state from exercising an important role in assuring the inclusion of marginalized groups.

30 Cf. Sarris and Shams, cited in Dittoh (1998).

The tendency to increase farmer involvement in the O&M of irrigation schemes can also be observed in Ghana, where local farmers were completely ignored in the planning, construction, and even implementation of irrigation schemes until quite recently.³¹ In a 1996 interview with the International Food Policy Research Institute (IFPRI), the Minister of Food and Agriculture said that the government *will invest more in small- and medium-scale irrigation projects that will be owned or managed by their users – the farmers.*³² In the Upper East Region (UER), where irrigation is most prevalent, almost all irrigation schemes now have varying components of farmer involvement in O&M. The following section focuses on this region, which also has the highest rate of population growth and population densities and the lowest living standards in Ghana.³³

Participatory Irrigation Management in Ghana's Upper East Region

Large-scale Schemes

Ghana's two largest irrigation schemes, the Tono and Veia Irrigation Projects, are located in the UER. Both projects are managed by the Irrigation Company of the Upper Region (ICOUR), a semi-autonomous government agency, which is expected to increasingly commercialize its operations and become self-financing.³⁴ The irrigation management transfer (IMT) adopted by ICOUR aims at increasing the role of participating farmers in the operation of the projects. Village Committees (VCs) – composed of small-scale farmers – have been formed in all villages belonging to the two large-scale irrigation schemes. As of 1998, VCs were actively involved in land allocation and control and distribution of irrigation water. Training to actively participate in record-keeping, committee administration, debt recovery, literacy programs, tractor / power

31 Cf. Dittoh (1998).

32 Cf. Laube (2001).

33 Cf. IFAD (1999).

34 Cf. Dittoh (1998).

tiller-hire programs, and threshing floor construction was still deficient at the time. VCs decide on the allocation of irrigable land as well as on the quantity and timing of water releases into the sub-laterals. ICOUR only provides guidance to encourage equity and fairness, and allocates excess land to contract farmers. VCs are also responsible for cleaning sub-laterals, field drains and field bunds, while ICOUR is in charge of cleaning, maintenance and repair of the main canals. Since 1998, the United Nations Development Programme (UNDP) has supported an environmental rehabilitation program to improve catchment area protection. It consists of the development of tree nurseries, community tree-planting projects, and the planting of trees, shrubs and grasses in a 100 meter protected belt around dams.

According to an analysis by Dittoh³⁵, the Veia irrigation project has suffered from problems of poor leadership and mistrust between farmers and their leaders. As a consequence, many farmers have refused to pay fees for water and other services, and irrigation has been reduced. The Tono project does not seem to be affected by such problems. Little is known about the success of the environmental rehabilitation program. The tree survival rate is thought to be around 70 %, and soil degradation, water pollution due to sanitation problems, and high incidences of water-borne diseases remain prevalent in both project areas.

Small-scale Schemes

Many small-scale irrigation schemes based on earthen dams and dugouts also exist in the UER. Many were funded by a World Bank project, the Upper Region Agricultural Development Project (URADEP), which started out in the 1970s. While it appears that the majority of small-scale structures have broken down over time due to poor maintenance and resulting siltation problems, several donor agencies and government organizations are involved in the rehabilitation of these schemes and

in the construction of new ones. There is a clear trend towards the construction of small structures and the use of participatory approaches for management. According to Dittoh³⁶, about 75 - 90 % of rehabilitated small schemes are controlled by farmers. A major rehabilitation scheme in the UER is the IFAD-funded Land Conservation and Smallholder Rehabilitation Project (LACOSREP). In its first phase, LACOSREP rehabilitated a total of 44 dams and dugouts.³⁷ The program has recently started out on its second, so-called consolidation phase.

Currently, the WRC does not require small-scale schemes to apply for water-use licenses, as it is perceived that the total volume of water used by such schemes is small. However, if the plans to promote irrigation in Ghana and the trend towards small structures continue, it may become necessary to require licenses for such schemes.

The local-level unit of organization under participatory schemes is the water users association (WUA). WUAs are responsible for operation and maintenance of dams, allocation of land to WUA members and collection of water fees as well as for providing agricultural services on the sites. The Government of Ghana, through the Ghana Irrigation Development Authority, often provides supervision and takes care of the maintenance of head works, pumps, primary canals and other major structures. The executive body of the WUA, the Damsite Management Committee (DMC), ensures that these functions are carried out. The DMC is also responsible for conflict resolution and ensuring protection of the dam's catchment area. Figure 5 shows the structure and responsibilities of a typical water users association under the LACOSREP program.

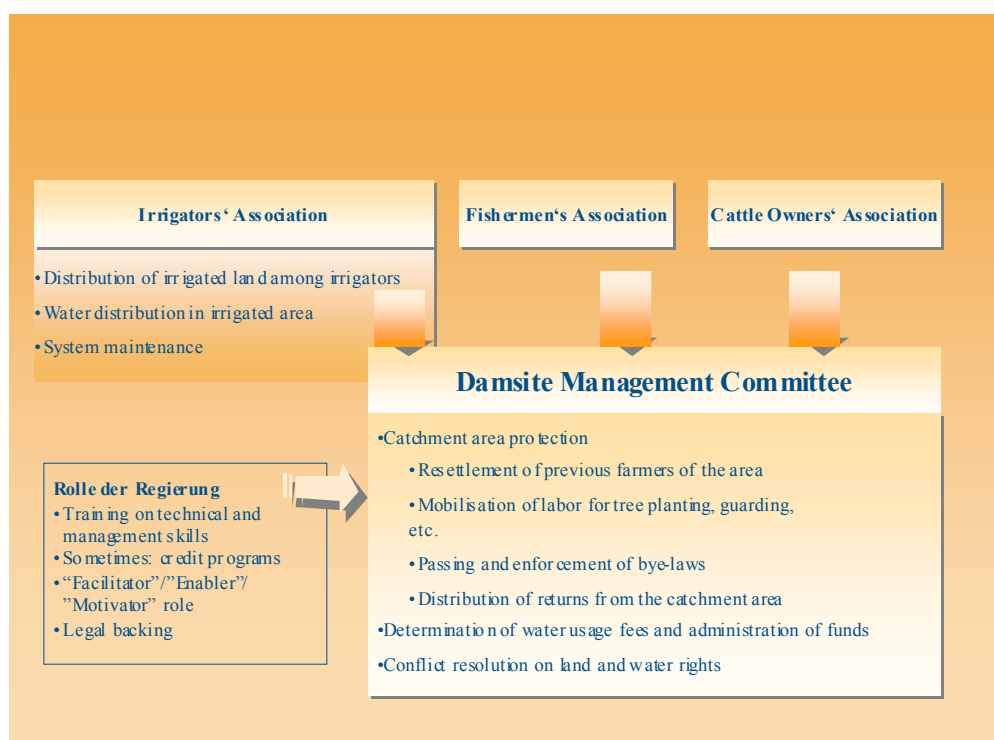
With assistance from the Ministry of Food and Agriculture and IDA, farmers have been involved in the planting of grasses on embankments and in protected belts. Attempts to prevent farming in the catchment areas have been made. However, due to land scarcity, population pressure, and poor definition of catchment areas, implementation of restric-

35 Cf. *ibid.*

36 Cf. *ibid.*

37 Cf. IFAD, 1999.

Figure 5: Structure and responsibilities of a water users association (using the example of the LACOSREP program)^a



Source: Engel, based on Ayariga (1993)

tions on farming in catchment areas has been difficult. Of the five schemes studied by Dittoh,³⁸ only one had an uncultivated catchment area. Soil degradation and water pollution caused by poor sanitation are also problems, but to a lesser degree than in larger schemes.³⁹

Determinants of Success of Participatory Approaches

The empirical evidence from Ghana's UER clearly shows that participatory approaches do not automatically lead to improved O&M of irrigation schemes. It is important to realize that participatory approaches imply significantly higher contributions of time and finances from farmers than more centralized approaches. Many aspects of participatory irrigation management require collective action on

the part of the members of local user groups. Examples include the distribution and financing of maintenance activities and the afforestation and protection of the catchment area. The fact that, in practice, differences can be observed in the degree to which communities succeed in these tasks leads to the following research question: What explains the different outcomes of participatory management across local user groups, and what policies can be used to improve these outcomes?

38 Cf. Dittoh (1998).

39 Cf. *ibid.*

Many aspects of participatory irrigation management exhibit characteristics of common pool resources.⁴⁰ The success of participatory approaches depends on whether the user group is able to *agree* on a set of *socially desirable* rules, and to *enforce* them. There are two potential ways to achieve this. First, in a hierarchical system, local leaders could take a decision. In this case, success will depend on whether these leaders act in the interest of the group and whether they have the institutional capacity (formal or informal) to enforce the decision. Potential problems arise in the form of political and economic considerations as well as corruption. Second, in a more democratic system agreement on a set of rules can be achieved through cooperation among user group members. These rules may either be self-enforcing or enforced by local leaders if – once again – they have the necessary backing in the form of formal legal or informal institutions. Free-riding and externalities are potential hurdles in the way of achieving such cooperation. Whether the problem takes on more of the first (hierarchical) or the second (democratic) form will depend on local conditions but also on the way in which the participatory scheme is set up by funding agencies. Most programs appear to aim at a democratic structure by including representatives from all potential stakeholder groups (farmers, women, landowners, livestock owners, etc.) in the formation of water users associations and by giving them equal weight in the decision-making process. However, little is known about the degree to which these externally imposed democratic structures will in fact endure in the long run, given the context of traditional hierarchical structures in Ghana.

Theoretical considerations and case studies in the field of the New Institutional Economics have led to a number of hypotheses about the conditions under which cooperation and collective action in the man-

agement of common-pool resources are more or less likely to emerge. Table 1 provides a classification of these determinants for the outcomes of participatory irrigation management. Potential policies and components of participatory programs that may influence these determinants are also shown. A few of these hypotheses will be discussed in more detail below.

A first class of determinants of the outcome of participatory irrigation management are those which relate to the community's awareness of the potential overuse and mismanagement of common-pool resources. In the case of small-scale irrigation schemes, the most problematic management aspect is the protection of the dam's catchment area. For this reason, most current programs aim to afforest the catchment area and prohibit agricultural activities in it. To achieve this, participatory programs like the LACOSREP emphasize education programs that aim to increase community awareness of the importance of protecting the catchment area for the sustainability of the irrigation system. However, it is important to point out that this approach is only likely to be successful where a lack of awareness is at the heart of the community's past failure to protect the catchment area. If, by contrast, other factors – i.e. the ones discussed below – are more important, education programs may not have much of an impact on the community's behavior.

A second class of determinants are those which determine the incentives and capacity for cooperation of individual water users within the community. One determinant which has attracted considerable attention in the literature is the number and the social homogeneity of resource users. It is generally hypothesized that cooperation is more likely to be achieved in smaller and more socially homogeneous groups. This could explain the trend towards smaller irrigation schemes in Ghana. Another factor in this class of determinants is the social capital of the community. The hypothesis is that communities where trust, leadership and altruism prevail are more successful at managing irrigation schemes than others. Participatory programs like LACOSREP are based on the idea that external actors like the government, NGOs or international donors can play a role in building social capital, i.e. by transfer-

40 Cf. Ostrom (1998). They define common-pool resources (CPRs) as systems that generate finite quantities of resource units, so that one person's use subtracts from the quantity of resource units available to others. Other authors use the term *local commons* instead (Baland / Platteau, 1996). Characteristics of CPRs are that they are typically large enough to allow for use by multiple actors and that efforts to exclude potential beneficiaries are costly.

ring partial responsibilities to local users, e.g. in the construction or rehabilitation stage, via workshops on leadership and cooperation.⁴¹ However, little is known about the success of these activities. Participatory programs like LACOSREP are centered on the idea of water users associations, which are in fact artificially created democratic structures. This raises the question of whether it is indeed possible to build democratic structures from the outside, in a context of strong traditional hierarchies.

A third class of potential factors determining the success of participatory irrigation management is related to the distribution of costs and benefits. The best democratic structures will not lead to cooperation if they are hampered by an unequal distribution of costs and benefits among different water users and between users and non-users of the resource. It is therefore important to understand the economic

41 Cf. Ayariga (1993).

Table 1: Hypothesized determinants of the outcomes of participatory irrigation management schemes and corresponding policy / program approaches

Hypothesized determinants	Program approaches
<p>Awareness of/ interest in resource within community</p> <ul style="list-style-type: none"> • Scarcity of resource • Visibility of resource and degradation • Importance of the resource conservation to people's livelihood • Existence of alternatives 	<p>Education / Awareness building "</p>
<p>Incentives and capacity for cooperation</p> <ul style="list-style-type: none"> • Number of resource users • Number of conflicting uses • Distribution of benefits and costs (see below) • Wealth endowments • Rate of time preference • Social capital • Leadership • Social heterogeneity • Prevailing norms • Past experiences with collective action • Past experiences with government programs policies • Formal and informal property rights (definition, security) 	<p>Location and size of schemes " Credit schemes Poverty alleviation, tenure reforms Participatory planning/construction? Location and size of schemes Involvement of NGOs, consistent Clear definition of rights, balance of rights and responsibilities</p>
<p>Distribution of benefits and costs of resource use and protection</p> <ul style="list-style-type: none"> • Level of investment required to make resource productive • Exit opportunities (alternative income, etc.) • Income inequality • Inequality in land holdings • Allocation rules chosen (endogenous) • Prices 	<p>Cost-sharing / technology transfer Market integration Tax policies, credit programs Land reforms, proposal of rules Proposal of rules Price policies, marketing</p>
<p>Potential for enforcement</p> <ul style="list-style-type: none"> • Size of resource • Clarity of definition of boundaries • Formal and informal property rights (definition, security) • Legal backing from higher-level agencies • Potential to exclude others • Community acceptance of executive body <ul style="list-style-type: none"> – Participation of community groups – Local hierarchies / power relationships – Leadership • Monitoring capacity 	<p>Scheme size Definition of catchment area Full transfer, adjustment Strong legal status of WUA, involvement of assemblymen, mediation Definition of property rights Involvement of all affected groups Involvement of traditional authorities Facilitation/ motivation/ training? External audits, technology transfer</p>
<p>Power structures / Information asymmetries</p>	
<p>Source: Engel, building on Rasmussen and Meinzen-Dick (1995), Knox and Meinzen-Dick (2001), Baland and Platteau (1996), Ostrom (1990), Vedeld (2000)</p>	

incentives for cooperation that prevail in a community. In the case of LACOSREP, it was found that protection of the catchment area from agricultural activities proved difficult if the farmers who had previously cultivated the area were not sufficiently compensated.⁴² As a consequence, the program recommends that these "displaced farmers" be given special consideration in the distribution of irrigated land. Similarly, the distribution of returns from the sale of goods extracted from the catchment area (i.e. fruits and grasses) is important for achieving cooperation. However, the water users associations themselves choose the rules governing distribution. Participatory programs can only provide advice on those rules that are most likely to achieve cooperation. Other options available to influence the distribution of costs and benefits from irrigation management include price policies, marketing programs and credit programs which are linked to legal and institutional reforms on the national level. If the rules are not enforced, cooperation on management and operation rules will not be sufficient to ensure the sustainability of irrigation schemes. A fifth class of potential determinants is therefore composed of the determinants related to the potential for enforcement. For example, one would expect better results where district assemblies formally support by-laws established by local water users associations. A lesson learned from LACOSREP's experience is that it is important to include local assemblymen early on in the decision process.⁴³ Similarly, experience shows that it is important to involve traditional authorities, like chiefs and lords of the land, since they have traditional authority over common-pool resources in the community (see Section 6). However, more research is needed on how programs can benefit from the structure of traditional authorities, without compromising the aim of a fair distribution of the costs and benefits of irrigation.

A final class of factors, which has received less attention in the past and is related to the issue of enforcement, is that of power structures and information asymmetries. If strong power imbalances

prevail at the community level, more decentralized approaches to irrigation management may lead to rent-seeking and corruption and may not achieve socially desirable results. Of course, similar problems exist in more centralized societies. Power imbalances are often enhanced by information asymmetries and vice versa. This leads us back to our earlier remarks on problems of corruption and distribution issues linked to the district and community levels. The article by Huppert and Renger in this volume presents interesting examples of how institutional design can help resolve these issues.

The discussion above illustrates that there are many factors that potentially influence the actual outcomes of participatory irrigation management schemes. While participatory programs have adopted design principles that appear to address these factors, little is known about their success. An improved understanding of the empirical importance of the various factors is required to improve program design and to concentrate public funds on those aspects that are most important. Moreover, the effect of many of the hypothesized factors on irrigation management appears ambiguous. In these cases, only rigorous empirical analysis can determine the actual effect of the various factors on irrigation management in the specific case of Ghana.⁴⁴

8 Conclusions and Issues for Future Research

This article is a first attempt at combining existing research projects at ZEF to describe the significant changes in water-related institutions currently taking place in Ghana and to analyze their potentials and difficulties. On the one hand, increasing water scarcity and conflicting water uses, both in Ghana and in its neighboring countries, have led to the establishment of a centralized national water management agency, the Water Resources Commission

42 Cf. Ayariga (1995).

43 Cf. *Ibid.*

44 The new project at ZEF mentioned earlier, which is funded by the Robert-Bosch Foundation, will conduct such an analysis based on econometrics and simulation models.

(WRC), with a mandate to distribute water use rights and pollution licenses among the country's water use sectors. On the other hand, Ghana has been pursuing a general policy of decentralization, including a devolution of authority to district and local level authorities, as well as a trend towards participatory approaches. Both types of reform have their advantages. Centralization of water allocation authority has the potential of providing an efficient and equitable allocation of water across sectors and to resolve externality problems associated with pollution and water scarcity. Devolution and participatory approaches potentially lead to improved water management at the local level. However, one of the major issues arising from the analysis is the way in which centralized and decentralized approaches can be coordinated to harness both these potentials. It is currently unclear how the new institutional set-up will ensure local-level compliance with sector-level water and pollution licenses. To address this issue, attempts are being made to involve district environmental committees and to build water management committees at the river basin level, though they are likely to be hampered by several factors.

First, environmental committees themselves function poorly. Second, little is known about how to set up River Basin Commissions to achieve an efficient water management and a fair distribution of water and pollution rights among different stakeholder groups. Third, the role and the sustainability of these new, externally imposed democratic structures in the context of strong informal rights held by traditional authorities remain unclear.

At the international level things become even more difficult. While the WRC has a mandate for international negotiations on water, there is a complete lack of comparable counterpart institutions in the other riparian countries. As water scarcity and the corresponding potential for international conflict grow, it is important that donor agencies facilitate comparable reforms in the riparian countries of the Volta Basin.

Analysis of participatory approaches for irrigation management at the community level has shown many parallels to the above issues. The perform-

ance of water users associations has been quite diverse, and the way in which these institutions can benefit from the enforcement powers of local authorities while ensuring a fair distribution of costs and benefits from water management remains unclear. An improved understanding of the factors that lead to different success levels would be useful to improve current programs. Moreover, the lessons learned from community level action can potentially provide useful insights for higher-level water policy issues (i.e. for the set-up of river basin management committees) and international cooperation. On the other hand, it would be important to gain a better understanding of *macro-* and *meso-*level water institutions in Ghana and their impact on local level decisions. The two ongoing research projects at ZEF will continue to analyze these issues.

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New Perspectives on Water Management: Rent-seeking in Irrigated Agriculture

Jochen Renger

1 Introduction

The present article analyses irrigated agriculture from the perspective of new institutional economics. The individual behavior of actors is decisively affected by institutional environments. Institutions are both organizations and sets of rules and norms. Central and bureaucratically organized systems in particular display structural features that favor rent-seeking. Rent-seeking is the process of seeking income and advantages that are not matched by labor or investment in the productive sense. Rent-seeking can be described as lobbying aiming at creating market and price distortions through higher-level regulatory bodies and obtaining transfer payments. Rent donors base their policy primarily on considerations of power and dominance. They allocate resources to social groups and individuals, receiving in return political loyalty and support. Rent-seeking diverts resources from productive activities and leads to a policy of distribution that causes heavy welfare losses and social costs. It damages the economic and social capability of the system affected.

Large government irrigation projects are a gold mine for rent donors and rent seekers. Administration and operation are generally subject to a highly bureaucratic apparatus allocating a wide range of rents, e.g. land, water or services. Agricultural interest groups, large landowners and farmers seek through lobbying to obtain access to state-allocated resources and services. Irrigated agriculture becomes overlaid by an unintended functional logic based on rational behavior of individual actors. Their behavior aims at achieving individual goals above all others. As a result, the focus of these activities is not on economic and development policy goals but on political efficiency in terms of specific interests.

Rent-seeking can accordingly be interpreted as a key reason for the diversity of problems in irrigated agriculture. These include minimal economic efficiency, water waste, exorbitant costs, and deficiencies in operation and maintenance. To enable irrigated agriculture to fulfill its development policy goals, it appears essential to combat rent-seeking. There are numerous institutional approaches for structuring the organization of irrigation systems and the relationships between actors in such a way that rent-seeking no longer pays. It is important to promote private sector involvement and help competitive incentive structures. In addition, it is necessary to regulate financial responsibility in particular so that resources are used for their original purpose. Within government bureaucracies it is important to establish transparent and binding norms and rules aimed at defining clearly agency responsibilities and authority and to give these legal force and make them transparent. The international donor community has a particularly important role in this. If it continues to reward and promote systems favoring rent-seeking, no institutional improvement can be expected at government level. Development cooperation must give greater attention to the problem of rent-seeking.

2 New Perspectives on Water Management

The present analysis is an attempt to examine water management in irrigated agriculture from the perspective of new institutional economics.¹ There is a need for lines of enquiry in water management, which go beyond technical aspects to look at the political and socio-economic aspects as well. The core idea of this approach is to interpret and explain the behavior of individuals and groups as a result of given political and administrative framework conditions. If we take an "average" actor, there are clear relationships between the structures in the environment within which he / she acts and his / her behav-

1 This article is an updated, abridged version of Renger / Wolff (2000).

ior. The structures and rules of the system not only determine people's scope for action ("What can, may and should I do?") but also the relative individual benefit of the various alternative actions for the actor concerned ("What course of action is most advantageous for me personally?"). This approach investigates the structures of incentives that largely determine the actors' motivations. Recommendations for improvement based on the new institutional economics accordingly involve identifying not "bad people" or "villains" but rather "poor" organizational structures and rules.²

The political systems in many developing countries are organized on centralized and bureaucratic lines which promote certain system-specific modes of behavior by actors which are known as rent-seeking. As we will see, the institutional framework can have a decisive effect on irrigated agriculture. It will be shown how and why rent-seeking can adversely affect irrigated agriculture and water management. The goal of the present analysis is to raise awareness of the problem of rent-seeking and discuss ways in which irrigated agriculture might better meet its development objectives.

3 Rent-seeking: Striving for Profit from Transfers

In the modern context of rent-seeking, rent strictly speaking means financial income which is not matched by corresponding labor or investment in the market sense, but involves a high level of organizational input.³ Rent in this sense arises from manipulation of the economic environment (e.g. monopolies, import and trading restrictions, subsidies), and the term / concept describes that part of income that derives from price and market distortions and

not from actual production in response to market demand.⁴

As a rule of thumb, rent-seeking is more likely to occur in bureaucracies remote from the market than in competitive systems of organization. This does not, however, mean that rent-seeking automatically encumbers every bureaucracy and that every company is automatically efficient. It should also be noted that rent-seeking emerges not only in the interaction between state and society, companies and politics, or within public administration, but also within companies in the private sector.⁵ The structural-organizational problem is always the same: how to design the organizational structures and procedural rules so as to limit the opportunities to misuse resources are limited. This is done through incentive and control mechanisms.

Rent-seeking: Political and Economic Behavior

Rent-seeking constitutes a form of political behavior, which can be described as the lobbying of superior regulatory bodies to garner rent. The characteristics of lobbying behavior include: submitting, following, serving, profiling, making oneself important and indispensable, soliciting, networking, passing on incorrect or distorted information, suppressing information, and frequently also bribing decision-makers.⁶ Thus rent-seeking designates a process and describes the variety of interactions between rent seekers and rent providers. For example, individuals, social groups, or interest groups exert influence on politicians and bureaucrats at all political and administrative levels regarding the allocation of resources and changes in economically rele-

2 For a comprehensive introduction to the new institutional economics see Richter / Furubothn (1996).

3 Although rent is an economic category, macroeconomic research has not yet succeeded in developing a generally valid procedure for identifying rent or rent elements in income in quantitative terms.

4 In an extended sense, rent covers all types of welfare transfer unmatched by any corresponding entrepreneurial or productive labor and investment inputs.

5 Studies show that rent-seeking is not only a phenomenon of developing and transition countries but can be found in the West, too. Cf. Picot / Dietl / Franck (1999); Wolff (1999).

6 Cf. Dietz (1998).

vant rights of disposal and use. Rent-seekers lobby and compete for government (transfer) funds.

Rent-seeking is also an economic form of behavior which aims at avoiding competitive or market pressure in order to bring about price distortions in one's own interest in the political sphere for the purpose of earning rents. One example of such activity is cartel formation. This also illustrates the difference between it and from profit seeking, the prototypical economic form of behavior in a market economy. In contrast to rent, profit arises in a competitive market-oriented process whose goal is to invest resources in productive activity (in the Schumpeterian sense) as a way of earning an economic surplus. Profit seeking is striving for productive profit; rent-seeking is striving for transfer profits.

The Effects of Rent-seeking: Welfare Losses and Social Costs

The social and economic effects of rent-seeking take many forms. In the long term the result is total distortion of the structure of social and economic incentives and misallocation of resources, leading to heavy welfare losses and social costs.⁷ Rent-seeking hinders economic growth and social development. Weede goes, as far as to state that rent-seeking is one of the main causes of underdevelopment and poverty in numerous developing countries⁸. However, it also appears that rent-seeking systems can lead to beneficial social policy and favorable economic effects, particularly in the short term.⁹

7 Cf. Pritzl (1997).

8 Cf. Weede (1985).

9 In individual instances, government distribution policy may very well benefit poorer population groups, for example through subsidies for food or fuels. Market restrictions, such as high import duties, can help protect emerging domestic agriculture or industry from being overwhelmed by international competition.

Institutional Environments and Social Conditions for Rent-seeking

Rent-seeking is a phenomenon that is present, in principle, in all political systems, although in different forms and intensities. In centralized and bureaucratic political systems, rent-seeking is much more widespread than in democratic and free market systems. This is because institutional conditions that have developed in non-democratic systems tend to reward rent-seeking behavior and make it attractive for many actors. Institutions cover both organizations (e.g. official agencies, interest groups) and codes (e.g. written and unwritten laws). Enforcement mechanisms are integral elements of every institutional environment. Bureaucracy as a control instrument functions only if the institutional environment is configured in such a way that behavior which benefits the system is more advantageous to the individual actor than behavior that damages it. If behavior benefiting the system is not profitable in this way for the individual decision-maker, actors will start pursuing their own interests within the scopes available to them – at the expense of the system goal. Rent-seeking is one of these functional defects. It tends to be favored in developing countries by the following institutional conditions:¹⁰

- hierarchical management with decision-making processes, that are not transparent;
- highly bureaucratic, in part personalized administrative apparatus;
- lack of controlling and monitoring bodies;
- minimal separation of powers between legislative, executive and judiciary;
- unclear legislative environment, high degree of legal uncertainty;
- little democratic tradition, dubious elections;
- wide education and information gap between actors.

10 Cf. Pawelka (1985) for the Middle East, Pritzl (1997) for Latin America.

Political systems with these characteristics evolve their own functional logic.¹¹ Political leaders are generally not democracy-minded in the Western sense of the term. They and their appointed and dependent bureaucrats (primarily government service officials and clerks) have to focus on their political survival and ensure adequate political support from social groups. The dominant strategy they here a simple trade: material advancement in turn for political loyalty and support. State actors develop an economic policy that is primarily redistribute in emphasis.

Segmented societies with strictly separate and internally highly structured organizational units, e.g. ethnic, religious and regional groups, family associations or guild-like occupational groups, are more prone to rent-seeking due to the requirements of socioeconomic and political competition.¹² Under such social conditions, the political leadership finds it easy to exploit these groups in their competition with each other for rents. Once established, rent-seeking tends to become autonomous and to intensify. Another characteristic of rent-seeking systems is that social groups or specific social-interest groups establish "bridgeheads" in bureaucracy. This enables them to pursue rent-seeking particularly effectively. Frequently, parts of the government are identical with individual interest groups.

Rent Donors and their Resources

Political research on developing countries indicates that political rent donors themselves can appear as rent seekers at a higher decision-making level.¹³ There are accordingly rent-seeking hierarchies. In-

dividuals and groups display rent-seeking behavior with respect to local authorities, which in turn display it with respect to those at regional level, and so on until the national level is reached. Here, the chain frequently continues on at the international level. All national governments pursue rent-seeking at the level of the international community. Such governments are known as renter states, defined as governments obtaining a considerable proportion (at least 40 percent) of their budget in the form of rent from outside sources.¹⁴ Rents in this context are of economic origin (e.g. income and investment from oil resources) or political origin (e.g. development aid). This external rent puts politicians and bureaucrats in renter states in a unique position. They can largely do without taxes from the national budget, taking, from the very start, the wind out of the call for democracy based on the slogan *no taxation without representation*. Instead, these persons act as socially elevated and benevolent rent donors, buying political loyalty and support from strategically important groups.

4 Rent-seeking in Irrigated Agriculture

Research results on rent-seeking have only been applied on an isolated basis to development cooperation. Repetto was the first to introduce a new perspective in the debate over problems of irrigated agriculture.¹⁵

Ideal Institutional and Social Conditions for Rent-seeking

Large public irrigation projects are in danger of being overlaid by rent-seeking. First, they are almost entirely subject to bureaucracy as a management system, because the government bureaucracy is also the central decision-making, operating and controlling body. Here, the institutional environment acts as an incubator and ideal feeding ground

11 Even democratic systems can structurally promote rent-seeking. Germany and the European Union offer plenty of examples in e.g. agricultural and coal policy, or nepotism within the EU bureaucracy.

12 Segmented population groups are by no means always the starting point for the formation of systems, which promote rent-seeking. Under the institutional conditions above, societies inevitably segment and organize themselves into "distributional coalitions".

13 Schmid (1991) offers a comprehensive picture on rent theory and rent systems.

14 Cf. Beblawi / Luciani (1987), p.70.

15 Cf. Repetto (1986).

for rent seekers. Second, irrigated agriculture is a gold mine for rent seekers and rent donors, because of huge government investment and payments, frequently made possible by external financial or technical assistance. The resources allocated by the state include, for example, water quotas, land, monopolies on cultivation, sale and marketing, payments for operation and maintenance and – above all – the wide range of direct transfer payments, e.g. in the form of free or cheap supply of water.

In looking at irrigated agriculture it is also necessary to take into account the problem of rent-seeking due to the fact that agrarian interest groups – primarily large landowners – traditionally constitute strong pressure groups, which no political leadership can ignore. If these groups take over parts of the top level of the national bureaucracy, politics will tend to favor agricultural interests to a disproportionate degree.

Water User Preferences Determine Action

For farmers, the top priority is the availability of water and other production resources. Their major concerns are how to get water for irrigation; how to ensure an assigned quota; how to reduce the costs to their advantage. Since large public irrigation systems are operated by government agencies, water allocation and water administration are poorly enforced; farmers accordingly mostly depend on the bureaucratic rent-seeking system to achieve their goals. Without the "favor" obtained from the agencies – in this case the fact and amount of water distributed by the agencies – farmers are unable to farm (and hence make an income) at all: farmers have to invest a great deal of time, energy, and creativity to gain entrance to all possible agencies and lobby them.

Distributor Preferences Determine Action

Government and ministries are the topmost national resource distributors, and they tend primarily pursue the goal of retaining power. To this end, they operate a policy of distribution and favor aimed at initiating a stream of new, large-scale government irri-

gation projects instead of operating existing irrigation systems in a way, which is economically efficient and sustainable in terms of development policy. Irrigation projects increase the scope open for distribution in favor of old and new clients, e.g. land allocation, water supply, and licensing. As parts of government are often recruited from agrarian interest groups, self-serving has priority. Large-scale and (particularly) new irrigation systems are very prestigious and are eagerly exploited by politicians and high-ranking officials to improve their image.

Statal and parastatal organizations play a key role in irrigated agriculture. They are generally the long arm of the ministries, or pursue an autonomous distribution policy. They allocate the actual resources, i.e. land, canal systems, water, agricultural supplies, services and agricultural credits. Although these organizations should perform their role as development agency or even service company, they are rather as an exalted distributive institution. The focus of their activities is not optimal management of the irrigation systems in economic and development policy terms but rather management for political advantage. Officials and employees in the rent donor agencies pursue concrete personal interests, such as maintaining the status quo, retaining resources and creating their own structure of dependencies dominated by patronage. Often, organizational units are occupied by a relatively closed social group (e.g. people from a given region, ethnic group, and family). It is no coincidence that many agencies are accordingly overstaffed.

Under development cooperation, the international donors supply financial and technical aid for large-scale state irrigation projects. As grants of development aid also foster the donor's own geopolitical regional and global goals and economic interests, attempts to implement important conditions to prevent rent-seeking are frequently little more than token efforts. As a result, crucial economic, institutional and (above all) political structural reforms are still lacking in irrigated agriculture in many developing countries.

5 The Impact of Rent-seeking on Irrigated Agriculture

Rent-seeking viewed from the perspective of the various actors has already been outlined above. The following sections systematically examine individual problems of irrigated agriculture from the new institutional economics perspective of rent-seeking.

Economic Inefficiency and Water Waste

Economically efficient use of water resources is not a priority. For government, ministries, and subordinate agencies, *politically efficient* water use is the decisive consideration. Water use, i.e. water supply and distribution here, is based on considerations of power and dominance. Once water has been deeded, promised or actually distributed to strategically important groups or individuals, the goal has been reached of binding these politically through material benefits. Since water distribution is subject to a process of negotiation within an uncertain and scarcely defined system of laws and norms, all attempts aimed at achieving efficient water use are incalculable in their consequences and accordingly of subordinate importance.

Deficient Control Mechanisms and Lack of Organizational Improvements

Irrigation systems often fall short of their economic and development goals because lack of transparency prevents effective management and control. The agencies frequently have inadequate financial accounts, controlling, logistics and statistics. Monitoring and evaluation by the agencies leave a great deal to be desired. An additional consideration is the reticence on the part of agencies to make laws, regulations, and rules on water management and agricultural data available to the public. For government agencies and organizations, any form of transparency is a direct threat to their comfortable position as allocate institutions. Lack of transparency is a crucial condition for creating scopes of action and decision-making in assigning rights of use and disposal or transfer payments. It is accordingly not

surprising that all activities aiming at accountability, data collection, and control encounter resistance.

Rent-seeking is an extensive barrier to organizational improvements in irrigated agriculture. This relates less to the technical state of the systems than to the know-how involved in managing irrigation systems. For state agencies as operators, technical and organizational improvements are entirely welcome, but only in the sense of new assets for distribution. The possible favorable economic and development-related effects of new technology or organization are secondary considerations as far as they are concerned. However, improved technology in particular is extremely welcome as one more asset for distribution. There is correspondingly great interest in acquiring a great deal of modern technology through international donors.

Suppression of the Control Effect of Water Prices

International donors require water tariffs to cover the costs of operating and maintaining irrigation systems. When rent-seeking has spread, none of the actors has a major interest in introducing water tariffs. For political decision-makers, considerations of power politics make water tariffs inappropriate. Water tariffs arouse demands and cause unrest. Ultimately, someone who pays has an entirely different sense of his / her rights. Water authorities are also not committed to water tariffs because they generally flow directly to higher-ranking institutions. Realistic water tariffs would deprive them of their role as distributive agency, and they would thus have to provide the appropriate services. Even farmers are very skeptical about water tariffs. In many cases it turns out that water tariffs are an additional burden without any effects on better service delivery. Thus rent-seekers will do almost anything to prevent the introduction and collection of water tariffs. Frequently, water tariffs are introduced *de jure* in order to satisfy international donors but are not collected *de facto*.

Deficiencies in Operation and Maintenance

In many countries where rent-seeking has spread, public services in operating and maintaining large public irrigation projects have the nature of rent. Operation and maintenance function not in their own right but because they have been created and allocated, and may in turn be withdrawn, by state agencies as assets for distribution.

Water agencies have primarily to ensure that an irrigation system functions in accordance with the state of negotiations in the distributive game with water users. Economic operation of the systems is not the objective here.¹⁶ Questions of maintenance also play a subordinate role. The state agencies are much more concerned with implementing a steady stream of new projects and systems that provide scopes for political maneuver. New systems mean new assets for distribution and – naturally – enhanced political prestige. The temptation to have international donors finance and install new systems is another motivation. Why maintaining existing systems if new ones are politically more opportune, and are financed into the bargain?

The farmer is confronted by rent-seeking in all areas of the irrigation system. He has to ensure that the water reaches his fields through the primary and secondary systems. Operation and maintenance of these systems are generally under state responsibility, i.e. if there are no authoritative water users associations. The farmer must frequently "organize" operation and maintenance, i.e. meet with the agencies and negotiate accordingly.

Deterring Private Investment

Private investment in a rent-seeking environment represents an incalculable risk. Since farmers in many developing countries frequently have no long-term use rights, let alone property rights, to irrigation water, private investment by water users can

hardly be expected. Nevertheless, many international donors call for financial participation by water users in the form of contributions towards investments. The goal here is to encourage water users to make responsible use of the systems. In open and unstable institutional environments like rent-seeking systems, this goal is unattainable. The financial contributions will most likely not be associated with rights and security, and will probably vanish somewhere in the bureaucratic apparatus. As long as the institutional uncertainties persist, any financial contribution by farmers themselves is merely an additional burden.

6 Institutional Approaches to Combating Rent-seeking

There are many approaches to limiting and avoiding rent-seeking. Action has to be taken on different levels such as the project level and the policy level.

Analysis and Disclosure of Actors' Interests

Since large public irrigation projects are managed by state bureaucracies, the focus shifts to analysis of bureaucracy as a management system. This is not an academic exercise; it is a matter of extreme importance for the practical implementation of projects in development cooperation. The undoubtedly discomfiting disclosure of the interests of actors and their modes of behavior provides information for example about who is bringing what motivations to a project, and who supports it more or less enthusiastically. An associated consideration is that the causes of problems cannot be found solely in the traditional framework of irrigated agriculture itself. In numerous cases, for example, solutions based on irrigation technology will be predictably insufficient to appropriately counter problems that have been identified. What are needed instead are organizational concepts to configure the institutional framework so that key problems in irrigated agriculture can be avoided in advance.

16 It is even possible to argue that the agencies have an interest in the systems not operating. Disfunctionality of systems is one of the structural foundations of rent-seeking. Everything has to be negotiated.

Making Rent-seeking Less Attractive

The goal of all measures directed against rent-seeking is to modify the institutional environment in such a way that rent-seeking is no longer profitable and too risky, and that productive activities (profit-seeking) become attractive instead. This means re-organizing social and economic systems of incentives in irrigated agriculture. Internal bureaucratic reforms are needed, on the lines of private-sector service providers, for example the introduction of an accounting system coupled with performance-related systems of compensation and promotion. At the government, fundamental reforms in the political and administrative system is needed, e.g. transparency, monitoring of management performance, and separation of regulatory functions from operative tasks. Such reforms demand above all clear commitment and determination on the part of reform-oriented political elites. In many countries, such as Jordan and Peru, sector reforms are successfully under way to change the system of irrigation administration.

Securing and Promoting Private-sector Commitment

A key element in constraining rent-seeking is promotion of private-sector commitment. Even in societies in which rent-seeking is a widespread phenomenon, there are actors interested in changes in the system, which promote efficiency. These frequently include the craft trades, commercial and industrial sectors, and social groups such as the urban middle classes and small farmers. It is important to promote these in order to increase their political weight. We see how entrepreneurs invest, both inside and outside state-dominated irrigated agriculture, in profitable areas such as the manufacture of export products, distribution of agricultural supplies, marketing and transport. Compared with the state sector, private-sector companies or commercialized independent state enterprises are able to show considerable success in irrigated agriculture, since the competition here systematically penalizes inefficiency. The international donor community should accordingly promote investment where it can help limit opportunities for bureaucratic influence.

Creating Transparent Financial Responsibility in Irrigation Systems

Financial reforms should aim at creating direct and transparent financial relationships between all actors. Decision-makers must also bear full financial responsibility for the results of their decisions, right down to the level of the individual. Agricultural agencies, for example, could be given a published budget for which they are responsible to their customers as well as to the agencies at higher levels. Official services going beyond basic government functions can be at least partly financed through fees. Water fees should be paid directly to the water agencies to finance the operation and maintenance of the installations. Funds provided by higher-level agencies for investment, operation and maintenance should be recovered and repaid. A repayment system of this kind can not only counter the disappearance of funds but also encourage economic commitment.

Individual actors who fail to discharge their responsibilities should themselves be discharged. Successful performers or applicants must be promoted accordingly or rewarded or compensated in other ways. Public disclosure must be made of these measures and for successes and failures in irrigation. Ultimately, public pressure from local and global public opinion in the media age is the most promising way of eliminating undesirable situations at the various decision-making levels. In many cases, tax money is involved. As a result, publicity leads to pressure on decision-makers to pursue efficiency.

Utilizing the Management Effect of Prices and Competition

While the market is not a panacea, economic incentives operating through market and competitive structures are still an appropriate means of constraining rent-seeking. Exchange relationships, which are as clear as possible, should be established between the various actors in irrigated agriculture, i.e. clearly defined performance in exchange for clearly defined contributions. Water users, for example, should participate in the investment costs of

installations, if this is combined with ownership or long-term user rights. Fees for water, operation and maintenance of installations should be collected, provided that the service in return for these is clearly specified. The fees must go to the agencies providing the service to be paid for, and those creating the demand for the service must have alternatives available, at least over time. Otherwise, economic incentives will be deprived of their effect. Competitive alternatives can be created by auctioning adequately defined service packages for limited periods among various service providers.

Adjusting International Donor Policy

The international donor community has a central role to play in rent-seeking, since it is a key source of joint finance for the irrigation systems and can accordingly exercise great political influence on governments. Development cooperation should aim to leave no scope for rent-seeking. At the level of development cooperation, projects can be designed so that they do not allow the conditions for rent-seeking to arise in the first place. Transparency in decision-making and allocation of funds and participation of autonomous target groups are promising approaches for this purpose. Otherwise development cooperation runs the risk of promoting rent-seeking, as has frequently been the case in the past decades.

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Efficient Inefficiency: Principal-Agent Problems in Irrigation Management

Walter Huppert

1 Introduction

In the wake of the Green Revolution, irrigation experts were hoping for a water management revolution to provide a comparable boost to production and productivity increases in irrigated agriculture in the developing world. Given the low efficiencies of water use, far from optimal cropping intensities, and the gaps between the area developed for irrigation and the area actually irrigated, sound management practices promised to solve these problems and respond to growing scarcities of water resources at the same time. However, few of these dreams have come true in recent decades. Water use efficiency in irrigated agriculture in developing countries remains low in many cases; the majority of irrigation schemes suffer from deferred maintenance, and the premature rehabilitation of irrigation infrastructure is eating up meager local financial resources, or diverting foreign funds urgently needed for other purposes.

One response to this situation has been the widespread desire to transfer management responsibilities from state agencies to local water user organizations. The results, however, have been mixed so far, so that a renewed interest in joint management between state agencies and water users is beginning to emerge. The intention is not to revert to old patterns of state paternalism and centrally administered water management, but instead to share roles and responsibilities in ways that correspond to local circumstances and that ensure optimal water service provision.

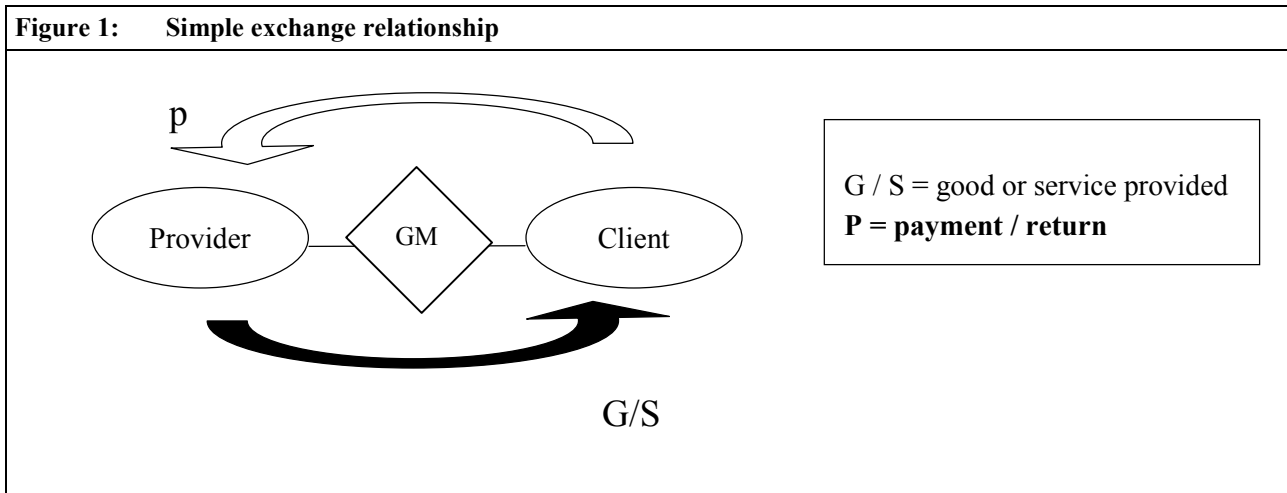
These new approaches require a fresh look at the problems and weaknesses of state agencies as service providers in the irrigation sector and as partners in a cooperative management relationship with water users. First and foremost, the interaction and coordination between service providers and

service recipients deserve renewed attention. Principal-Agent Analysis opens a new perspective in this respect. Instead of accepting high levels of inefficiency and tendencies towards rent seeking and corruption as in-built characteristics of state service organizations, this approach draws attention to contexts and circumstances that provoke such behavior. Analyses of this kind are an important tool for use in converting the fight against bureaucratic inefficiencies, rent seeking and corruption into a *struggle for* transparency and accountability in joint irrigation management.¹

2 Service Provision in Irrigation

Water allocation, water delivery and maintenance are more than just the performance of technical tasks. It is useful to perceive them as services supplied by a provider, the agent – usually an irrigation agency or a water user organization – to a receiver or client, the principal – usually a farmer or a group of farmers. Hence, looking at irrigation services, we need to be aware of the underlying exchange relationship between a particular provider and a particular receiver / client – in other words the relationship between agent and principal. Figure 1 visualizes such a simple, bipolar exchange relationship. Service delivery can be provided in an effective and efficient way only if this relationship functions well. As economic theory tells us, the functioning of such exchange relationships depends primarily on the demand and supply conditions of the good or service to be provided (G or S in Figure 1) as well as on the price or return to be paid for it (p in the figure). But under real life conditions a good match of demand and supply of the good or service and the price to be paid for it, is not sufficient to make the relationship function. Who or what ensures that the agreed service and return / payment are actually provided according to the expectations of the two parties? In other words, what kind of mechanisms is available to govern the relationship? To what extent can the providers

¹ Cf. also Wolff / Huppert (2000).



induce the recipients or, conversely, the recipients induce the providers to honor their respective commitments and obligations? What prompts incentives to create and maintain a high-quality service relationship? Or, to rephrase the question, what prevents providers and recipients from behaving in an opportunistic manner?

Questions like these point to the importance of smoothly functioning *coordination mechanisms* or *governance mechanisms*² as a precondition for successfully functioning exchange relationships. Governance mechanisms may comprise one or several of the following mechanisms:

- formal and informal contracts and agreements between parties;
- externally set and enforced laws and regulations;
- third-party interventions such as external audits, regulatory actions, adjudication, and operation of joint committees comprising representatives of both sides;
- basic norms, values, and common understandings (*cultures*) shared by the exchange partners;
- procedures and common practices growing out of rules, regulations, norms and values.

The contracts, agreements and other form of governance mechanism that coordinate the exchange

relationship is represented in the figure by the diamond in-between the provider and the client. These mechanisms create incentives, which act on the parties to the agreement, causing them to honor (or abrogate) its terms. Incentives can be either positive – e.g. bonus payments for superior performance or praise and approval from fellow staff and farmers – or negative e.g. penalty payments, loss of future contracts, or criticism and ridicule from friends or colleagues.

3 Fundamental Principal-Agent Problems

People will engage in and maintain relationships for the exchange of goods or services if there are incentives for both the providers (the agents) and the clients (the principals) to do so. These incentives depend on the demand, supply and price conditions mentioned above, but are also influenced by the strength and credibility of the governance mechanisms in place. An important indicator of the strength of governance mechanisms is the level of accountability and transparency they bring about in a particular relationship.³

In commercial exchange relationships, accountability is unambiguous in many cases: the provider

² The terms are used interchangeably.

³ Cf. Svendsen / Huppert (2000).

of the goods or services, the agent, is accountable to the principal, i.e. to the person or organization that orders, pays for and makes use of the goods or services delivered. The latter, the customer, assumes three functions at the same time: as the arranger, payer and user (consumer) of the service provided. As such, under normal circumstances, the customer is able to shape the terms of the delivery agreement, monitor and evaluate the provision of the service, and sanction non-compliance with the terms agreed upon. Achievement of accountability (A) under such normal circumstances is thereby ensured in an ideal way and further enhanced by the direct interaction between the exchanging parties. Accountability here indicates that the provider honors the terms of the contract and is aware of and accepts sanctions by the principal in case of non- or sub-optimal performance. Where many goods and services are provided, transparency (T) for the customer can be readily brought about by comparing the actual service provision with the agreed-upon – and clearly specified and quantified – terms.

Unfortunately, circumstances that would promote such easy-to-achieve compliance with A + T requirements⁴ are often absent, especially in service delivery situations. The first problem of transparency arises due to the fact that many services, such as consulting, giving advice, teaching or carrying out complex non-routine professional activities, cannot be inspected before the service has been provided. With the provision of material goods, the customer may benefit from a fairly high level of transparency concerning the quality of the goods to be purchased simply through prior inspection. This is not possible in the case of the services mentioned above. Even if the provider and the customer agree on a predetermined service quality level, a certain degree of non-transparency – and hence risk – exists, as the customer cannot be entirely sure what to expect from the provider.

The problem of transparency is particularly serious in situations where there is a large gap in professional knowledge between the provider and the customer with respect to the service provision

process. Not every customer of a pump repair service may be able to judge the inputs required to repair a given pump failure. Nor will such a customer generally have a clear idea about the exact time needed to do the repair job. A low level of transparency for the customer is a more or less in-built characteristic of more complex services. In fact, information asymmetry may be the reason why the service is asked for in the first place: the provider is the expert and has knowledge and experience that is not available to the client and that is hence the object of the demand. Nevertheless, such transparency problems – or problems of information asymmetry – may have serious consequences. First, it is difficult for the customer to judge the quality of the service and the price demanded for it. Second, the customer faces considerable uncertainty with respect to recommendations made by the provider for further action. In our example of a pump repair, the provider may propose replacing essential parts of the pump set and purchasing new spare parts. Such a recommendation can be a real necessity in the given circumstances. But even so, the non-expert customer is left with a certain risk that the provider may be proposing an action that is not really needed but has only been proposed to increase the provider's gain (demand induced by the offer). Such a risk is called moral hazard in principal-agent theory.⁵

Transparency problems that stem from differences in information between the service provider and the customer about the details of a particular service provision process – i.e. information asymmetries – can also arise in a different context. Even if the customer has the professional knowledge to judge the quality of the provision, he or she may not have the time or opportunity to monitor the behavior of the provider. Here again, control problems related to the provision process arise and a certain risk remains for the customer that the provider may be using this situation to his / her advantage.

Moral hazard situations are common in everyday life as well as in irrigation development. Think of a

4 Contract theory speaks of complete contracting.

5 Cf. Richter / Furubotn (1996); Wolff / Huppert (2000); Huppert / Svendsen / Vermillion (2000).

consultant who is commissioned by a development agency to support the institutional strengthening of a water user association in a developing country. The commissioning agency is too far away to monitor and control each step of the consultant's work. Moreover, the terms of the contract can only be rather vague, given the unpredictability of the interactions with local partners and target groups, and their reactions. Still, if the governance mechanisms – i.e. the contract itself, the non-formal agreements, the norms and values shared by the contracting parties etc. – function smoothly, information asymmetry need not be detrimental, and the service relationship may still function well, with the consultant striving for optimal performance.

Moral hazard problems can considerably aggravate circumstances in which problems stemming from deficiencies in transparency are combined with external influences that impinge on service provision but cannot (in reality and / or in the eyes of the customer) be influenced by the provider.

In our pump repair scenario, the customer may find it difficult to hold the provider accountable for the repair job according to the agreed-upon terms if the repairperson claims that it was only during the repair work that some unforeseen additional damage was discovered. In a similar manner, the above-mentioned consultant supporting the institutional strengthening of a water user association may point to the unforeseen influence of the local government, to sudden conflicts between major stakeholders or to other contingencies beyond his or her control. In both cases, the provider (agent) may use these facts to deviate from the terms of the contract, without the customer (principal) being able to hold him / her accountable for such deviations. Such situations are particularly difficult in cases in which considerable investments have already been made up to the point in question. Since it will not be easy for the customer needing the pump repair or for the agency commissioning the work to hire a different service provider at an advanced stage of the project without considerable losses in time and money, he or she faces a problem that referred to as the hold-up problem: While the agent cannot be held accountable for the non-fulfillment of the terms agreed upon, insistence on the terms of contract by the

principal may result in substantial losses. Hence, the principal is held hostage in this situation and may not have any other option than to comply with the demands of the agent, unless the design and composition of the governance mechanisms are such that such an outcome can be prevented.

This discussion makes it increasingly clear that basic A + T problems of service provision like those mentioned above arise in circumstances in which essentially problematic components coincide:

- A transparency problem brought about by the complex nature of the professional service and / or by the customer's difficulty in monitoring the service provision process (in other words, by information asymmetries). This problem may consist in or be combined with circumstances in which the service delivery process is subject to unpredictable influences beyond the control of the provider.
- A problem of governance related to the service relationship. Contractual provisions or other enforceable rules that enable the parties to cope with the above-mentioned problems are lacking or insufficient.

These problems weaken the accountability of the agent, encourage opportunistic behavior, and hence open the door to rent-seeking behavior⁶ and corruption.

4 Principal-Agent Problems in State-administered Irrigation Systems

The example most often cited in discussing principal-agent situations in irrigation relates to an irrigation engineer or ditch rider of a state-administered irrigation agency who renders service de-

⁶ The term rent seeking indicates the pursuit of monetary or non-monetary advantages (rents) through non-productive influence activities (e.g. lobbying). Renger, in the present volume, provides a comprehensive discussion of rent-seeking behavior (cf. also Renger / Wolff [2000]; Repetto [1986]).

livery unpredictable, i.e. prevents the farmer from knowing in advance when and how much water he will receive.⁷ The engineer possesses information about water availability that is not accessible to the farmer. Hidden information enables him to use the situation to his advantage and extract illegal side payments for a service he is actually supposed to provide.

What Robert Wade describes for just one level of exchange (between engineers / ditch riders and water users) may be endemic throughout the entire system. Large and medium-size public irrigation agencies often operate with an extremely steep hierarchy of engineering levels. In the large systems in Pakistan and India, there are often seven or more such levels.⁸ Every superior-level engineer supervises an area of the system that is subdivided between three or more engineers immediately below him. Hence these subordinate engineers and the sub-areas they represent compete for water allocations and/or budget allocations from the level above. However, only the higher engineering level often knows the exact figures on water availability or the available budget. These figures may vary highly from season to season or within seasons (or between and within fiscal years) and are subject to various external influences. This information differential between engineering levels creates moral hazard situations, with the lower levels facing the risk that the superior level is behaving opportunistically, allocating water (or funds) on a preferential basis, with extra amounts (of water or finances) given to those levels that provide personal advantages of a monetary or non-monetary kind.

While such cases of petty corruption may be of little relevance compared to large-scale corruption in the context of major infrastructure investments, they may nevertheless seriously hamper efforts to improve the efficiency of irrigation water delivery if they become endemic throughout the system. Since such a set-up may provide additional income to most of the (generally underpaid) irrigation pro-

professionals, and since large and influential farmers can be sure of preferential allocations, the system can degenerate into a very stable condition of inefficiency. In fact, none of the influential actors, i.e. both the irrigation engineers and influential farmers, will have any motivation to change this situation – if anything, the opposite applies.⁹ It is clear that any effort to improve irrigation system performance by means of technical improvements or managerial prescriptions will stand little chance of success unless such motivational structures can be changed as well.

Moral hazard problems in irrigation may also accompany complex engineering services, e.g. those required to maintain and repair pumping stations or to rehabilitate complicated hydraulic structures in irrigation canals. Often, the agent is the one who has to specify the demand for the engineering services and perform the required tasks, like the doctor who provides the diagnosis as well as the therapy. From the client's point of view, i.e. from the farmer's perspective, this lack of transparency has a considerable impact on his / her control over the service: the farmer loses part of his / her client sovereignty and becomes dependent on the judgment of the service provider, the engineers. In most cases, farmers are not really able to determine whether any additional technical works recommended by the engineers are truly necessary, or whether the engineers are acting purely out of self-interest. With this type of offer-induced demand, farmers will encounter great difficulty in keeping service delivery in line with their actual needs.

In irrigation management, the above-mentioned hold-up problems are also common. After a farmer has prepared the land and applied the seed, he / she remains absolutely dependent on a timely and sufficient water supply. Even though there is no information asymmetry involved, the farmer may, after making the investment, be exploited by the delivery agency, for instance by being asked for a tip. If hold-up problems are coupled with information asymmetries and moral hazard problems, this will create situations where farmers – especial-

7 Cf., for example, Wade (1982).

8 Cf. Svendsen / Huppert (2000); Scheumann / Vallentin (1998).

9 Cf. Scheumann in the present volume.

ly the smaller water users in the tail reaches of canals who lack the resources to play the game – lose the will to engage in intensive irrigation farming. External evaluations often interpret such situations as demonstrating a lack of technical knowledge on the side of the farmers, and devise training programs, predictably to little avail.

In irrigation, many deficiencies, including maintenance and repair problems, can be traced back to hold-up situations. Situations where special tailor-made equipment has been acquired that are unique on the market (e.g. special equipment for automatic downstream water control; special sets of pumping gear etc.) illustrate this problem. When an irrigation organization has already invested heavily in equipment, it risks losing some of its investment or being faced with expensive adjustments should it try to change suppliers. This therefore creates a situation where the original supplier, who may attempt to demand excess prices for spare parts, servicing or additional equipment, may exploit the high specificity of the investment.

5 Principal-Agent Problems in Water User-managed Irrigation Systems

At first glance, it might be assumed that such problems occur only in large agency-managed systems, i.e. in irrigation schemes in which an irrigation agency manages the main and secondary system and possesses the authority to determine and implement any major structural improvements. However, even transfer of authority to farmers does not necessarily exclude moral hazard problems. To the contrary, moral hazard risks are at the root of one of the most pertinent problems afflicting the management of associations, so-called completed staff work. Larger associations like water districts need to employ specialized staff or even professionals to take over tasks that are time-consuming and require a high degree of professional expertise that association members cannot provide. This situation is inherently prone to a moral hazard problem of the following kind: professionals like district managers, as agents, provide a service to the

principal, the association, or, more precisely, to the governing board of the association. If decisions have to be made based on complex technological considerations, the president and the board of the association, as laymen, have to rely on the agent to provide them with timely and sufficient information on where and when interim decisions have to be made that could influence the final outcome. However, the agents may take such interim decisions on their own (following their own interests) and not inform the principal about them. On the basis of hidden information and hidden actions, they may present the principal with a final solution that he/she can either accept or reject but never properly evaluate or change – hence the term completed staff work.

The staff members of a professional maintenance unit may, for instance, prepare a maintenance plan. In so doing, they may, on the basis of their professional judgment, make an interim decision to replace certain infrastructure parts with new equipment. But they may also decide to plan a level of maintenance well above actual requirements. In presenting their maintenance budget requirements to the board of the irrigation district, the professionals submit completed staff work that leaves little room for the board members to understand or even change underlying decision criteria – just like a patient of a highly specialized doctor can hardly judge the therapy when he or she does not even understand the diagnosis. Following this line of action, the maintenance staff engage in rent-seeking activities, i.e. seeks to manipulate decisions in such a way that they will ensure or even enhance their future job security and thus pocket a (completely legal) rent, without having engaged in any additional productive activity.

6 Options to Solve Principal-Agent Problems

The literature describes quite a diverse set of options for the solution of principal-agent problems¹⁰. The most common approaches that are of relevance to the irrigation sector are the following:¹¹

— *Performance compensation*

In this scenario, the client / principal seeks to couple the level of return / compensation for the service to verifiable indicators or other facts that can be influenced by the provider / agent. One way may be to agree upon individual performance levels, as in the Management by Objectives approach. In general, this is a difficult approach to be followed in irrigation. In fact, it means that fees for irrigation water delivery need to be somehow coupled with the quality of delivery service. While it is possible, but not always easy, to link the level of fees with the volume of water supplied, it is difficult to establish such links with respect to quality aspects of water delivery such as timeliness, predictability, flexibility etc. However, in a more general form, such links can be made. An example of an incentive-based method of avoiding potential moral hazard risks in irrigation is provided by franchise systems like the one that the French Government is using in the Gascogne.¹² The *Compagnie d'Aménagement des Coteaux de Gascogne* (CACG) has a 10-year mandate to provide a certain maintenance service to water users in irrigation systems. If CACG as a provider does not perform in the desired way, another provider will be chosen for the next term. Creating a credible threat of competition between alternative providers acts as a self-regulating incentive for them, encouraging them not to deviate too far from the buyer's interests when deciding upon the allocation of scarce resources. If wasteful suppliers fail to comply

with the buyer's interests, they lose their source of income.

— *Team-building*

Information asymmetry may be avoided through team-building efforts in which team members each have an interest in preventing moral hazard actions by others. Social pressure and control can in this way bring about efficient service provision.

There are lessons to be learned in this respect from recent irrigation reforms in Andhra Pradesh, India. Svendsen and Huppert¹³ report that previously, due to non-transparent situations of the kind described above, engineering staff was able to play one farmer off against another, opening up opportunities to secure and raise side payments for preferential treatment in water delivery. However, irrigation reforms have introduced two important changes. Firstly, Water Users Associations (WUA) was established at the level of the minor canals, while committees were formed on the next higher level of canals (Distributor Committees). Secondly, specified on-site engineers from the responsible irrigation agency were allocated new roles as so-called Competent Authorities (CA), charged with supporting the Committees and WUAs in technical matters. Under the new set-up, the Distributor Committee interacts with the Competent Authority to plan a water delivery schedule for all the WUAs represented in that Committee. Water availability and water allocation are in this way made transparent – for the individual WUAs as well. As Svendsen and Huppert observe:¹⁴

"The farmers now have a hand in arranging service delivery, a process that had previously bypassed them entirely. Their only function under the old setup was to use whatever water they received to grow crops. The change is important, in terms of

10 Cf. e. g. Richter / Furubotn (1996).

11 Cf. Wolff / Huppert (2000).

12 Cf. Huppert / Hagen (1999).

13 Svendsen / Huppert (2000).

14 Svendsen / Huppert (2000), p.33.

incentives, because the users of the service are the ones with the strongest conceivable incentive to arrange the highest possible quality of irrigation service. They replace, in the function of arranging the water delivery schedule, irrigation technicians and engineers who have little or no stake in the quality of service they provide, and thus have little incentive to act in the interests of the farmers."

In this way, the farmers' new role in arranging service provision helps to close off the avenues for rent-seeking behavior open to water delivery staff.

— *Decentralization of ownership*

The idea here is that, in cases where a local actor is the owner of certain resources, he or she may treat these resources with more care than would otherwise be the case. Certain critical resources could therefore be transferred to this actor.

This is the idea behind the wave of irrigation management transfer efforts that have taken place in recent years in the irrigation sector across the world. Management transfer assumes that water users who are responsible for their own systems will handle these systems more efficiently than public administration employees, since they are the ones who benefit directly from increases in efficiency. As mentioned in the introduction to this paper, the results of these efforts have been mixed, and it can be assumed that principal-agent problems inside water users organizations – like the ones mentioned above – have been vastly underestimated.

One noteworthy way of redressing the asymmetrical information status inside water user associations has been reported from traditional irrigation schemes in the Andes¹⁵ Irrigation farmers in the Bolivian Andes still use the principle of rotating tasks (*cargos rotativos*).

Members of different age groups are responsible for different tasks in the operation and maintenance of the irrigation system. This age-dependant rotation means that in the course of time everyone becomes familiar with all the essential tasks needed to keep the system operational. At the same time, this prevents one particular person from gaining specialized knowledge, which is not available to others. In other words, it prevents the emergence of an asymmetrical information situation and hence the existence of moral hazard situations.

While it may be difficult to transfer such experiences, the sustainability of traditional irrigation systems in the Andes illustrates the power of genuine ownership and participation in overcoming principal-agent problems.

— *Efficiency pricing*

In cases where a client (principal) can obtain services on the basis of agreements for returns (payments) that do not reflect the scarcity of the service, he or she will tend to overuse and waste the service. Hence, efficiency pricing is needed to prevent such moral hazard problems.

This argument is well known in the irrigation sector and relates to the introduction of cost-covering prices for water delivery services. However, it is important to be aware of the fact that full cost pricing – and the elimination of principal-agent problems on the side of the individual water user – requires a reliable and predictable service in the first place, and hence solution of any principal-agent problems on the provider side (i.e. inside the irrigation agency or the water user association). To engage in water pricing schemes without previously addressing this condition will in most cases lead to a complete waste of effort.

— *Manipulation of outside options*

In this scenario, the client / principal tries to stop undesirable side-actions by the provider / agent that may have an effect on the service in question.

Before the recent irrigation reform in Andhra Pradesh, India, village revenue officers for a certain canal reach on the basis of the area irrigated collected irrigation fees in the Sriram-

15 Cf. Huppert / Urban (1998).

sagar irrigation scheme. The revenues collected had to be handed over to the revenue department. Water users did not have access to revenue records and hence could not verify the amounts handed in by the collectors. At the same time, the revenue department did not have the means to carefully monitor and control the areas irrigated in a certain period, and as a result had no accurate information on the amounts collected. This structural deficit opened the door to opportunistic behavior on the part of the village revenue officers. There was a great temptation to hand in amounts of money substantially lower than the amounts actually collected – a situation not easy to resist given the poor salary level of state employees. Hence, the figures in the revenue records did not at all reflect the actual area under irrigation. With the establishment of WUAs, water users gained access to revenue records. More importantly, the reformers have implemented several steps aimed at modifying the incentives relating to irrigation fee assessment and payment. The most important is tying WUA maintenance grants to the area registered with the Revenue Department. Consequently, the WUA receives a larger maintenance grant due to the expanded irrigated area on the tax roles. The benefit for the Treasury is an increase in revenue to the state.¹⁶

Thus, the enormous increases in the area irrigated following the creation of Water Users Associations are due less to the increased efforts of the water users than to the effect of institutional changes that put a stop to the corrupt practices of some of the stakeholders involved.

7 Conclusions

Given increasing water scarcity problems worldwide, improving the efficiency of irrigation schemes

is of the utmost importance. However, many irrigation systems are locked in an inefficiency trap. This trap is due to the fact that inefficient water delivery and maintenance may provide sources for additional income or at least offer non-material advantages to the providing managers or technicians. In terms of the personal goals of income maximization and extension of socio-economic power that are pursued (not only) by most of the irrigation staff, inefficiencies may be highly efficient in terms of personal gain. More often than not they pave the way to rent-seeking activities and corruption.

The common practice of searching for technical and / or economic / financial solutions to the efficiency problem in irrigation is therefore bound to fail in many cases. While this will often be the case in state-administered systems, farmer-managed irrigation systems are by no means immune to such incentive distortions.

It is therefore imperative to give more space to principal-agent-analysis in irrigation management and elsewhere, and to search for solutions to problems of transparency and accountability. The degree of commitment attached by local governments to such approaches may be a good indicator of the chances for real improvements in performance in the irrigation sector of the country in question.

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16 Cf. Svendsen / Huppert (2000), p. 43.

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River Basin Management and the Economic Theory of Federalism

Two Basic Concepts and their Applicability to Water Policy

Axel Klaphake

1 Introduction

Many observers complain about over-centralization and over-intervention in water management in developing countries.¹ According to them, competences and administrative capacities at the local or regional level should be enhanced in order to realize a water management which is closer to the needs of people and the characteristics of water as a space-bounded resource. However, it is doubtful whether a pure decentralization of competences in water management alone will yield satisfying results in terms of environmental protection and efficiency in water resource utilization. Since water bodies do not respect political or administrative boundaries, political systems in which the smaller units (states, regional or local authorities etc.) have the primary responsibility in water policy could fail to put into practice a coordinated and a basin-wide approach in water management.

Against this background, river basin management (RBM) is strongly recommended as an adequate approach for institution-building aimed at better matching regional and local circumstances (characteristics of rivers and groundwater bodies, regional and local preferences etc.) on the one hand and political responsibilities on the other. But RBM is an equivocal concept, which means different things to different people in different political systems.² While RBM is often judged as a decentralization concept, in some political sys-

tems it is rather perceived as an attempt to re-centralize water policy.

Furthermore, there are confusing and somewhat contradictory concepts concerning the very nature of RBM. Largely, RBM is interpreted as an *operational* affair, water allocation, water quality management, cost recovery and stakeholder involvement being essential components of it. However, in this view the respective organizations at the river basin level are neither a legislator nor responsible for policymaking and the setting of objectives for and constraints on operational management.³ This type of RBM is thus rather a regional approach to the realization of objectives stipulated elsewhere. On the other hand, some advocates of RBM support a broader delegation of power to organizations at the river basin level. Such a delegation of competences should imply an ample scope for objective setting, financing and the freedom to choose adequate economic or command-and-control instruments.⁴

Finally, RBM does not specify management structures. According to Mostert (1998) two archetypal organizational models can be distinguished: The first is the authority model, in which a single unified organization is empowered to make decisions. Water management is a separate policy sector, organised on the basis of hydrological boundaries. The second is the coordinated model, in which existing administrative units work together to cover entire river basins.⁵ Although both management models are similarly labelled as organizational approaches to RBM, we can expect fundamental differences in functioning

1 Cf. Coxhead (2001) for developing countries and Zimmermann / Kahlenborn (1994), Rudloff / Urfei (2000) for the EU and Anderson / Hill (1997) for the US.

2 Cf. Barraqué (1999).

3 These characteristics largely apply to RBM institutions in the centralised European states, e.g. United Kingdom and France.

4 Despite increasing and more uniform state regulations, permit systems, controls etc., some RBM institutions in Germany (*Genossenschaften, Zweckverbaende*) and in the Netherlands (*Watershappen*) fit in this model.

5 Teclaff (1996) distinguishes three organisational approaches to RBM: river basin authorities, commissions and committees. Here, commissions and committees can be interpreted as two possible forms of Mostert's coordinated model.

and outcomes that depend heavily on the contextual fit in different political systems.⁶

However, the scholarly debate on RBM shows hardly any links to debates on federalism in the field of economics. The economic theory of federalism, for example, deals with the allocation of authority, by centralized states, upwards, downwards, and sideways; and yet the basic theoretical arguments developed here have rarely been applied to water policy.⁷ Against this background, the objective of the present paper is to present some basic theoretical insights which might be used as an initial analytical point of departure for the institutional analysis of RBM in federal political systems.

2 Two Faces of the Economic Theory of Federalism

The economic theory of federalism deals with the efficient allocation of competences in federal political systems and has been occasionally applied to environmental policy in general.⁸ Here, environmental goods are regularly interpreted as public goods which must be provided by the state because in the face of externalities and / or excludability problems market transactions alone will not lead to satisfying results. But while the general theory of public goods justifies governmental action in providing and regulating these goods, it does not specify the optimal level of decision-making in a given political system. As the borders of political units and ecological and economic regions are not congruent, there are overlaps and spillovers, or, in other words, cases

of pollution or water shortages whose effects mainly occur behind the border of a given sub-national jurisdiction. Due to the spatial dimension of public goods the allocation of competences between the political decision-making levels therefore makes a fundamental difference in terms of economic efficiency and ecological outcomes.

In general, the economic theory of federalism offers two basic concepts, which could be applicable to the delegation of competences in water policy. These criteria stem from the literature on *fiscal equivalence* in the provision of public goods on the one hand⁹ and from the proponents of a more flexible and multi-level federalism¹⁰ on the other hand.

Fiscal Federalism: A Static Concept of Governmental Action

The Concept of Fiscal Federalism

The fundamental assumption underlying the theory of fiscal federalism – and the exchange economy in general – is the concept of fiscal equivalence. This simply means that those who benefit from a service should bear the major burden for financing that service. Since the provision of public services is always confronted with externalities, the governmental system should be organized in such a way that every individual standing to benefit from a good or service bear the costs *and* decide on its provision. The question as to when a public good is provided efficiently by a jurisdiction was discussed already in the sixties by M. Olson (1969). He stated that the provision of a public good is efficient if the users of the good, the taxpayers, and the decision-makers are identical. In Olson's theory of fiscal equivalence, the scope of the jurisdiction can be determined by three factors:

1. the homogeneity of preferences for the public good,

6 Another aspect is whether and how RBM on particular rivers is coordinated or supervised at a higher political level.

7 For a review of the debate on environmental federalism and some examples for the empirical application of basic theoretical arguments in the water policy field cf. Oates (2001).

8 Cf. Oates / Portney (2001).

9 Cf. Olson (1969).

10 Cf. Frey / Eichenberger (1996 and 1999).

2. the similarity of costs for the provision of the public good, and
3. the geographic scope of the public good.¹¹

According to Olson, these factors determine the geographic scope of the jurisdiction, which can offer an efficient supply of the relevant good or service. In the environmental field the third factor is especially important. The scope of an environmental good is determined in most cases by biological or physical condition, which can hardly be influenced by political decisions. In the field of environmental policy the jurisdictions therefore have to be adjusted primarily to the scope of the environmental goods.¹² This is the fundamental economic rationale for the allocation of competences in water policy in such a way that, if necessary, the competent jurisdiction can make decisions that concern the whole river basin. Furthermore, consumer preferences and costs of production are likewise of importance.

In cases of highly divergent preferences for a given level of protection, each region should, according to Olson, make its own decision – provided that there are no spillovers. One example is the water quality of small water bodies; if this is regulated at the central government level, this could certainly constitute an example of over-centralization in terms of fiscal equivalence.¹³ Costs also are an important argument, in particular in cases of economies of scope or scale. If there is a significant cost reduction when larger quantities are produced (e.g. water provision), the optimal jurisdiction will be greater compared with a situation in which economies of scale are irrelevant. Economies of scope could be another argument for centralization of competences. Otherwise, abate-

ment costs that differ markedly between regions indicate welfare losses stemming from centralised regulation. However, the optimal allocation of competences can be calculated on the basis of these various factors.

In general, proponents of fiscal federalism are concerned with power-sharing among a limited number of governmental levels (e.g. local, regional and national level). The vision is primarily to allocate competences *exclusively* to a limited number of usually *pre-existing* jurisdictions with mutually exclusive territorial boundaries in such a way that as to avoid spillovers. The relevance of significant benefits and costs that escape jurisdictional boundaries justifies the (re-)allocation of power to the next higher governmental level. Further, in cases where significant economies of scale and scope exist, proponents of fiscal federalism prefer multi-task jurisdiction in order to avoid a dispersion of public authority and to reduce transaction costs.

However, although fiscal federalism is predominantly interested in the allocation of power to existing governmental levels or agencies and in the potential benefits of decentralization, there is even room for institutional innovation if a simple centralization or decentralization would not be feasible. Such an institutional change might be desirable because, for example, only small parts of the higher jurisdiction are affected by decisions in the respective policy field and / or there are high costs of decision-making and coordination at the lower level. In case of RBM, for example, it is imaginable – and usually supposed by the proponents of fiscal federalism – that existing jurisdictions (States in the US, German *Bundesländer*) do not reach interstate agreements, in the sense of Coasean bargains¹⁴, to sufficiently remove inter-

11 Usually, public goods are subclassified into local, regional, national, international and global public goods.

12 Cf. Smith et al. (1999).

13 Some scholars have therefore criticised the increasing centralization of water quality regulations, e.g. the nitrate policy in the US and the EU, and / or regulations relating to water quality for bathing purposes (cf. Rudloff / Urfei 2000; Shortle 1996).

14 Coase (1969) analysed the feasibility and conditions of voluntary and efficient bargains in case of externalities. Frequently, he has been interpreted as an advocate of voluntary arrangements between jurisdictions and a sceptic regarding the central state's intervention.

jurisdictional inefficiencies.¹⁵ Furthermore, decision-making at the central level could prove inefficient and lead to an under-provision of the public good. In this sense, fiscal federalism is a normative concept, which can be used to theoretically support RBM in general terms. If economies of scope in water policy are less important, various jurisdictions specialized in the provision of specific goods (e.g. flood protection, water quality, energy supply) could be established.

However, functional jurisdictions are the exception and not the general rule, because the theory supports instead a system with a limited number of jurisdictions that interact. The fundamental argument is that any jurisdictional reform – that is, creating, abolishing or radically adjusting new jurisdictions – is costly. While it is true that even *a well-functioning federal system is [...] always a candidate for change*, such change normally consists of re-allocating policy functions across existing levels of governance.¹⁶ Further, the arguments stemming from fiscal federalism provide no criteria that might be applied to the analysis of particular functional jurisdictions or institutional alternatives in terms of transaction costs. It is therefore likely that only an eclectic approach that combines arguments from fiscal federalism with institutional economics (incl. organizational theory, principle-agent models)¹⁷ may be able to deliver a full set of criteria.¹⁸ Finally, fiscal federalism generally favours a clear separation of competences and aims to avoid overlapping jurisdictions. An application of fiscal federalism to RBM would therefore mean that not only operational competences should be allocated to an institution at the river basin level but also legislative compe-

tences (e.g. in terms of water quality), the right to levy taxes and subsidize certain activities, and the right to implement necessary regulatory measures. In that sense, an RBM that is based on the principles of fiscal federalism would be in possession of extensive legislative and financing competences.

Limitations of the Concept

However, to briefly assess the relevance of fiscal equivalence theory and the flaws that limit its applicability, the following aspects must be stressed:

First, the theory is accepted in economics literature as a normative guide for the allocation of power in environmental policy, though its positive explanatory power and fruitfulness in concrete cases is at least limited. Water policy is not alone a matter of quasi-permanent, formal, and multi-task jurisdictions and administrative bodies that are hierarchically structured; it can better be described as an interaction of various formal and informal institutions that are not stable, that in part intersect geographically, and that are regularly characterized by a vertical and horizontal division of power and a lack of a clear hierarchical structure in decision-making.¹⁹ In those regions that are characterized by a high degree of political and economic integration, there are even strong indications for the relevance of voluntary agreements of sub-national and private actors regarding water quality and quantity management, public-private partnerships, transnational movements, and corporations and associations of sub-national actors. The narrow focus on formal and lasting institutional arrangements therefore implies a concept too narrow to depict institutions in water policy in a realistic manner. In particular, institutions marked by network characteristics and a widespread dispersion of capacities to solve complex problems is not sufficiently accessible to fiscal equivalence theory.²⁰

15 Currently, the empirical knowledge on international experiences in regional respective interjurisdictional cooperation as an alternative to centralisation in federal political systems is limited. It is the objective of an ongoing research project at the Technical University Berlin to analyse the allocation of competences in water policy in several federal political systems and to explore interjurisdictional bargains.

16 Cf. Nicolaidis (2001).

17 Cf. the contribution of Huppert in this volume.

18 Cf. Garbe (1996).

19 Policy-making in the European Union may serve as an example (cf. Hooghe / Marks 2001).

20 Cf. Bressers et al. (1995). Recently, political scientists have adopted a network approach to river basin manage-

Second, fiscal federalism is a static concept and does not allow us to explain institution formation endogenously. In particular, fiscal equivalence theory has been little concerned with decision-making within particular jurisdictions and for this reason at least fails to specify the process in which particular goods and services are supplied.

Third, fiscal equivalence theory evidently lacks an empirical foundation, since the key determinants have clearly not been satisfactorily quantified.²¹ Even today, empirical studies in economics on the spatial scope of public or club goods that are produced by water managers are very scarce, as are quantifications of their key cost elements (including economies of scope and scale, transaction costs) and benefits. Against this background, fiscal equivalence theory has delivered some plausible estimates concerning the adequate level of governmental action, but no harder criteria have been developed to assess effects on economic welfare.

Fourth, fiscal federalism has been used as a theoretical justification for both a more centralized and decentralized approach in water management. In fact, a key weakness of the theory is that the normative model does not specify who decides whether a political level is able to manage water resources: the political level itself (e.g. a municipality or a regional authority) or the level above it (e.g. the central government)?

Fifth, while the model stresses the importance of power allocation between governmental levels it does not consider other key aspects. For example, the design of property rights, the organisational structure in water management and the crucial aspect of mechanism for (intersectoral) coordina-

tion and conflict resolution are not given sufficient attention.

A Flexible and Variable Approach: Functional Federalism in the Form of FOCJ

The FOCJ Concept

To come up with a more flexible concept for the allocation of political responsibilities, the alternative vision would be modern theories of functional federalism and of institutional competition among jurisdictions.²² Compared with fiscal federalism, these theories are more interested in the supply processes of public goods, the evolution of given institutions and the dynamics of the competition between them. Here, federalism is generally interpreted as a multi-level co-ordination system with fluctuating jurisdictions.

Frey and Eichenberger coin the acronym FOCJ (or FOCUS, which is taken as the singular) for this form of federalism.²³ According to them, this concept is applicable to national water policy as well as to co-operation of riparian states on trans-boundary rivers.

FOCJ can be defined as:²⁴

- *functional*: new jurisdictions extend over areas defined by the tasks to be fulfilled;
- *overlapping*: many different tasks exist within the crisscrossing boundaries of corresponding governmental units;
- *competition*: individuals and / or communities may choose, via initiatives and referenda, which governmental unit they want to join; and

ment in the US. In their view, current governance structures in water policy are regularly characterised by a wide range of governmental and non-governmental actors and multiple networks of organisation. Cf. Imperial / Hennessey (2000).

21 One of the few exceptions is the contribution of Dinan et al. (1999), who estimated empirically the potential welfare gains from decentralised standards for drinking water in the US.

22 Cf. Frey / Eichenberger (1996); Vanberg (1998); Kerber (1998).

23 Cf. Frey / Eichenberger (1999b). Similar concepts have been developed by Vincent Ostrom (1999) and his collaborators, who use the term "polycentric" to describe the co-existence of multiple centres of decision-making.

24 Cf. Frey / Eichenberger (2001).

- *jurisdictions*: established units are governmental, have enforcement power and can, in particular, levy taxes.

Although FOCJ are still based on the fundamental insights of fiscal equivalence theory, they nevertheless constitute a completely different governmental system. While fiscal federalism mostly analyses the behaviour of *given* political units (government agencies, bureaucratic structures) at the different levels of government and proposes an optimal division of power or co-operation, FOCJ *emerge* endogenously in response to the geography of the specific task to be fulfilled. This mechanism of endogenous formation is based on club theory, a term used by Buchanan (1965) to deal with the provision of shared goods, and on efficient jurisdictional competition that can be traced back to the member units' possibility to exit the jurisdiction or their citizens' right to vote. The geographically non-exclusive and functionally specific nature of FOCJ therefore permits voluntary departure from the organization to play a significantly greater role than in the conventional thinking of federalism. Proponents of FOCJ strongly favour unfunctional or at least limited-function governmental units of different sizes. The FOCJ catering for the same service may even overlaps or geographically intersects. The FOCJ concept thus also breaks with the fundamental notion of classical federalist theory that rules out any overlapping of units at the same level!

In general, the application of the FOCJ concept to water policy differs in many crucial respects from the current view on the installation of RBM on national or international rivers.²⁵ A major difference is that FOCJ emerge endogenously and from below and are financially independent, while

RBM commonly is perceived as a bundle of tasks that must be established from above and is dependent on external subsidies and predetermined objectives. Furthermore, FOCJ are not stable institutions, and their existence and scope depend on the problem-solving capacity and the decisions of people or communities concerning their voluntary membership.

Since people or communities who pay for a public service demand its effective supply, the government of the jurisdiction is assumed to exploit economies of scale and the size of FOCJ is thus determined endogenously by the benefits and costs to members. Finally, the FOCJ concept favours unfunctional units and voluntary co-operation between jurisdictions (e.g. horizontally between municipalities or vertically between municipalities and a higher or lower state level), whereas the concept of RBM is normally interpreted as integrated and multi-functional. Ideally, even the coordination between specialized FOCJ in water policy (e.g. one FOCJ for flood protection, another for water quality; water provision agencies etc.) is a matter of endogenous formation because, according to the model, political managers of FOCJ have stronger incentives to bargain and to exploit synergies than do the classic bureaucrats in water policy (e.g. public administration at higher state levels). Compared with fiscal federalism, the FOCJ concept thus appears much more optimistic concerning decentralised bargaining and the factual relevance of Coasean negotiations.

The key question regarding the explanatory power of the concept is whether it provides a model that closely resembles institution-building processes in practice. On first inspection, there are many processes and phenomena that appear to fit the model well, e.g. watershed initiatives and water districts in the US, voluntary arrangements which municipalities or individuals join (e.g. *Zweckverbände*, *Genossenschaften*), inter-regional commissions or voluntary working groups of the sub-states (e.g. Germany), Inter-State Task Forces and Environmental Co-operation Councils in the US, interna-

25 One question might be whether the FOCJ concept can be applied to RBM. The most compelling justification is that Eichenberger and Frey cite water policy institutions (e.g. sewage treatment but even co-operation of riparian states on transboundary rivers in the field of water quality policy) as a characteristic example for their proposal (cf. Frey / Eichenberger 2001). For a discussion of the applicability of the FOCJ concept to the management of transboundary rivers (cf. Blatter / Ingram 2000).

tional transboundary co-operation between sub-national actors²⁶, further issue-specific transnational arrangements, transnational jurisdictions that coordinate a mix of state and non-state actors, and even at the global level of water policy the manifestations of non-governmental structures (*World Water Council, Global Water Partnership, World Commission on Dams*). Similarly, many existing or emerging institutional changes in developing countries could be attributed to institutional competition and dynamics that are described in the FOCJ concept.²⁷ According to the proponents of the FOCJ concept, Elinor Ostrom's work on communities that have developed task-specific governance structures for the management of common pool resource problems fits well into the picture.

Limitations of the Concept

At a first glance, the concept provides a convincing theoretical approach that might be used to explain the obvious polycentricity in water policy and its lack of hierarchical structures. In fact, many of the existing jurisdictions are overlapping, voluntary, and cannot be traced back to the theoretical approach of traditional federalism. There is therefore an ample scope for the application of the FOCJ concept. But there also are some important shortcomings:

First: there is a trend towards more functional and flexible solutions in the field of water policy, but apart from some cases (e.g. in the field of water provision), there are few examples for a clear fiscal equivalence between those who benefit and those who pay. Frequently, the existence of voluntary arrangements (e.g. cross-border institutions in Europe) can be traced back to external funding. But if fiscal equivalence is not an important rule in institution-building, the endogenous process of

FOCJ, based on the welfare-maximising behaviour of individuals and communities, does not correspond to empirical findings on institution formation. Obviously, many of the institutions mentioned above can be explained only partly by the key factors that are stressed in the model. Furthermore, many existing institutions lack the elements of democratic participation that are stipulated by the model.

Second: in many cases the individuals / communities are members in several overlapping institutions that are concerned with the supply of the same public good. Memberships are rarely exclusive in the sense that communities or agencies have to make a decision in favour of membership in the one or the other jurisdiction that is, for example, engaged in water quality issues, often they belong to both or their actions are restricted by decisions taken on various political levels. In general, the competition between FOCJ is not only about membership but about other factors as well, depending on the nature of the institution and the interests of FOCJ managers.

Third: although Eichenberger / Frey support the application of their model to water quality as a public service it is, theoretically, unclear why welfare-maximizing individuals or communities should voluntarily agree upon specific institutions as well as how competition between overlapping jurisdictions should work efficiently. For example, it is possible to imagine a system, which would allow a functional jurisdiction to buy higher or lower emission reductions from as many sources as it wished. The total increase of water quality would depend on budget constraints, which in turn would be determined by the number of members and their financial contributions. But then, in cases of non-excludable public goods, the overall result would be an average water quality for all, while the members of the high-quality FOCUS would be voluntarily paying more and the members of others would be charged less for the same water quality. Why should any rational individual or community want to be a member of the high-quality FOCUS? Again, additional specifications concerning an adequate framework for efficient institution-building processes at the river basin

26 A practical example is the emergence of cross-border cooperation on the Lake Constance with borders on two German Länder, two Swiss Cantons, and one Austrian Land.

27 Frey / Eichenberger (2000).

level are needed. In general, since the theoretical basis of the FOCJ model – Buchanan's theory of clubs – applies solely to club goods, it is doubtful whether the voluntary mechanism also can be transferred to the provision of pure public goods from which non-members of the FOCJ cannot be excluded.

Fourth: the problem of co-ordination between the numerous FOCJ is remains to be dealt with. Efficient competition only works if spillovers do not occur. However, voluntary agreements and inter-jurisdictional co-operation will neither occur automatically nor be without costs. Water policy in general and RBM in particular are a multi-dimensional matter (drinking, shipping, power generation, land-use, preservation of ecosystems etc.), where the fragmentation of competences among numerous FOCJ is not wholly clear. Frey / Eichenberg only suppose a relative advantage of FOCJ in meeting the necessary co-ordination task. In their view, FOCJ representatives are political managers, and because of their direct internal accountability there should be a stronger incentive to co-operation as compared with hierarchically integrated bureaucracy. But this general assumption is not empirically established, and it is in obvious contrast to the findings of many authors in the political sciences who have analysed the requirements of efficient bargaining processes in inter-jurisdictional interactions.²⁸ The proponents of the FOCJ model argue that voluntary co-operation could work better than hierarchically enforced coordination. But again, these calls for fewer interventions by the central state and the dismantling of barriers to voluntary decentralized co-operation are not well founded in empirical terms.

3 Perspectives for Further Research

Water policy is a complex matter and institutional diversity is a matter of fact. The economic theo-

ries of federalism provide theoretical approaches to the allocation of competences in multi-level political systems. Fiscal equivalence theory is more interested in the (re-)allocation of competences in given political structures. In contrast to the classical model of public organisation – monocentricity in the theory of public administration – the analysis starts out with the proposition that institutional arrangements in a federal system should depend on the types of public goods and services that are provided. However, fiscal equivalence theory is still close to classical theory of administration because the theory interprets federalism as a static and largely hierarchical affair. Usually, the theory is used to give reasons for either centralisation or decentralisation in resource policy. The general objective is to develop a more or less abstract blueprint of the perfect and ideal distribution of tasks and powers over administrative units. However, it is unclear what public organisation should (and would be able to) enforce the blueprint's implementation in practice.

The FOCJ view of federalism is much more radical because in a way it overcomes the political dominance of thinking in terms of centralisation / decentralisation in that here various forms of functional decentralisation and a much larger institutional multiformity are combined with given political decision levels. The model stresses the efficiency of endogenous institutional change and recommends removing existing political and bureaucratic barriers that limit voluntary institution-building processes in practice.

Both approaches can be used to point to the failures of the existing allocation of power in water policy. However, they are distinct in their normative implications. One option is to re-allocate competences in bundles to a limited number of pre-existing governments and to support few function-orientated institutions that are primarily based on the interaction of formal governmental organizations. The other view is more radical and supports a dispersion of competences among a very large number of overlapping governments, where institutional competition even helps to overcome co-ordination and spillover problems.

28 Cf. Scharpf (1998).

However, water policy reality does not fit in simplistic theories. Although the FOCJ model and other institutional approaches to policentricity in federal political systems might serve as an analytical point of departure, it is only by identifying the empirical relevance of specific institutional arrangements and by comparing their relative advantages and disadvantages that the organisation of river basin management can be judged from a perspective of institutional and organisational economics. Against this background, the future discussion of RBM in federal political systems not only needs to take into account the economics of federalism but also to include insights from institutional economics (in particular transaction costs models) and the political sciences. We thus need both a less simple theoretical approach to RBM institutions and better empirical knowledge on their relevance, functioning and effects.

Accordingly, RBM should not be interpreted as based on either fiscal equivalence theory or the FOCJ model. In reality, the two types of federalism are not mutually exclusive but co-exist. In some cases, the FOCJ concept may be applicable and fit in ongoing decentralization processes. It is even conceivable that voluntary co-operation between highly function-specialized institutions would work better than attempts of higher political levels to enforce or facilitate coordination.²⁹ In other cases, governance structures that are based on traditional or fiscal federalism might reduce coordination costs by limiting the number of jurisdictions and actors. For example, the oversight and coordination role in RBM might be better carried out and planned by traditional political levels because voluntary cooperation between FOCJ would not come about automatically.³⁰

In general, the political and cultural prerequisites necessary for the functioning of FOCJ in the framework of water policy has not been sufficiently elaborated. In developing countries, however, the application of the model could be limited

because of the associated economic costs, low administrative capacities at the local level, and further practical difficulties and hurdles. Although Frey / Eichenberg recommend the application of their model to resource policy in developing countries, empirical knowledge on the relevance and effectiveness of FOCJ is still limited to developed countries with longer democratic traditions and a long history of local self-administration.

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The German Water and Land Management Associations and their Alternatives

Economic Criteria for Comparative Institutional Analysis

Jan Monsees

1 Introduction

This introduces the German institution *Wasser- und Bodenverband*, i.e. Water and Land Management Association (WLMA), and combines it with a brief sketch of economic institutional analysis. *Firstly*, this institution is introduced within the context of German law and in relation to alternative institutional arrangements dealing with collective tasks in the management of water and land resources. The legal basis, different tasks, membership provisions, and the regional prevalence of WLMA are described. *Secondly*, it is shown that diverse analytical approaches in economic science (including Theory of Collective Goods, Club Theory, Theory of Parafisci, Economic Theory of Federalism, Theory of Infrastructure, New Institutional Economics) can be used to examine WLMA. This turned out to be fruitful as a heuristic intermediate step before going ahead. *Thirdly*, a concept based on the New Institutional Economics (NIE) is designed as a prerequisite to compare the economic performance of alternative institutions. This concept comprises the proper definition of the economic problem to be solved (e.g. maintenance of water bodies), the identification of (in this case) seven clearly defined alternative institutional arrangements (including different types of WLMA) to be compared, and a set of evaluative criteria. After stressing the problem of specifying a NIE-efficiency criterion, four evaluative criteria (institutional congruence, economies of scale and scope, transaction costs, incentive structures) are then deduced from the literature. *Finally*, further steps are mentioned to complete the framework necessary for a comparative economic institutional analysis.

2 The German Water and Land Management Associations

The Water and Land Management Association (*Wasser- und Bodenverband*, WLMA) is a very special institutional form under German law. Despite its widespread occurrence, it is not even well known in Germany itself. It therefore appears necessary to start out by describing their key characteristics and mention their tasks and other alternative institutional arrangements designed to deal with these tasks, in the context of the federal administrative system in Germany.¹

Collective Tasks in Managing Water and Land Resources

Although they vary in their degree of publicness, the main characteristic of all the tasks performed by WLMA and alternative institutional modes is their collective nature; proper performance usually goes beyond the capabilities of individual landowners. The overall range of potential tasks includes:

- water bodies (maintenance, extension and renaturation),
- facilities in and on watercourses (construction and maintenance),
- flood control and dike maintenance,
- drainage systems (construction, operation, maintenance),
- irrigation systems (construction, operation, maintenance),
- regulation of soil-water balances,
- commonly owned agricultural facilities (construction, operation, maintenance),
- rural roads and pathways (construction and maintenance),
- fresh water supply,
- waste water disposal,
- nature protection and landscape conservation.

¹ For the following cf. Rapsch (1993); Monsees (1999).

Alternative Institutional Arrangements in Water and Land Management in Germany

Due to the public nature of the tasks mentioned above, an arrangement is needed that could help the owners of adjacent plots of land to join forces. Such arrangements may be reached on a voluntary basis, but it seems helpful to have the support of the law. Germany is a federal state (*Bund*), consisting of 16 states (*Bundesländer*), all of them endowed with legislative powers within their state borders to regulate collective tasks of water and land resource management and treatment. As a result of this, a wide variety of institutional arrangements have been established across Germany to cope with such tasks. Among them are public authorities either on the state level (*Bundesland* level) or on the local or an intermediate level, different types of WLMA with regard to membership provisions and tasks performed, and two types of special functional administration unions or jurisdictions, called *Kommunaler Zweckverband* (KZV), and *Sondergesetzlicher Wasserverband* (SWV). Each of the latter two consists of several municipalities, and the SWV sometimes also include business enterprises and other stakeholders. Indeed, SWV exist only in the *Bundesland* of North Rhine-Westphalia (which is mainly due to specific mining-related water management problems). In some *Bundesländer* responsibility for some of the tasks mentioned is even left in the hands of individual landowners.

Regional Prevalence of Water and Land Management Associations

The total number of Water and Land Management Associations across Germany is estimated around 12,000; these range from small, honorary, single-task, local entities up to large, full time, multi-task regional ones. Their regional prevalence is subject to topographic, climatic and historic characteristics of the various *Bundesländer*. In some regions, especially in the coastal areas and wetlands in the northern parts of Germany, WLMA have a very long tradition, in some areas reaching back to medieval times. The synopsis below (Table 1) shows how WLMA are spread across the country. Predominantly, WLMA occur in the North and North-

west (e.g. Lower Saxony), where they were established to perform a number of different tasks. In some southern and south-eastern parts of the country they do not even exist at all (e.g. Thuringia), while the central areas have a few WLMA.

Legal / Statutory Basis

WLMA is a statutory body founded under German public law. Its legal basis is the *Gesetz über Wasser- und Bodenverbände* (WVG; i.e. Water and Land Management Association Act) of 1991. It consists of a statutory framework, which prescribes the main features of WLMA dealing with its formation, statutes, tasks, membership, management boards, finances etc. Because the WVG is a federal act (i.e. is implemented on the *Bund* or national level), on one hand the federal administration interferes in *Bundesländer* competences in this field. But on the other hand the WVG does not prescribe everything in detail, so that the *Bundesländer* are able to adapt the federal act within certain limits according to their specific needs and regional traditions. 11 of 16 *Bundesländer* have thus enacted so-called *Laenderausführungsgesetze zum WVG* (i.e. state implementation acts for WVG). Besides this legal basis of the institutional form WLMA, some of the different tasks and alternative institutions mentioned above are legally regulated by the *Bundesländer* as well. It is important to note here that for some reason WLMA are established on a legal basis only in some *Bundesländer* to undertake public tasks like maintenance of water bodies and dikes, while other *Bundesländer* appear to be wholly unaware of this institutional arrangement (see Table 1). They obviously prefer other institutions to perform the same public tasks.

Membership Provisions

Their membership provisions are the paramount feature of WLMA. Membership in a WLMA is always linked with the ownership of land, so that generally all members are individual landowners. (An exception from this rule exists in some regions, where local authorities act as WLMA-members instead of landowners, in the same way that agents

WLMA purpose	Union of WLMA on <i>Bundesland</i> level	Compulsory WLMA for water body maintenance	WLMA for dike maintenance	WLMA for artificial drainage systems	WLMA for irrigation systems	WLMA for fresh water supply	WLMA with other tasks^a
Name of <i>Bundesland</i>							
Baden-Wuerttemberg				X ^b	X		
Bavaria				X ^b	X		
Berlin							
Brandenburg	X	X					
Bremen	X ^c	X	X	X			
Hamburg			X	X	X		
Hesse	X				X	X	X
Lower Saxony	X	X	X	X	X	X	
Mecklenburg-W.Pom.	X	X					
North Rhine-Westph.			X	X	X		
Rhineland-Palatine	X			X	X		X
Saarland							
Saxony							
Saxony-Anhalt	X ^c	X					
Schleswig-Holstein	X	X	X	X			X
Thuringia							

a In Hessen: composting and rental of agricultural machinery; in Rhineland-Palatinate: composting and cattle water feed facilities; in Schleswig-Holstein: wind protection and waste water disposal.

b Number of WLMA is declining, i.e. liquidation of existing WLMA and no more new WLMA.

c Joint union on *Bundesland* level with Lower Saxon

do.) Also, membership is compulsory, i.e. whenever a WLMA is established, e.g. for maintenance of water bodies, every landowner within the statutory limits of the territory of this WLMA, e.g. the catchment area of a regional outlet channel, is obliged to become a member. The main rights and duties of members are usually bound up with the individual benefits they obtain from the activities of the WLMA. Hence, normally the rights to vote of the WLMA's managing-committee and commission, which are elected out of the general meeting, and the obligations to contribute are weighted according to the individual member's acreage (acreage yardstick), i.e. the larger the acreage, the greater

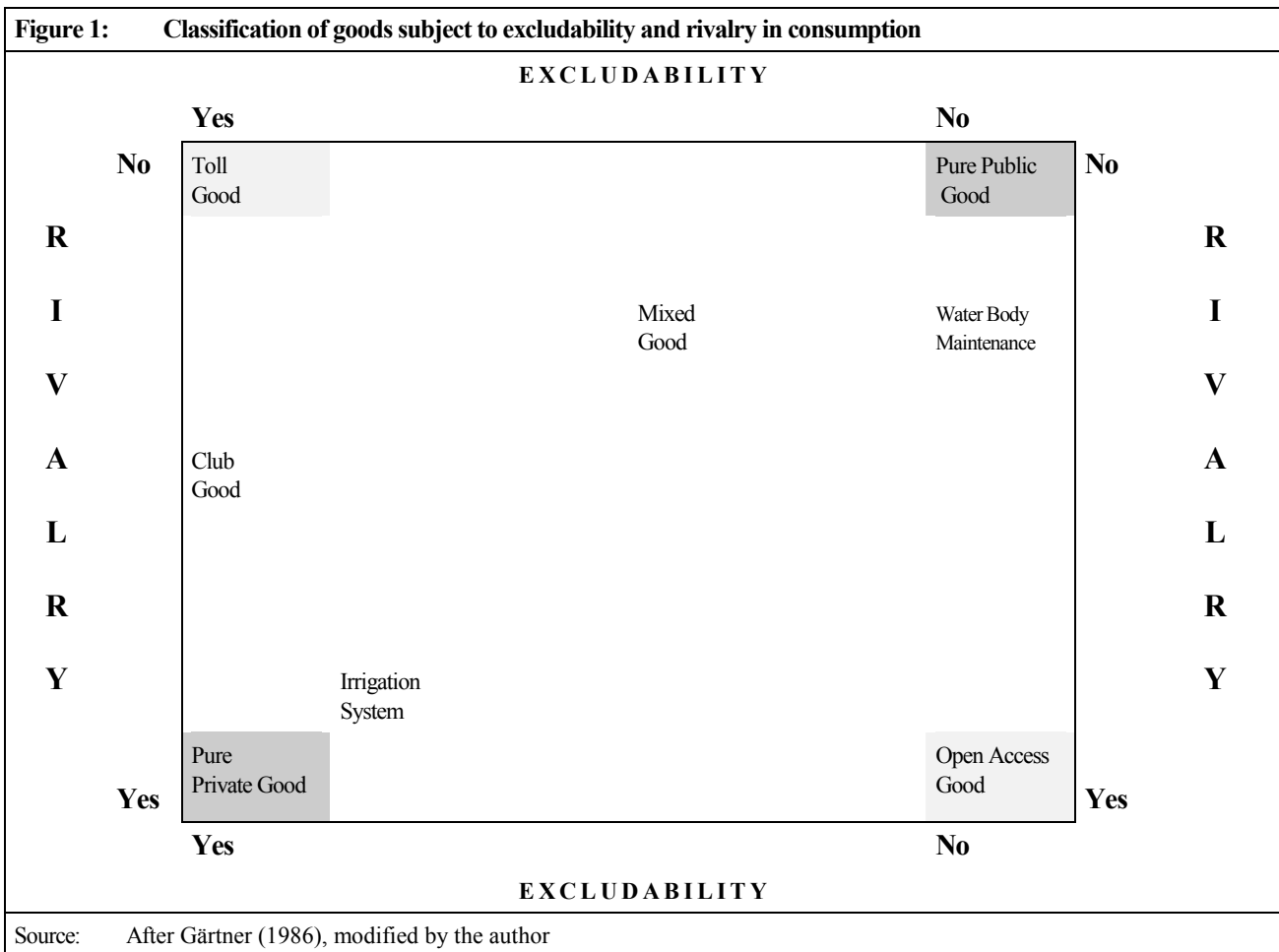
the individual's voting rights and membership fees. Moreover, in many WLMA the acreage yardsticks (in Euro per hectare) are staggered according to different kinds of land use, with e.g. housing paying more than agriculture, and agriculture paying more than forestry. Sometimes agricultural land is subdivided further, with wetlands paying more than other uses. All this has to be set out in the WLMA statutes, and the general meeting of the WLMA is, to a certain extent, free to deviate from the principles mentioned.

3 Classification of Water and Land Management Associations in Economic Theories and Concepts

Bearing in mind the basic information about WLMA outlined in the previous chapter, we can now examine this institution through the eyes of different theories and concepts in economics. This serves as an intermediate step to gain a deeper understanding of WLMA before tackling the problem of comparing WLMA and their institutional alternatives.

rivalry in consumption (see some examples below in Figure 1). Hence, free riding is likely to occur and, compared to private goods, a market allocation of public goods does not work here. In this situation, the establishment of a legally based institutional form with compulsory membership, like a WLMA, serves as a means to overcome free riding.

If the consumption of a certain public good is connected with congestion effects (depending on the number of users), the non-rivalry assumption does



Theory of Public Goods and Club Theory

In the light of the theory of public goods,² WLMA can be seen as the pooling of individual landowners to provide a public good. The key characteristics of such goods are non-excludability of potential users and non-

no longer apply here. Under these circumstances we are concerned with an impure public good or club good, and a WLMA providing such a good can be seen as a *club*. However, a WLMA is different from e.g. a tennis club. Hence the club analogy is imperfect, particularly in that free personal access to and exit from a WLMA is not possible, since WLMA-membership is compulsory and contingent on the ownership of land.

2 Cf. Cornes / Sandler (1996).

Theory of Parafisci

The theory of parafisci³ emerged as a subdivision of the theory of public finance in continental Europe. In the broadest sense, it deals with organizations between market and state, e.g. social security institutions, public broadcasting services, chambers of commerce or the like. The initial point was the conclusion that government occasionally separates public tasks from the regular budget to elude parliamentary control. Instead, the government creates so-called *para-fiscal organisations* or *parafisci*, i.e. special functional bodies beside the public authorities to perform these tasks. However, this top-down concept remains in the governmental sphere, since these parafisci are seen as 'handymen' of the government. Later on, the theory of parafisci developed a contrasting, associationist or bottom-up view, in that the initiative to establish para-fiscal organisations can emanate from individuals as well. If a private association of individuals is for any reason privileged by the government (e.g. obtains the right to raise compulsory contributions from compulsory members), it gains a parafiscal status. Seen in this way, the German WLMA can be referred to as a *para-fiscal organisation*. Historically they have been established in both ways, top-down and bottom-up, depending on the particular regional traditions in the various *Bundesländer*.

Economic Theory of Federalism⁴

The economic theory of federalism studies the optimal allocation of public tasks among different government units and levels (*fiscal federalism*). The goal is to design a spatial pattern of public goods provision that minimizes spill-overs, maximizes the exploitation of economies of scale and scope, and creates congruence between the group of beneficiaries of a given public good and the groups of taxpayers and voters associated with that good (*perfect mapping* and *fiscal equivalence*). Since externalities and economies of scale and scope differ for various public goods, the respective optimal range of provi-

sion will be different in size, too. Optimal spatial allocation of public goods therefore would require a public administration with a vast array of units and levels. However, due to transaction costs and the bounded capacity of citizens to control all these authorities, perfect mapping hardly ever occurs. In real life the number of levels is limited to just a few, e.g. national, provincial, regional, district and municipal levels. Hence spill-overs usually occur, and intergovernmental grants are paid to counterbalance these effects. On the other hand, the existing governmental structure of this *territorial federalism* allows for competition on the sub national level among the various provinces, regions, districts and municipalities. Also, we have to bear in mind that the provision of collective goods can be (and is) carried out not only by territorial (multi-purpose) governmental units, but also by functional (single-purpose) authorities, as well as by parafisci, and indeed even families, clubs, non-profit organisations etc. as well. If we now imagine that competition among all these units is possible, this may be referred to as *functional federalism*. Under these circumstances the German WLMA serve as a (parafiscal) *functional, single-purpose public good provision unit*.

Theory of Infrastructure⁵

The principal subject of the theory of infrastructure is a goods with natural monopoly and public goods attributes (e.g. externalities, indivisibilities, high demand for capital, longevity, non-excludability - to a certain extent-, non-rivalry in consumption - up to a certain degree). Hence government has been in charge of infrastructure provision for long periods of time. However, technical and institutional progress in the past two decades has improved the means of exclusion, and now private provision is possible for various types of infrastructure (e.g. telecommunications). Deregulation and privatisation of infrastructure have become actual political options. Some of the tasks of the WLMA like flood control, artificial drainage and irrigations systems, also have infrastructure characteristics. Considering

3 Cf. Tiepelmann / van der Beek (1992).

4 Cf. Olson (1969).

5 Cf. Kessides (1993).

that these tasks, in Germany, are undertaken by many different institutions in the various *Bundeslaender*, ranging from *Bundesland* authorities and para-fiscal (or *semi-private*) WLMA up to the individual level, it appears worthwhile to examine what institutional arrangement should be preferred on economic grounds, and whether the formation of WLMA can be interpreted as an early *special form of infrastructure privatisation*.

New Institutional Economics

The New Institutional Economics (NIE)⁶ is well suited to examine the questions raised in the foregoing section. In brief, NIE is a conglomerate of transaction cost economics, property rights theory and agency theory. As opposed to neoclassical theory, the principal hypothesis of NIE is that allocation of resources is not independent of institutions, i.e. of a system of formal and informal rights and norms and mechanisms to enforce these rights. This assertion is based particularly on two assumptions: that individuals are subject to bounded rationality and that they act opportunistically. As a result, the design of institutional arrangements or governance structures for public tasks in general, as well as flood control or maintenance of water bodies, has to consider transaction costs and appropriate incentive structures, which are some of its prominent topics. Thus NIE provides adequate analytical tools for a *comparative institutional analysis of WLMA and alternative institutions*.

4 Comparing the Water and Land Management Associations with Alternative Institutions

The subsequent section exemplifies briefly an approach for the comparison of WLMA with their institutional alternatives. The concept is based on the New Institutional Economics (NIE), and the focus is set on the selection of criteria used to

evaluate the *economic performance of different institutional arrangements*.

The Approach

Demsetz was probably the first to stress the necessity of a *comparative institution approach* in economics instead of a "nirvana approach".⁷ The latter was common practice in neoclassical economics, i.e. it tended to compare real-world institutional arrangements with a construed, theoretical ideal allocation mechanism. As a result of that practice, every real-world institution comes off badly when compared to the ideal. Unfortunately, Demsetz leaves it at that; he did not mention any criteria that could serve as a yardstick to compare different institutional arrangements. Yet evaluative criteria are of paramount importance for any comparative economic institutional analysis. Aside from that, it is necessary to define precisely the economic problem (e.g. a given public task) to be solved by the alternative institutions compared. Furthermore, of course, these alternatives have to be defined very clearly too, to be viewed as sufficiently distinct from one another. While the definition of alternatives may involve adjustments of real-world institutions to fit the analytical approach, this must always be guided by the principle of *fair comparison*, i.e. no discrimination or undue idealisation of any institution is permissible here.

Alternative Institutions for Maintaining Water Bodies

Next we have to define the public task to be fulfilled by the alternative institutions to be compared. In our exemplification, we will specify the selected task of *maintaining water bodies*, as *maintaining the bed and banks of a water body in a condition sufficient to ensure risk-free water runoff, bearing nature and landscape concerns in mind*.

6 Cf. Richter / Furubotn (1999).

7 Demsetz (1969), p. 1.

Now we can proceed with the definition of alternative institutions to deal with the specified public task. Referring to the water laws of the German *Bundesländer*, seven alternative institutions can be identified, and these are actually in operation at present. These are the following:

- WLMA with individuals as members,
- WLMA with local authorities as members,
- functional statutory body composed of various stakeholders (*Sondergesetzlicher Wasserverband*),
- functional administration union composed of several municipalities (*Kommunaler Zweckverband*),
- local authority,

- *Bundesland* authority,
- individuals (beneficiaries, riparian land owners).

Evaluative Criteria for Comparative Economic Institutional Analysis

The next step is to ascertain a set of criteria appropriate to evaluate the above-mentioned alternative institutions. On this score we face a difficulty, inasmuch we cannot simply adopt the customary Pareto-criterion from neo-classical economics (i.e. an allocation is Pareto-efficient if there is no other allocation in which some other individual is better off and no individual is worse off). Moreover, in NIE there is no alternative analytical concept di-

Author	Criteria	Criteria	Criteria	Criteria	Criteria
Bärsch	Pareto efficiency	Transaction costs	Incentive structures		
Crew / Kleindorfer	Allocative and X-efficiency	Dynamic efficiency	Scale efficiency	Equity attributes	Transaction cost issues
Ferris / Graddy	Managerial incentives	Input flexibility	Scale economies	Transaction costs	
Frick	Economic efficiency	Socio-economic dynamic	Democratic controls		
Grossekettler	Subsidiarity principle	Congruence principle	Coordinative power	Coordination costs	Exclusion costs
Grote	Synergetic potential	Static transaction costs	Dynamic transaction costs		
Kessides	Managerial skills	Productive efficiency	Dynamic efficiency	Accountability	Financial autonomy
Malone	Production costs	Coordination costs	Vulnerability costs		
Ostrom et al. - Overall criteria	Economic efficiency	Equity	Accountability	Adaptability	
- Intermediate crit	Transformation costs	Coordination costs	Information costs	Strategic costs	
Peters	Political intervention costs	Transaction costs	Social costs		
Picot et al.	Externalities	Transaction costs	Agency costs		
Stöbel	Allocative efficiency	Productive efficiency	Budgetary efficiency		
Theuvsen	Incentive intensity	Administrative control	Adaptability	Organisational costs	Production costs
Williamson	Incentive intensity	Administrative controls	Contractual controls	Remediableness criterion	

rectly available that is as capacious and unequivocal as Pareto-efficiency. Nonetheless, it is possible to say that some institutions are in some sense more efficient than others. Hence there is a rich body of literature that can be used to derive evaluative criteria (Table 2), regardless of the fact that many of these titles have been developed for purposes other than comparative economic institutional analysis. Only Crew and Kleindorfer, Kessides, and Ostrom, Schroeder and Wynne expressly designate evaluative criteria for comparing alternative institutions for the provision of infrastructure. However, all other criteria listed are helpful as well, since they have been developed for problems similar to ours.

This exemplary comparative analysis will be limited to allocative considerations. If we further take into account that several criteria of the authors cited differ from one another only in verbal terms though they coincide in their meaning, then only *four criteria* (strictly speaking criterion complexes) remain:

1. Institutional congruence,
2. economies of scale and scope,
3. transaction costs,
4. incentive structures.

The criterion of *institutional congruence* derives from the economic theory of federalism. Thus the provision of public goods is the more efficient, the more congruent the respective collectives of beneficiaries, tax payers and voters are. If these groups correspond perfectly, all economies are internalised, and no spill-overs occur. If a full internalisation (e.g. of benefits from maintaining water bodies) does not work, the group (e.g. a WLMA) has to be compensated by means of intergovernmental grants or some other means.

The criterion of *economies of scale and scope* will be used to analyse whether, and if so to what extent, alternative institutional arrangements are predestined to capture such economies. This is like to be the case if e.g. the total length of watercourses to be maintained is relatively large (economies of scale), and if several of the tasks mentioned in Section 1, e.g. maintenance of water bodies and flood control,

are pooled in one organisational unit (economies of scope).

The *transaction costs* criterion comprises the inputs for activities such as searching for information, decision-making, coordination, monitoring / control, enforcement, and adaptation to changing environments. It is not the absolute extent of transaction costs of any single institution that needs to be measured; the crucial factor is the cost differentials between one institutional arrangement and another. Sometimes these are not accessible to quantification either. However, a qualitative assessment on plausibility grounds often suffices to meet this criterion. The *incentive structures* criterion deals with a complex of problems which arise from the bounded rationality and opportunism assumptions of the New Institutional Economics. All the institutional arrangements compared must be assessed in terms of the extent to which they offer opportunities to individuals to obtain benefits at the expense of others (e.g. through free riding, rent seeking, shirking, corruption), whether they provide institutional precautions against such strategic behaviours, and how effective these are.

5 Conclusion and Outlook

The preceding sections may have made it clear that there are a lot of public tasks related to the management of water and land resources which are subject to the laws of the 16 German *Bundeslaender*, and that as a result these tasks are undertaken in fact by a variety of alternative institutions. Among these institutions, the German WLMA are striking on account of their rich traditions in some regions as well as because of their particular institutional features. Thus the WLMA and their alternative institutions present quite a good example for a comparative economic institutional analysis. A proper framework to tackle this problem is offered by the NIE. Hence we have developed a concept based on NIE to compare WLMA with their alternatives, based on the example of the task of maintaining water bodies. A set of four criteria has been deduced to assess the economic performance of seven

institutions to be compared. Some questions remain concerning methodological issues, e.g. the collection and validity of data and the measurement, scaling and aggregation of the four criteria.

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Water Harvesting: Challenges and Opportunities for Community-based Management

A Case Study from India

Hannah Büttner

1 Introduction

*"... the complex issues consisting of equity, sustainability and economic growth in the management of natural resources ... cannot get sorted out by bureaucracies."*¹

Institutional aspects have gained wide recognition as an important factor for water management. This finds expression in recommendations to decentralise water management and in statements to the effect that new institutional arrangements are needed at the local and national level.² In this context institutions are mainly considered to be formal institutions like government organisations, national laws and bureaucracies. At the local level often the committees that have been initiated to manage natural resources are referred as institutions.³

The present study focuses on local and regional institutions and seeks to contribute to a better understanding of the dynamics taking place among local communities involved in management of natural resources. This is why the concept *institution* embraces not only formal institutions but also informal and unwritten rules, which, intentionally or unintentionally, shape decisions on resource management.

The reasons for a decision in favour of a case study in this field are that water harvesting is

considered a relevant water-wise technology for the future. The study explains why community-based water harvesting has to be considered as a complex task and looks into the role social dynamics play in it.

Water harvesting means basically the collection, storage and use of rainwater and runoff. The stored water can be used for irrigation or domestic purposes. Water can be harvested with the help of ponds and cisterns, but also with microstructures directly in the field. Water harvesting is an age-old tradition in India, one that has been practised by rural communities for many centuries, especially in areas where canal and river irrigation has not been available. However, the often sophisticated systems of irrigation ponds have mainly been neglected by India, both in colonial times and since then. Only recently has it begun to gain increasing attention; the country is facing an acute water crisis, with decreasing groundwater tables and the benefits of big dams becoming more and more questionable.⁴ Even in groundwater-rich areas like eastern West Bengal, water harvesting is under discussion, as severe problems have occurred involving arsenic contamination of groundwater.⁵

There are two ways to promote rainwater harvesting: One is to restore the neglected tanks and ponds and to save the *dying wisdom* of rural communities concerning water harvesting.⁶ The other is to introduce watershed management, as an integrated approach to managing water, soil and vegetation in a given demarcated micro-watershed. The Indian government has practiced watershed management since it was adopted under the eighth Five-Year-Plan (1992 - 1997) as a national programme, especially for the drought-prone areas of the country.⁷ Participation and active involvement of local users is crucial to water harvesting and watershed management as a

1 Agarwal (1997).

2 International Freshwater Conference (2001).

3 Cf. Leach et al. (1999).

4 CSE (1997).

5 Cf. Agarwal (2001).

6 Cf. Agarwal (1997).

7 Cf. GOI (1992).

means of achieving commitment and responsibility in the management of water-harvesting structures.⁸ Exploration of problems related to community-based resource management therefore appears highly relevant in improving the state of water harvesting in India.

Participatory and decentralised solutions like community-based management of natural resources are gaining more and more importance in the discussion about sustainable development both in India and worldwide.⁹ Two arguments are bound up with this trend: first, it had to be realised that state control of natural resources has not resulted in their sustainable management, but rather contributed to their overexploitation or even destruction.¹⁰ Second, it is acknowledged that local communities have to take control of the resources that are crucial for their livelihood strategies. It is assumed that they will be more skilful and responsible managers of these resources.¹¹ This argument is based on many studies of successful community-based management of natural resources, sometimes also referring to institutions called *traditional*.¹² However, failures in practice have shown that it is also necessary to understand the problems and conflicts of community-based resource management and the complex factors involved.¹³

2 Perspectives and Conceptual Framework

Three approaches from the social sciences have been helpful in studying the factors involved in community management of natural resources: *Common Property Research*, in analysing the

rules of resource management; *Political Ecology*, in analysing the political-economic context in which these rules and practices are embedded; and the *Environmental Entitlements Framework*, in analysing the dynamic aspects of community-based resource management. The following descriptions are rough and simplified sketches of these complex and in part overlapping approaches. They will explain the different starting points and focuses of each approach as well as the underlying institutional concepts.

Common Property Research

The crucial question for Common Property Research (CPR) is how local users organise to manage resources like water, forests and grazing lands, which are often under common ownership. The starting point of common property research has been the metaphor of the *tragedy of the commons*.¹⁴ In this view the commons are depleted because every user is bound to remove from them as much as possible for his own benefit, and for this reason therefore overexploitation is inevitable. But researchers¹⁵ have shown that many communities do have certain rules, and hence institutions, to manage and conserve their common property resources. Depletion of common resources only takes place if local users lose control over their management, as they did in India starting in colonial times, e.g. with the nationalisation of forests or bureaucratisation of water development.¹⁶

Following Ostrom,¹⁷ institutions are necessary to make co-operation work; these are defined as *the set of working rules that are used within a resource management regime*.¹⁸ This definition encompasses formal institutions like state laws or

8 Cf. Rosegrant et al. (2001); Agarwal (2001).

9 Cf. Singh / Ballabh (1996).

10 Cf. Guha / Madhav (1993); CSE (1997).

11 Cf. Pretty / Gujit (1992).

12 Cf. Bromley (1992); Berkes (1989).

13 Cf. Leach et al. (1997); Bohle et al. (2000).

14 Cf. Hardin (1968).

15 Cf. Ostrom (1992).

16 Cf. CSE (1985).

17 Cf. Ostrom (1990).

18 The term regime refers to state, private or collective resource management and property rights.

organisations as well as informal institutions like local rituals or unwritten rules. The aim of CPR is to identify certain design principles of institutions and analyse them so that sustainable resource management institutions can be *crafted*.¹⁹ For the case study, CPR is relevant to the analysis of the present rules of water harvesting in the study area because the water harvested is often owned and used by a group of individuals that, in addition, built, operate and maintain the necessary infrastructure.

Political Ecology

While Common Property Research focuses on the rules directly related to today's natural resource management, Political Ecology (PE) takes into account the wider social and historical context in which decisions on natural resources are made.²⁰ The starting point of political ecology has been the application of political economic perspectives to environmental problems, an approach that introduces issues concerning distribution of power, control of and access to natural resources, and the issue of social heterogeneity in the exposure to environmental risks. Political ecology explores two questions: first, what are the different interests, strategies and scopes of action for the actors involved in struggles over access to and control over natural resources? Second, how does the political economic context influence the scope of action of given actors and what role do state politics play in distributing benefits and costs? In looking at both questions, the historical dimension must also be considered.²¹

While CPR analyses to what extent institutions *fit* to solve problems of co-operation, PE pays more attention to their role in framing the social context in which resource management is embedded and the way in which they influence the scope of action of different actors in gaining access to and

control over natural resources or avoiding exposure to environmental risks.²² For the case study, political ecology is relevant to gaining an understanding of what groups are vulnerable and why and what power relations at the local and regional level influence the regime of water harvesting in the study area.

Environmental Entitlements Framework

The Environmental Entitlements Framework (EEF) focuses on the dynamic and conflicting aspects of local natural resource management.²³ The starting point of EEF is the fact that development projects that seek to introduce community management of natural resources at the local level often fail to establish the necessary consensus among the local users. Instead, conflicts and tensions occur, making sustainable resource management difficult. The premise of EEF is that these development approaches are often characterised by a simplified understanding of communities and their environment. Instead, it is necessary to see these *communities* as diverse and differentiated and to view their environments as dynamic and changing.²⁴ In order to analyse these complex relations between actors and environments, EEF builds on Sen's concept of *entitlement*²⁵ and differentiates between the *endowment* of individuals or households with resources, their *entitlements* to resources and their *capability* to use these resources for their well being.²⁶ Moreover, EEF postulates that overlapping and sometimes contradicting institutions mediate these relations. To understand conflicts involved in community-based resource management, it is therefore necessary to analyse the institutional arrangements, which shape the relations between actors and their environments of different levels,

19 Cf. Ostrom (1992).

20 Cf. Peet / Watts (1993).

21 Cf. Blaikie (1999).

22 Cf. Peet / Watts (1993).

23 Cf. Leach et al. (1999).

24 Cf. Leach et al. (1998).

25 Cf. Sen (1985a).

26 Cf. Leach et al. (1999).

from the macro to the micro, and to identify contradictions between the institutions involved.²⁷

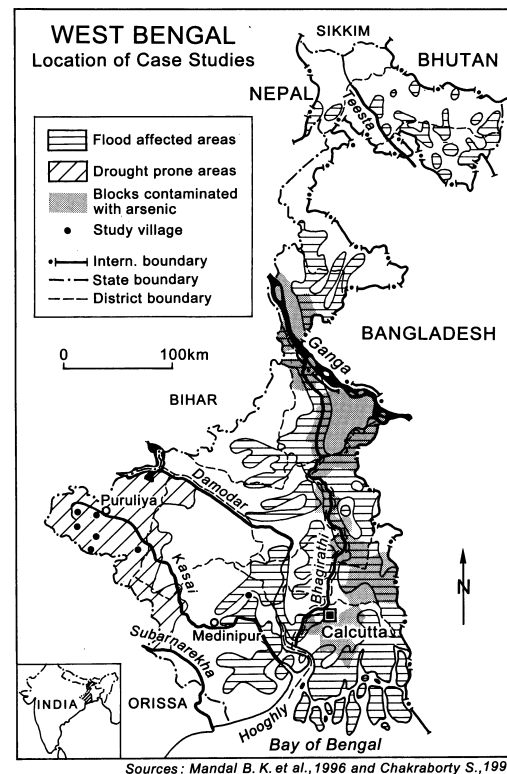
The concept of institutions in EEF embraces formal as well as informal institutions and is based on Giddens' idea of institutions as a system of interaction, which is produced and reproduced by social actors who may contradict one another.²⁸ EEF analyses the role of institutions with respect to their intended as well as their unintended effects on community-based resource management. In this study the EEF is relevant to the analysis of the wider institutional arrangements that have shaped the way water harvesting is practised as well as to analysing the underlying contradictions and tensions involved. The analytical framework of the study builds on all three approaches: *Common Property Research*, *Political Ecology* and the *Environmental Entitlements Framework*. The approaches are applied in such a way that each stresses certain aspects at different levels of analysis.

3 Case Study of the District of Purulia

Purulia is a drought-prone district in East India (see Figure 1) where the population is facing an acute crisis of natural resources. Water harvesting is highly recommended here to increase local livelihood opportunities and to regenerate the environment.²⁹ This case study on water harvesting and community-based resource management in Purulia aims to understand the complex factors and institutions involved in the present practice of water harvesting at the local level and to identify challenges and opportunities for future development.

The case study breaks down into two steps: the first step investigates the present practice of water

Figure 1: Location of Case Studies



Source: Mandal B.K. et al. (1996) and S. Chakraborty (1999)

harvesting in Purulia and looks into the problems and conflicts involved. Second, it examines the wider context in which water harvesting in Purulia is embedded, identifying relevant areas of tension in the socio-cultural, political-economic and ecological spheres. The study is based on secondary data as well as on empirical fieldwork that has been carried out by the author and her assistant, Sanjay Kumar Mahato, in six selected villages of Purulia, using household questionnaires, group interviews and various methods from the PRA toolbox,³⁰ during September 1998 and May 1999.³¹

27 Cf. Leach et al. (1999).

28 Cf. Giddens (1984).

29 Cf. CSME (1996).

30 PRA = Participatory Rural Appraisal (Chambers, 1994).

31 Cf. Büttner (2001). This study was part of the author's PhD Project. It was supported by the South-Asia-

Present Situation of Water Harvesting in Purulia District

Purulia, the westernmost district of West Bengal, bordering the states of Bihar and Orissa, is one of the country's poorest districts. The population amounts to approx. 2.5 million people and contains a high percentage of *Scheduled Tribes*³² (20 %) and *Scheduled Castes* (20 %), who usually belong to the most vulnerable and poor groups in India. Nearly 90 % of the people live in rural areas.³³ The villages vary from pure tribal villages to mixed villages, populated by the locally prominent Hindu-caste (Mahato), as well as by tribal groups (mainly Santal, Munda or Bhumij) and some households of the *Scheduled Castes* (mainly Dom, Gop, Karmakar).

Water Harvesting and Rural Livelihoods

Agriculture in Purulia is basically rain-fed and mono-cropped. Purulia has approx. 1350 mm of precipitation per year, 80 % of which falls during the 4-month rainy season.³⁴ Rainfall is highly seasonal and therefore it is extremely important to store water for the dry months. Only 30 % of the cultivated area in Purulia is irrigated, approx. 50 % with help of local ponds, the rest with state canals and open dug wells. The majority of the population are small and marginal farmers. The main crop is paddy; vegetables are cultivated for sales in the market. Due to insufficient rainfall and bad soil conditions, agriculture is risky and of low productivity.³⁵ The majority of households can live only 3 or 4 month from their own harvest. Income opportunities are scarce in Purulia, and members of most households migrate for several months a year to the

intensely irrigated plains of West Bengal, earning their livelihood as agricultural labourers.³⁶

Water harvesting in Purulia is mainly practised with local ponds, which are distinguished as *tanks* and *bandhs*: *tanks* are usually of quadrangle shape and dug into the earth, sometimes tapping the groundwater level. *Bandhs* are constructed by erecting an embankment in the undulating terrain above the fields, across the drainage lines. These structures are used to collect and store rainwater and runoff during the rainy season for use during the drier seasons.³⁷ In irrigation, there are two important applications: first, when the paddy ripens in the post-monsoon season, it is important that the plants do not suffer water shortage. Second, after the paddy harvest, irrigation is used to cultivate vegetables, which can be sold in the market. Additionally, ponds are also used for fish farming. Beside these productive functions for livelihoods, ponds are also important for daily needs and cleaning purposes, as the majority of the households do not have sanitary facilities of their own. Further, some ponds are very important for taking ritual baths before certain festivals or ceremonies such as weddings and funerals.

Ponds in Purulia: Ownership and Access

There are thousands of small and medium-sized ponds in Purulia, each village having approx. 5 to 25 ponds. The biggest ones were for the most part constructed by local kings and rulers, while local farmers have constructed the majority of them during the last centuries. Recently only very few households have been able to construct new ponds, because suitable land and sufficient money are not available. New ponds are mainly built by the government and therefore managed by the *Gram Panchayat*³⁸. In most villages there is one

Institute of Heidelberg University and the German Academic Exchange Service (DAAD).

32 Scheduled Tribes: the *aborigines* of India, also referred to as Adivasi. *Scheduled* means that they have been incorporated in the state list for affirmative action.

33 Cf. GoWB (1991).

34 Cf. Sen (1985a / b):

35 Cf. GoWB (1996).

36 Cf. Rogaly (1998).

37 Cf. Sen (1985 a / b).

38 Panchayats (orig. *council of five*) are democratically elected councils at the village level. In West Bengal, this system of Panchayats has been introduced to decentralize decisions at three levels: district level (Zilla Paris-

specific pond reserved for ritual use, and the local priest often looks after this one.

In legal terms, ownership applies only to the area, which the pond covers. As ponds are also inherited and cannot be really divided like land, households own a certain share of the pond, which can be inherited, divided and also sold (though this happens very rarely). The price of each share is not fixed; it has to be negotiated when sold. Numerous shareholders, consisting of groups of between 3 and 80 households, usually own the bigger and older ponds of a village. The size of each share determines its holder's influence on decisions and the distribution of benefits, and this depends basically on how many times the shares to the pond have been passed on and divided among inheriting family members. Usually the wealthier and more influential households are the ones who have the largest shares. Often these households belong to the clan of the village founders, who built these ponds some centuries ago. In most of the villages studied, the *Scheduled Tribes* and *Scheduled Castes* in the village very seldom own shares of one of the ponds. Shareholders tend to keep the pond within one clan or caste, because this arrangement facilitates cooperation.

Nearly all households in a village are users of ponds, because villagers use them for their daily bath. Fewer households have access to irrigation water or to a pond for fish farming. The latter users may be tenure holders, sometimes from neighbouring villages, and sometimes they are professional businessmen. Access to use a pond is basically determined by ownership and share size. If households which do not hold shares of a pond want to take water for irrigation, they have to apply to the owners, who then decide, considering aspects such as pond water level, the applicant's economic situation and owner-applicant social relations. These relations are structured along cast, class and family lines, and are influenced by political considerations as well. *Scheduled Caste* and *Scheduled Tribe* households usually face

many difficulties in gaining access to a pond, because they have a low status in the Hindu-dominated social order and water is also a ritually sensitive issue. Because there is no alternative to the use of ponds for daily purposes, and these groups mostly do not hold shares to a pond, they are forced to work for the owners or provide discounts for their products to gain access to a pond. This hidden but marked dependency sometimes allows pond owners to *play like a football* with these groups, a local key informant explained.

Pond Management: Rules and Actors

Management of ponds encompasses basically decisions over pond use, allocation of water as well as organisation of pond renovation or other pond-related work. Pond management is mainly done by the group of shareholders who own the pond, and the rules are negotiated with respect to actual water levels and crops to be grown. Usually at the beginning of the irrigation season, the shareholders meet to decide how the water will be allocated. Their decisions are not fixed and depend on mutual agreement. Such meetings will also consider the distance of fields from the pond or the economic situation of shareholders. When a pond is used for fish farming, the shareholders often form a small committee in charge of organising decision-making. Sometimes the pond is leased out for fish farming, and if none of the shareholders is interested, also other actors, like professional fishermen, can bid for the lease.

Beside the shareholders, certain local actors play also an important role in decisions over pond uses: first, the *Gram Panchayat* is responsible for government-financed ponds and takes decisions concerning distribution of state funds for renovating village ponds. Second, the traditional village council, the *Soloana*,³⁹ plays a crucial role in collective conflict resolution and the settling of village disputes, which are also often related to pond

had), block level (Panchayat Samiti) and village level (Gram Panchayat) (cf. Mukarji et al. 1995).

39 The term *Soloana* is a metaphor for collective action. Solo = 16, Ana = monetary unit and 16 Ana amount to one rupee. The term thus symbolizes 16 persons forming a unit.

management. Furthermore, the *Soloana* organises village festivals or other village-related social issues like temple repairs. To finance these issues sometimes the priest pond is used for fish farming and the *Soloana* organises the process. Third, local (*youth*) *clubs* are an important actor in the village. As they are officially registered bodies, they are able to manage and save funds. While some clubs only organise cultural or sporting activities for village youth, others have become engaged in building up local credit systems and dedicate their work to village welfare. To increase their capital stock, the members undertake various activities, fish-farming being among them. In one village, the local club has even managed to buy a pond for its members; all of them classified as *Scheduled Tribe members*.

Ponds have to be renovated approximately every 10 years by removing the silt and digging deeper to improve storage capacity. Often 50 % of the earnings from fish farming are saved for pond renovation, or a special paddy field is rotationally cultivated by one of the shareholders, with 50 % of the harvest being saved for pond renovation. In many cases the shareholder households also have to contribute additional money or labour. But in most of the villages the majority of ponds were in poor condition, falling dry in summer, because owners were either not able to save enough for renovation or the group of responsible shareholders was involved in various conflicts, which made collective action difficult.

Conflicts Involved in Community-based Water Harvesting

Observing all villages, the following areas of conflict were identified during fieldwork:

- Conflicts related to pond use decisions: as many ponds fall dry in summer, the question arises among the entitled shareholders whether the water should be used for irrigation, or saved for bathing in summer. Also, irrigation and fish farming are competing uses once water levels have reached a critical point.
- Conflicts concerning the distribution of benefits from irrigation or fish farming occur often among shareholders, especially when the group is large and the water level is low or the fish harvest small. The issues of how to distribute the workload and how to organise and control fish-farming cause disputes among shareholders.
- Conflicts related to the rights-of-way for irrigation canals across non-irrigated fields occur between various groups – shareholders and non-shareholders – and sometimes these conflicts have the potential to become violent.
- Conflicts over ownership of ponds are a frequent problem in the villages and especially relevant for bigger and older ponds, which are jointly owned by many shareholders of different clans or social groups. Conflicts over ownership often arise when one part of shareholder-group has renovated the pond in former times and therefore claims sole ownership against the rest of the shareholder-group. These conflicts are mainly related to rivalries among competing clans in a village, and they are one of the most important reasons for the neglect of ponds.

All these conflicts are embedded in complex dynamics and tension areas, which are often not directly related to pond management – e.g. political struggles, social rivalries or ecological transformations. But they influence the scope of action of the actors involved and their decisions on who has access, who is to be excluded, who will cooperate with whom under what conditions and how negotiations are to be conducted. Without understanding the complex factors and dynamics involved, it is difficult to develop sustainable solutions for pond management. The following section therefore examines the special context in which water harvesting in Purulia is embedded.

The Context of Water Harvesting in Purulia

To understand what problems, areas of conflict and transformation processes influence the present situation of water harvesting in Purulia, three spheres have to be examined: the socio-cultural, the political-economic and the ecological spheres. As examples, the following section will depict only some selected aspects.

Ecological Transformation and Rising Environmental Risks

Since the 19th century, Purulia has experienced a far-reaching transformation from a rich forested area into a degraded, drought-prone district in which the livelihoods of the local people are increasingly exposed to environmental risks. Three problematic processes are important in this context:

- Removal of vegetation cover and change of water regime: Due to the extensive exploitation of timber, especially under British Rule, the regional precipitation regime has changed, and now a given amount of rain falls within a shorter period of time (days), causing soil erosion and heavy surface runoff.⁴⁰
- Introduction of wet paddy: Coming with Hindu immigrants from lowland areas, wet paddy cultivation has been introduced in Purulia and replaced the drought-proof crops that were previously cultivated. This has led to rising water requirements in agriculture, and it exposes more and more local livelihoods to the risks of unreliable rainfalls.⁴¹
- Stagnation of irrigation potentials and decrease of pond irrigation: While new irrigation potentials – basically involving medium or small dams and dug wells – have been created by the state, statistical figures from 1965

till 1995 reveal that pond irrigation decreased by nearly 50 % during this period.⁴² This means that the net increase of irrigation potential in Purulia up to 1995 is nearly zero, which contributes to the scarcity of water in Purulia.

Political-economic Tensions and Dynamics

The recent political-economic history of Purulia has been characterised by some sweeping transformations and also some violent political conflicts. The following processes are especially important:

- Emergence of a separatist tribal movement: Social marginalization and economic exploitation of the tribes during British and post-independence period contributed to the formation of the Jharkhand-movement⁴³ for a separate tribal state. This struggle for autonomy has led to violent conflicts in recent decades.⁴⁴
- Changing power relations: The communist government of West Bengal has introduced one of India's most extensive agrarian reforms as well as far-reaching political decentralisation. This was done by introducing democratically elected councils (*Panchayats*) at the three administrative levels (i.e. village, block and district) and reserving seats according to the population composition of the relevant constituency.⁴⁵ This has led to a transformation of the regional and local power balance in favour of sharecroppers and small farmers, which has been accompanied by serious clashes at the village level.

42 Cf. GoWB (1996); Sen (1985a / b).

43 The Jharkhand region correlates with the Chota Nagpur Plateau of the Eastern Indian Highlands. It consists of 22 tribally dominated districts, which are divided into four states (Bihar, Orissa, West Bengal and Madhya Pradesh). Since 2001 a separate union state *Jharkhand* has been formed out of the 15 districts of Bihar.

44 Cf. Devallé (1992).

45 Cf. Dasgupta (1995).

40 Cf. CSE (1987); Sivaramakrishnan (1999).

41 Cf. Damodaran (1998).

- Politicisation of daily life: As the *Panchayats* are elected on the basis of party affiliation, party politics has become an important influence at the village level.⁴⁶ The traditional village councils, the *Soloana*, have lost importance. Now struggles between the different political parties often split up villages or even families, negatively impacting on co-operation at village level as well as on decisions on access to and distribution of resources. Another aspect of this politicisation is the problematic practice of party cadres of distributing the benefits of welfare schemes with an eye to the party affiliation of the beneficiaries.

Social and Cultural Transition and Areas of Tension

The socio-cultural context of Purulia is characterised by the variety of social groups living in the area who are involved in different transition processes. The following processes are especially relevant:

- Transition of a tribal-dominated culture into a Hindu-dominated society: this process is associated with heavy immigration of Hindus into an area, which used to be inhabited by tribes, with their distinctive culture, religion and social order. Now the increasing influence of Hindu mainstream culture is contributing to various conflicts over identity and autonomy among the tribal groups.⁴⁷
- Growing importance of the hierarchical order of Hindu society: this is expressed in various rivalries among the different groups concerning their rank within the regional social hierarchy. Access to and control of natural resources often lead to struggles at the village level.⁴⁸

- Disputes over social order, values and worldviews: The ongoing influence of secularisation, democratisation and access to education is creating areas of conflict between competing and even clashing worldviews. Especially the concept of a local hierarchical social order is in contradiction to the concept of a secular egalitarian society, as represented by the state.⁴⁹ This question comes into play in the issues of access to water for groups of low ritual status or shared ownership of ponds with mixed groups. And the different worldviews influences the way, people explain the shortage of water and rain and indicate the necessary actions which range from planting forests and digging new ponds to increasing religious activities and changing the personal life. These various concepts are influenced by education and age, factors leading to further disputes among the different social actors.

4 Conclusion

The conclusions are structured along two aspects: first, the section highlights the practical lessons learned for supporting water harvesting in Purulia. This is followed second, by a discussion of some conceptual reflections concerning the benefit of the theoretical concepts used as a framework for analysis.

Practical Conclusions: Challenges and Opportunities

In general, water harvesting with help of ponds plays a crucial role in satisfying basic needs and has many potentials for contributing to securing local livelihoods and regenerating the local resource base in Purulia. At the same time it has become clear that community-based water har-

46 Cf. Chatterjee (1997).

47 Cf. Mallick (1993).

48 Cf. Davies (1983).

49 Cf. Davies (1983).

vesting is complex and that it is of great importance to take the social, political and also environmental processes into account in which the regime is embedded. In practical terms this means that neutral platforms in villages are crucial as a means of re-arranging existing rules and managing the social challenges involved in water management. As other experiences from India indicate, this negotiation process has to include all groups at the village level and takes nearly two years of social mobilisation before physical work can start.⁵⁰

The case study indicates that the institutional setting in Purulia contains opportunities but also challenges for the promotion of water harvesting and sustainable livelihood security. The most important opportunity to support water harvesting at the village level is seen in the local youth clubs and the traditional *Soloana*. Together they can form a suitable platform to negotiate the water management and to mobilise resources at the village level outside the party-politic context. Furthermore the combination of youth and elders as well as the combination of informal traditional and formal institutions is seen as a chance for sustainable solutions at the village level. But the *Panchayat* system also holds much potential for improving water harvesting. First of all, *Panchayats* are important for balancing power relations in favour of weaker groups, thereby strengthening their bargaining position in negotiation over local water resources. Then, they can be influential in allocating government funds to water harvesting projects. Finally, an important task for *Panchayats* as well as for development projects and NGOs is to support local initiatives through networking or information transfers of good practice examples as well as by offering advice on administrative or legal issues, if needed.

As far as the challenges to be dealt with are concerned, the biased principles of welfare distribution by the party cadres and *Panchayats* are one of the most important obstacles to the empowerment of local communities. Also, the patronising

behaviour of political leaders often spoils local self-initiative and contributes to further dependency of the people.⁵¹ Another challenge must be seen in bureaucratic procedures, which often make local resource mobilisation difficult.

Conceptual Reflection

The aim of the study has been to analyse the factors involved in community management of natural resources at the local and regional level, and thereby to contribute to a better understanding of the conflicts and problems involved from a social science perspective. Here, the three conceptual approaches described above have found to be very useful, because each highlights an important aspect at a given level:

The focus of Common Property Research (CPR) concerning rules has been helpful in judging issues related to rule-making and rule-breaking. It became clear that there are appropriate rules for managing ponds, but that these rules are often no longer followed due to increasing size of shareholder groups and various conflicts among them. For this reason, but also due to a lack of the resources needed to renovate ponds, the storage capacity of the ponds has often deteriorated. The guiding issues of the political ecology (PE) approach take the wider political context into account, thereby detecting that control over ponds is not equally distributed, and also plays a role as a "strategic resource" for pond owners. Further, it proved useful to analyse the problem of party politics as well as social rivalries among differently ranked groups. Finally, the Environmental Entitlement Framework (EEF) has been useful in analysing the role of environmental change on the one hand and highlighting the role of various areas of tension and institutions involved on the other hand. This made it possible to explore the many overlapping dynamics in the social, environmental and political spheres in which water harvesting is embedded.

50 Cf. Agarwal (2001).

51 Cf. Agarwal (2000).

As we have seen, each of the approaches has contributed a relevant part to the analysis of community-based water harvesting in Purulia. But what about their contribution in framing future solutions? And what role do institutions play? To put it in nutshell, it seems that the different analytical perspectives also correlate with certain approaches in development practice:

- CPR tends to be preoccupied with rules. It suggests that there are certain design principles for successful natural resource management, which have to be detected and implemented in order to come up with sustainable solutions.⁵² Institutions are seen from the *collective action* perspective; i.e. to what extent they *fit* to solve co-operation problems.⁵³ This approach, with its focus on institutional design and its implementation, might be designated here as the *expert approach*.
- Political Ecology focuses on issues of power and access, which sometimes results in somewhat unsatisfying approaches to solutions.⁵⁴ According to Political Ecology, it is necessary to change the conditions in the political, economic and social sphere in order to come up with sustainable resource management. That is not an easy task, and it could even be more difficult than other interventions. This approach might be termed here as the *political approach*, and it sees institutions as basically relevant with respect to their role in framing political-economic conditions.
- Third, EEF, with its focus on dynamic and contradictory processes involved in natural resource management, suggests that mediation between the various institutions and actors involved is necessary and that this process has to be constantly reflected in order to avoid the possibility that powerful groups may take over the process.⁵⁵ This process- and negotiation-oriented approach is here

termed the *reflective participatory approach*. Here, institutions are viewed more from the *social practice* perspective, i.e. they are constantly produced and reproduced by social interaction.⁵⁶

Of the three approaches, the *reflective participatory approach* seems to be especially valuable for development practice, as it takes into account the complex socio-cultural and political context as well as local institutional arrangements and dynamic environmental change. And it also takes into account the crucial role of active participation of local users, without whom any degraded environments cannot be transformed.

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52 Cf. Ostrom (1992).

53 Cf. IDGEC (1999).

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Institutional Change in Smallholder Irrigated Agriculture

A Case Study from South Africa

Bettina Hedden-Dunkhorst

1 Introduction

In numerous countries worldwide smallholder irrigation is currently in a process of transformation from government-controlled, externally managed schemes to farmer-managed schemes. Transformation became necessary when government subsidisation reached unjustifiable levels, while at the same time low productivity characterised most schemes, and increasing demand for water from alternative sectors required new concepts of water management.¹

In South Africa the transformation of smallholder irrigation was initiated when the new water act was adopted in 1998.² The act provides some policy proposals for transformation, and more guidelines for the implementation of the process have been developed in the meantime. Both policies and guidelines are concentrated on water management. However, many particularly institutional, aspects that also affects the performance of smallholder irrigators have not yet been carefully thought through.

This paper aims to provide some insight into various institutional aspects affecting small-scale irrigators in South Africa. It describes the current changes and their effects on smallholders and suggests approaches and measures to facilitate the transfer.

2 Smallholder Irrigation Farming in South Africa

Smallholder irrigation, which accounts for only 5 - 10 % of the irrigated area in South Africa, basically involves two large categories. These are (1) irrigation schemes, in which about 40 000 farmers operate on a total of 50 000 ha, and (2) an unspecified number of food garden projects which involve thousands of people, mainly women.³ In addition, a small but growing number of black, independent, commercially oriented irrigators exist. Food garden projects were established by governmental and non-governmental organisations, mainly to supplement nutrition and to some extent incomes of rural poor households. Smallholder irrigation schemes have been constructed in rural black communities by government agencies since the 1940s to contribute to rural development through income and employment generation. Yet the concept of government-managed, highly mechanized schemes has failed. Despite extensive subsidisation the contribution of the schemes to rural development was only marginal, and most farmers have had to rely on additional income sources to sustain their livelihoods.

3 Legal and Institutional Innovations Affecting Smallholder Irrigation

A General Framework

Since the early 1990s small-scale agriculture, and particularly smallholder irrigation, have been more and more recognised as important components of rural development. Besides, increasing demand for water from previously excluded rural and urban communities and industry have led to a growing awareness of the scarcity of water. As a result, the efficient use and fair distribution of water have become important issues discussed in the context of smallholder irrigation. To achieve these objectives, substantial adjustments of the

1 Cf. Vermillon (1997).

2 Cf. Department of Water Affairs and Forestry (1998).

3 Cf. Backeberg / Odendaal (1998).

apartheid-shaped legal environment were necessary.

Smallholder irrigation farming is currently affected by three sets of new legal acts. These include various acts on land tenure (1991-1997), the new marketing act for agricultural products (1996) and the new water act of 1998 (Figure 1). These acts regulate access to land and water, product markets, and resource utilisation and ownership. More specifically, the new water act proclaims a balanced distribution of water among alternative users. It enacts reserves to secure basic water needs for human beings and aims to achieve sustainability through the establishment of environmental reserves. Moreover, the act aims to improve water use efficiency by introducing transferable user rights and, in the longer run, through the introduction of water markets. However, if this transformation is to be realized, the new legislation also calls for substantial adjustments at the institutional and policy level.

Numerous institutional arrangements related to production and marketing affect smallholder irrigation (Figure 1). These include water supply (water rights, water management, water markets), financial markets, land tenure arrangements, access to information and technology, and collective action. For the performance of smallholder irrigation, these arrangements are more or less important, depending on the actual situation. Yet in a process of transformation alternative arrangements need to be considered and modified simultaneously and jointly. Appropriate water management, for example, will be insufficient to generate adequate returns from irrigation, if at the same time farmers lack access to production loans or information about output markets.

In the past five years, building on previous responsibilities, various government organisations have been mandated to design, co-ordinate and administer new institutional arrangements and outline new policies. However, this process is hampered by internal and external factors that impact on new developments within the organisations. These factors include insufficient human and technical capacities, and lack of the financial

resources and political will needed to accelerate transformation. As a result, despite efforts to overcome the constraints and more recent efforts to exchange information and co-ordinate activities among stakeholders, transformation is still characterised by a lack of expertise and co-ordination as well as by insufficient participation of target groups.

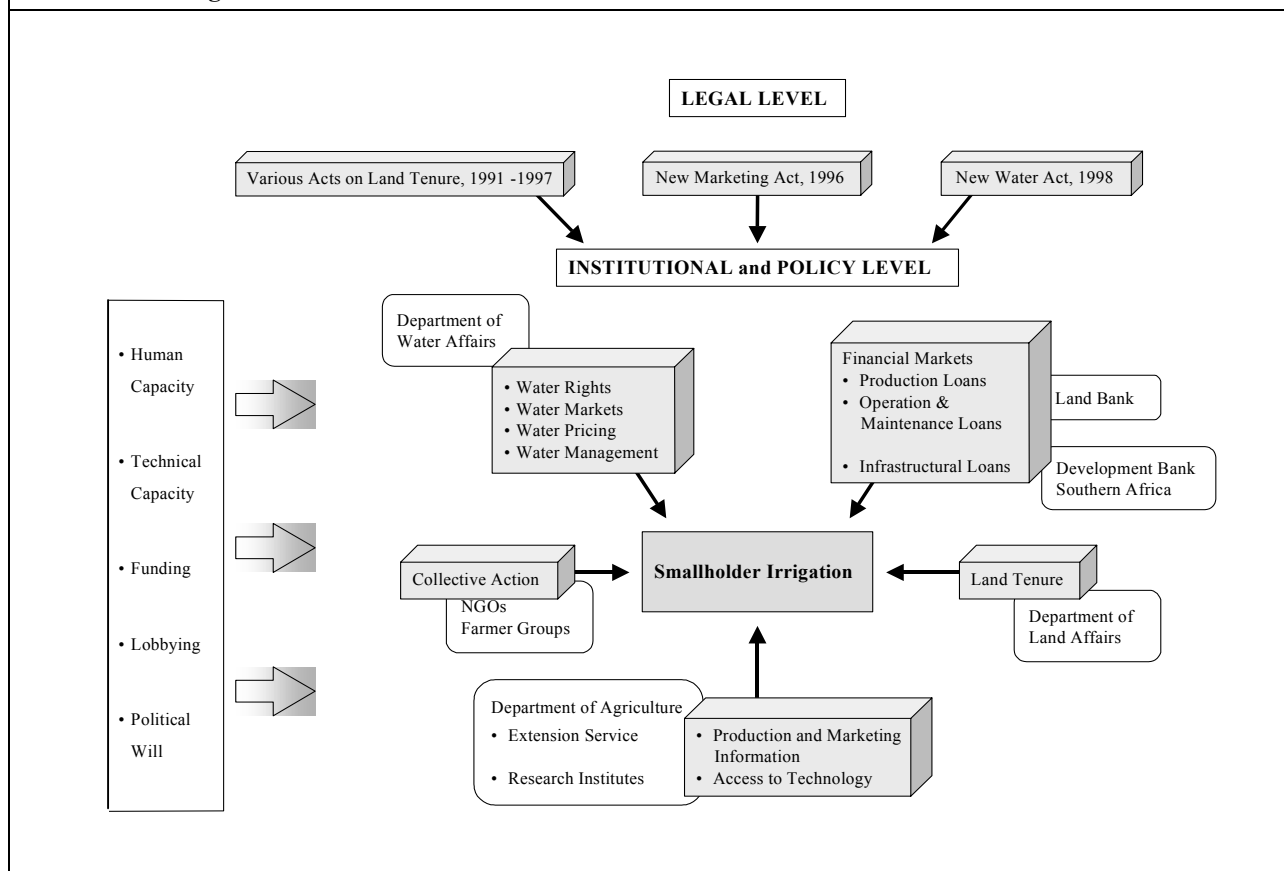
Water Management, Water Rights and Water Markets

In South Africa, water management is co-ordinated and administered by the Department of Water Affairs and Forestry (DWAF). Water management is implemented at the river basin level, with Catchment Management Agencies and Water Users Associations (representing all water users) currently being registered and established by DWAF.⁴ DWAF is also responsible for administering water rights, which are, according to the new water act, granted in the form of user licences. This implies that water rights are de-linked from land rights. In addition, DWAF is currently discussing the feasibility of water markets and alternative water pricing strategies.

While DWAF's clients are per se water users, the transfer of water management from government agencies to smallholders also involves the Provincial Departments of Agriculture, which administer the scheme-managing state agencies. The Provincial Departments of Agriculture are also responsible for the implementation of a number of special programmes designed for small-scale farmers and rural communities. These programmes (Land and Water Care Programme, Special Programme on Food Security etc.) frequently include water components.

4 Cf. Subramanian et al. (1997); Saleth / Dinar (1999).

Figure 1: A framework of adjusted legal and institutional arrangements impacting on smallholder irrigation



The objectives pursued by the different departments involved in alternative programmes often vary substantially, and are sometimes contradictory. This situation immanently causes conflicts and misunderstandings within and among different departments.

Financial Markets

The availability of and access to financial markets is important for the success of irrigation farming. Individuals or groups need loans for production inputs, operation, maintenance and infrastructure either occasionally or on a regular basis. In the past, government support agencies have in part subsidised production loans and fully covered operation, maintenance and infrastructure expenses. Now, a parastatal bank, the Land Bank, has been given responsibility for assisting smallholders.

The Land Bank has recently introduced new programmes for production loans that better suit smallholder credit needs, but access to these programmes is still limited and more adjustments are needed to optimise them for smallholder circumstances. At the same time, informal credit options to finance inputs as well as operation and maintenance of water supply are emerging slowly. These "saving clubs" often build on personal relations and involvement in other social activities (e.g. burial societies). Information on alternative formal and informal credit options could improve farmers' access to credit markets. Yet currently no institution seems to consider itself responsible for providing this information, even though the lack of credit has contributed to a serious decline in irrigated areas following the phasing out of subsidised production loans.

Access to Information and Technology

Apart from information on credit, access to information on production and marketing, and information on and access to appropriate technology are important. In this respect farmers largely depend on governmental extension services and various governmental research institutes, both falling under the responsibility of the Department of Agriculture.

Extension in the past followed a markedly top-down approach, which resulted in a high degree of dependency on individual extension officers. Only recently have some Provincial Departments started to reorganise the structure of their extension services, retraining extension officers in participatory methods and reformulating extension contents. In the context of irrigation management transfer, substantial self-management skills are required of farmers. Training and support to farmers would accelerate the process of developing know-how. Yet this requires new approaches and extension contents and coordination of support among extension services and other stakeholders, including farmers' and non-governmental organisations, input supplies, etc.

Smallholder irrigation is also constrained by the past focus of government research institutes on large-scale commercial agriculture in terms of technology research. Hence appropriate, low-cost technologies for small-scale irrigators are almost nonexistent. Even with technology transfer from other countries, as currently developing, the availability of low-cost technologies for smallholder irrigators will take time. Besides, the design of smallholder irrigation schemes, geared mainly to mechanise agriculture, limits the utilisation of alternative, less capital-intensive technologies.

Ownership Rights

With increasing intensification, secure ownership rights for water and land are essential. We mentioned already that with the introduction of the new water act, water rights will be granted to water users by means of renewable licences. But

what is the situation in terms of land ownership? Smallholders are operating under communal land tenure (permission to occupy) that de facto limits their ownership rights. Research findings, however, show that in general farmers feel largely content with the situation, which in the past has proven to provide sufficient security.⁵ For irrigated agriculture, however, which operates in schemes established primarily with public funding, the situation is different and restrictions on the sale or lease of land have negative effects on income and employment generation. Hence in the context of revitalizing the smallholder irrigation sector, land tenure arrangements are an important institutional arrangement that requires more consideration.

Collective Action

Collective action among farmers in areas related to water management, credit, information, input supply and output marketing provide opportunities for small-scale farmers to be better informed, to be involved in decisions, and to exploit economies of scale.⁶ As a result of strong government involvement in the management of smallholder irrigation projects in the past, collective action in South Africa is limited in most projects. However, following the government's withdrawal from credit and input supply, some collective action initiatives related to credit supply have developed. If more assistance were provided on how to organise collective action activities, fewer failures could be expected and the process might be accelerated. Yet the question is: Who among the support agencies has the expertise and the means to provide this assistance?

Summary

To conclude, we see that numerous institutional arrangements affecting smallholder irrigation are currently changing, partly to improve the effi-

5 Cf. Hedden-Dunkhorst (2001), p.72; Lahiff (1999), p. 39.

6 Cf. Meinzen-Dick et al. (2000).

ciency of smallholder irrigation, partly as a result of the changing overall political, social and economic environment. This situation offers new opportunities, but it also involves new responsibilities and risks for small-scale farmers. The challenge is to design appropriate policies and to identify and implement strategies, which guarantee that objectives are achieved and the costs of transformation are shared socially and judiciously.

4 Policies and Implementation Strategies for Transformation and Recent Effects on Smallholder Irrigation

This section summarises major policies and strategies for the implementation of the transformation process as envisaged and to some extent implemented by stakeholders. Secondly, the section reviews some of the recent developments in smallholder irrigation following the start of transformation.

Policies and Implementation Strategies

In the context of smallholder irrigation, the *Department of Water Affairs and Forestry* (DWAF) and the Department of Agriculture (both at national and provincial level) are the major players involved in the design and implementation of new policies and strategies. The two departments were assigned different tasks. Coordination problems in the past five years recently resulted in new initiatives to closer collaborate and coordinate support activities among government departments and other stakeholders in committees at various levels.

In terms of water management, a decentralisation process has been initiated by DWAF with the current establishment of Catchment Management Agencies and Water Users Associations (WUAs). Smallholders will be represented in WUAs and will have to compete for water resources with other users at catchment level. Apart from being responsible for water management at local level,

WUAs will also be given responsibility for operation and maintenance of irrigation infrastructure, which in the past was carried out by state managing agencies. Irrigation schemes that need to be up-graded will be rehabilitated before the transfer takes place. The Provincial Departments of Agriculture will cover costs for rehabilitation. The extent of farmer participation in the process of rehabilitation is still under heated discussion. To initiate the implementation of irrigation management transfer, a small number of pilot project schemes have now been identified, and some of these schemes have been transferred to farmers via WUAs. Yet it seems questionable whether it will be possible to repeat a similar, costly process of rehabilitation and transfer for the remaining several hundred-smallholder schemes.

Recent Developments in Smallholder Irrigation

For the majority of smallholder irrigators, the transformation process as experienced since 1998 has translated out into a withdrawal of government services. This has affected access to production loans, water management (including coverage of operation and maintenance costs), management of input and product marketing and in part extension services. As a result of the withdrawal, areas irrigated were reduced to 15 % of total irrigation land in some schemes, primarily due to defective irrigation equipment and liquidity constraints. Besides, yields were affected in connection with inappropriate water management and lack of inputs (fertilizer and pesticides). Moreover, due to lack of marketing information and means of transportation farmers have also been concentrating on subsistence crops. In addition, irrigation infrastructure (canals, pumps, pipes) has continued to deteriorate. Subsequently, in some schemes land and irrigation infrastructure has been leased out by government agencies to commercial farmers. But some positive developments have also taken place. New smallholder projects have emerged on or in relation to pilot transfer projects, and some collective action and self-help initiatives developed that have helped farmers to overcome liquidity constraints for input supply.

5 Conclusions and Policy Implications

The following general and more specific conclusions can be drawn from the presentation above. First, the importance of time and timing in the process of transformation should not be neglected. Different institutional arrangements pursue different time paths to adapt. For example, farmers' liquidity constraints have serious implications for production. Hence problems of access to credit or access to information about credit options need to be approached at an early stage of transformation. In some cases, as a result of lack of timing and coordination, groups of smallholders have "lost" land to commercial farmers, with serious implications for their incomes and food security. Thus more needs to be done to better understand smallholder constraints and to coordinate policies, strategies and activities of all stakeholders, including farmers.

Information and training play an important role in transformation. This issue was discussed in relation to water management, financial markets, input and output marketing and collective action. One prerequisite for the supply of appropriate information and training to farmers is expertise at the level of existing and newly developing organisations. Currently there is a vacuum in terms of capacity and responsibility for most information and training activities. To fill this vacuum will again require time and coordination. Moreover, one stumbling block in this context is also the mind-set still prevalent among some officers and farmers that smallholders are not in a position to develop solutions on their own and that physical inputs need to be provided from outside. This prejudice needs to be addressed.

In conclusion, a simultaneous and joint approach to the transformation of the broader institutional framework affecting smallholder irrigation is important. Any abrupt withdrawal of services, as experienced by smallholders in many irrigation schemes in South Africa, will only increase the costs of rehabilitation and development in a longer run.

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Household Strategies to Cope with Institutionally Induced Supply Constraints

The Case of Jordan

Maria Iskandarani

1 Background

The Hashemite Kingdom of Jordan belongs to the group of countries with the greatest water scarcity. Both surface and groundwater sources are used to supply the country, but these resources are already too overexploited to be able to satisfy the water demand of all sectors. This means that the abstraction of groundwater exceeds the safe yield of the aquifer system. Thus the country's water needs cannot be satisfied in a sustainable manner even today, a situation leading to increasing uncertainty over sufficient freshwater availability for domestic water supply in the future. This situation is particularly precarious as the country's population is rapidly growing by about 3.4 % per year. However, this vulnerable situation also results from massive shortcomings in water supply and demand management. In the past institutions in the Jordanian water sector have failed to develop and enforce sound water management strategies which adequately meet changing water needs and water availability, resulting in a water massive crisis today. Although government sensitivity regarding the necessity of reforms in water management seems to be growing and an official document of the Ministry of Water and Irrigation on *Jordan's Water Strategy* (1997) has given hope for improvement, Jordanian water policy in fact still lacks a coherent sectional water management strategy which – and this is the most crucial aspect – has any real prospects of being implemented in the end. So far, water use in all sectors remains wasteful and weakly monitored. The domestic water sector, which is the focus of this article, also operates inefficiently and is struggling with weak management structures. For some years now, water supply has been rationed through intermittent supply, particularly in the summer season. How

people cope with this supply constraint and what strategies they develop to secure their daily water needs – and at what cost – is the subject of this article.

2 Intersectional Water Allocation in Jordan

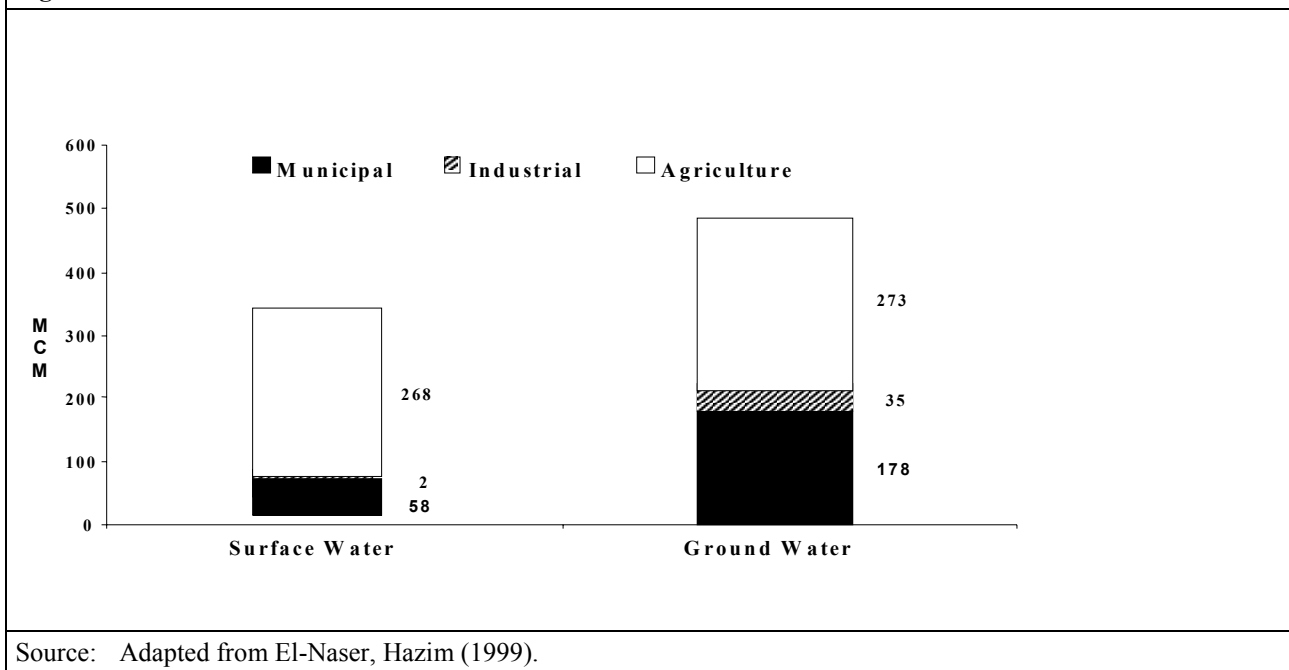
In the past few years, Jordan has become increasingly aware of its looming water crisis. Ground water, the major source of water supply in the country, is overexploited. Jordan's water budget for 1997, for instance, was approximately 876 million m³, of which 55 % was provided from ground water sources (72.9 million m³ of which were non-renewable). The total annual recharge of ground water in Jordan is around 275 million m³; consequently, about 138 million m³ were over drafted from ground water resources in 1997, which is likely to have a negative impact on Jordan's future water security.

Surface water contributed approximately 38 % to the 1997 water budget. Around 7 % of the water budget consists of reused wastewater. Treated wastewater has become an important water source for restricted use (e.g. in irrigation) in the last decade and is now part of the strategic planning of policy makers.

Agriculture is the largest water-using sector, accounting for around 68 % of total water withdrawals (see Figure 1). 27 % of water withdrawals are for the municipal sector, and 3.8 % of this is extracted from non-renewable ground water sources.¹

Reliable supplies of water for the future, adequate in quantity and quality, is one of the most challenging issues Jordan is currently facing. Over drafting of ground water is already prevalent; water needs continue to rise, and water use efficiency in irrigation and domestic supply is low.

1 Cf. El-Naser (1999), p. 3.

Figure 1: Water Sources and Water use in 1997

Projected water demands exceed available resources by far.² Both water demand and supply management measures are necessary to address growing scarcity. In addition, intersectional reallocation will be required to meet the drinking water needs of the population. Intersectional competition between the agricultural and domestic sectors is rising. On the one hand, Amman and other Jordanian cities suffer from water rationing also due to water scarcity. But on the other hand irrigation water is subsidized and a large share of water is used inefficiently by farmers to irrigate water-intensive crops. The objective behind this allocation policy is to attain a certain degree of food self-sufficiency, a major concern in any national food policy, and especially in an unstable political environment such as the Middle East.

In addition, the Jordanian agricultural sector is politically powerful, since many big landowners belong to traditionally powerful families who are important supports of the political power of the Hashemite Royal House. However, the population

is becoming increasingly aware of this doubtful allocation policy, and this may force policy makers into reforms.

First steps were taken by declaring water resources to be state-owned property,³ in this way making it possible to control water abstraction, and, secondly, by banning water-intensive crops, which has occurred in the past two years. But the actual implementation of these policies is questionable. Nonetheless, it becomes clear that intersectional water redistribution needs to be reconsidered with a view to human needs and in terms of economic returns.

3 Institutional Framework of the Water Sector in Jordan

Currently, Jordan is undergoing a water strategy reform process, as the country's water crisis is becoming increasingly serious. This includes a

² Cf. El-Naser (1999), pp. 13 - 16.

³ Cf. Water Authority Law, Article 25, Hashemite Kingdom of Jordan, 1988

reform of legislation and institutional structures in the water sector aimed at meeting changing needs. Both public and private involvement in water resource development and management are to be strengthened.

Institutionally, the Jordanian water sector includes three entities: the *Ministry of Water and Irrigation* (MOWI), the *Water Authority of Jordan* (WAJ), and the *Jordan Valley Authority* (JVA). The Ministry of Water and Irrigation is responsible for sector governance; its activities centre on providing policy formulation, decision making, centralized data collection, monitoring and planning at the national level for the water sector of Jordan. The WAJ, subordinate to MOWI, is in charge of bulk water supply and retail functions for the domestic and industrial sector. The sector reform proposes that the bulk supply and retail functions should be separated and that the retail water delivery function should be managed by the private sector. WAJ would monitor retail supply contracts and manage resources as well as the bulk supplies, which are not privatised. The third institution, the JVA, which is also subordinate to MOWI, is responsible for irrigation water supply in the Jordan Valley. According to recent plans, JVA will be in charge of integrated development of the Jordan Rift Valley, which includes tourism and industrial water use in addition to irrigation supplies.⁴

A major feature of the Jordanian domestic water sector is the ongoing reform process towards privatisation. Private sector participation (PSP) and Public-Private Partnership (PPP) respectively, were first introduced in Jordan in August of 1999, when a foreign company was contracted to manage the Greater Amman water supply. LEMA (a consortium of Suez de Lyonnaise des Eaux – Montgomery Watson and Arabtech Jardaneh) is now responsible for a treatment plant, 100 wells, and a water network extending over 4,500 km and including 270,000 subscribers. It is expected that the management contract signed with LEMA in the summer of 1999 will help to improve supplies,

to increase supply efficiency and to reduce the burden on the national budget. 1 ½ years later, the performance of the management contract is considered to be successful. Unaccounted for Water (UFW) was reduced by 6 %, energy consumption was clearly reduced, cash flow was improved, water meters were repaired, and response time to customer complaints was reduced considerably. Nonetheless, a reduction of rationing intensity has thus far not been achieved.⁵ But this will be decisive for public judgment of the privatisation measures and may therefore create a legitimacy problem for LEMA and the national privatisation strategy. However, Jordan intends to continue with this reform process with plans to extend privatisation of the domestic water supply to the Aqaba governorate in the south of Jordan. But in contrast to Amman, where management of the water supply was contracted out to a private enterprise, a supply company in the form of a public shareholding company is planned for Aqaba. A positive investment climate is expected in this governorate due to anticipated high revenues from tourism and the industrial sector. Moreover, the government plans to privatise domestic water supply in all 12 governorates of Jordan by 2003.

4 Dealing with Water Scarcity in Jordan: Household Choice between Formal and Informal Water Sources

The Jordanian household water sector is quite diverse in terms of its sources, means of supply, and costs for the individual household. Nearly 100 % of households are connected to the piped water system. But the public supply is marked by rationing through interruption (water is supplied only once or twice a week for 12 - 24 hours) due to water scarcity, infrastructure and managerial deficits (~ 58 % of unaccounted for water losses – UFW in 1998) and increasing demand due to population growth. Access to water, source choice

4 Cf. Ministry of Water & Irrigation (MOWI) 1997, Jordan's Water Strategy, Amman, Jordan.

5 According to information from the World Bank, which is financing the management contract for Amman.

behaviour and water costs are examined on the basis of a household survey conducted in Eastern Amman as well as in 14 villages in the northern governorates of Jordan in 1999.

Rationing of public piped water, particularly in the summer season, compels households to invest in storage tanks and supplement their water needs with water from other sources. The storage tanks are usually situated on the roof and have a volume of 1 - 2 m³. In rural areas, some households have underground tanks or cisterns in addition to stored piped water or collected rainwater. Other alternatives are water purchases from public or private tankers. Water supply from public tankers (run by the *Water Authority*) is considered unreliable due to long response times as well as and limited volume and numbers of vehicles. Purchasing water from privately operated tankers has become very common inside and also outside Amman, particularly in the summer season. 30 % of the households interviewed in Amman (23 % in rural Jordan) purchase additional water from private tankers and pay a price 10 times higher than that of piped water. As the government has failed to respond to rapidly changing water demands and seasonal water availability, a spontaneous local (informal) water market has developed. Individual water vendors buy water from farmers owning wells and transport the vital resource with large tanker trucks over many kilometres to the capital city Amman and other urban areas and then resell the water to individual households at a comparatively high price. In addition, informal, small-scale water exchange can be observed between neighbouring households. Here, water is typically exchanged without monetary compensation as a neighbourly service. Moreover, in rural areas some villages have access to surface / spring water. Sometimes this water is the preferred source for drinking. In the northern rural areas precipitation is between 400 - 600mm a year, and traditionally some households (28 % of the households surveyed) harvest rainwater for household usage, particularly for drinking purposes, and mainly for the traditional preparation of tea. The harvested rainwater is usually stored in cisterns. Most of the households consider rainwater to be of better

quality than piped water and therefore prefer this source for drinking purposes.

Since water quality levels of piped supplies is not acceptable to all households for drinking purposes, particularly following the water quality crisis of the summer 1998, when bad-smelling, brown-coloured water came out of the taps, a new drinking water business emerged. Increasingly, it is observed that households buy mineral water or drinking water in huge gallons from special shops, which filter and treat water for drinking. According to survey results, 12 % of the households in Eastern Amman and surely more households in other, wealthier parts of Amman consume bottled water, having lost confidence in quality of piped water. No households using bottled water for drinking were observed in the villages. Figures 2 and 3 give an overview of the domestic water sector in Jordan, sketching the system of domestic water source choice and decision moments of households in Amman and the northern rural region of Jordan.

The survey showed that total household water consumption per capita (including all water sources) lies between 60 and 80 litres per capita and day, mainly depending on household characteristics, storage capacity and season, and is thus quite low.⁶ About 20 - 30 % of this water is obtained from other sources than the public piped water system. In contrast to expectations, rationing turned out not to be a significant determinant of overall water consumption. A statistical analysis has shown that the household storage capacity per capita largely enables households to circumvent the rationing policy.⁷ The decision to purchase water on the private market is a matter of piped water availability, though it also depends on household satisfaction with the quality of piped water. The price of water from private vendors appears not to be a primary determinant of the decision to purchase water on the market. This in turn leads to the conclusion that the demand is

6 In comparison, German households consume on average 130 liters per capita and day.

7 Cf. Iskandarani (2002), p. 86.

price-inelastic, since water is a vital good; when households are short of water, their willingness to pay for water on the open market is very high.⁸

5 How do Households Value Water Supply Reliability?

In addition to the quantity and quality of domestic water, consumers value water supply reliability highly. The value placed on reliability has at least two aspects. The first is the interruption of hourly or day-to-day reliability of municipal water supply to domestic customers due to insufficient capacity of the supply system. The second instance is valuing the reliability of water supplies throughout climatic or seasonal variations – particularly during droughts or dry seasons.⁹ One way to measure the value of domestic water supply reliability to the consumers is to measure the *corrective expenditure*, which indicates how much the customers experiencing (seasonal) water shortages pay for water supply reliability by, for instance, investing in an in-home storage tank or by paying higher water prices for water from an alternative source, e.g. from as private water vendors. An analysis for Jordan shows that in Amman, during the summer season, on average 30 % of overall household water-related expenditures are costs incurred to increase water supply reliability. In rural areas the share is even higher, 50 %. Overall water-related expenditure includes direct water expenditures (for piped water, water from public / private vendors and bottled water) and indirect water-related expenditures – mainly storage costs and treatment costs – which in Amman averages 14.77 US \$ monthly (6.65 US \$ in rural Jordan) in summer and 9.32 US \$ (4.93 US \$ in rural Jordan) in winter.¹⁰

It is likely that expenditure for supply reliability is not only a matter of interruption intensity but also a matter of household income. Poor household can less afford to spend money on water reliability than wealthier households. A regression analysis confirmed this hypothesis, and revealed that expenditures for supply reliability are significantly determined by per capita household income and rationing intensity.¹¹

However, it appears that households are not aware of how much they are actually already paying for reliable supply through investments in storage and purchases from water vendors. By asking households whether they were willing to pay an additional amount on their quarterly bill if they were to receive continuous water of good quality through the public piped system, the majority said "no", and those willing to pay stated a much smaller amount than they are actually paying.¹²

6 Intra-household Water Conservation Behaviour

Water conservation is an important means of water demand management in a water-scarce environment such as Jordan. There are increasing efforts to use the media to sensitise people to the need use the resource water more economically. Water conservation is therefore expected to be part of the household strategy of coping with water supply rationing.

95 % of urban households and 77 % of rural households state that they conserve household water during the dry season. For more than half of

8 Cf. Iskandarani (2002), p. 89.

9 Cf. Young (1996), p. 95.

10 For more details on water related expenditures and effective water prices in Jordan, cf. Iskandarani (2002).

11 Cf. Iskandarani (2002), p. 110.

12 Cf. Iskandarani (2002), pp. 109 - 110.

Figure 2: System of domestic water source choice in Amman

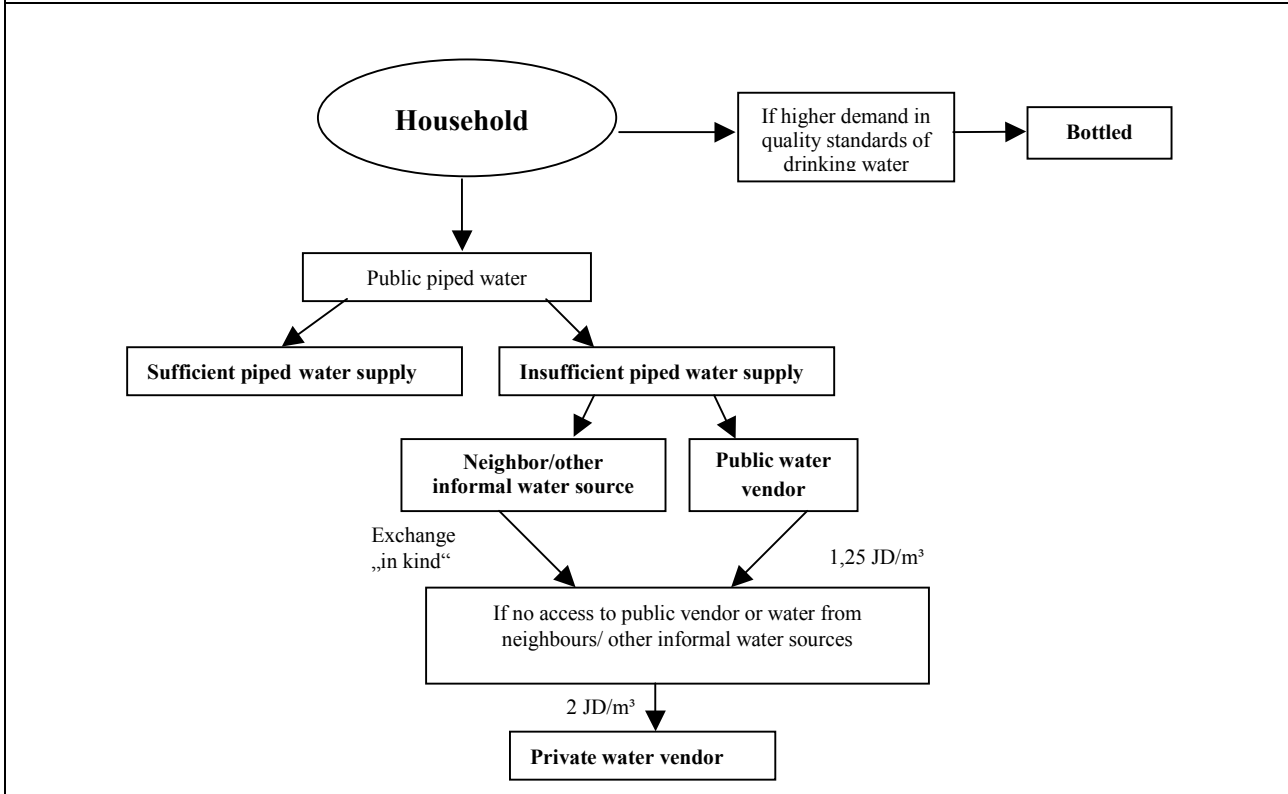
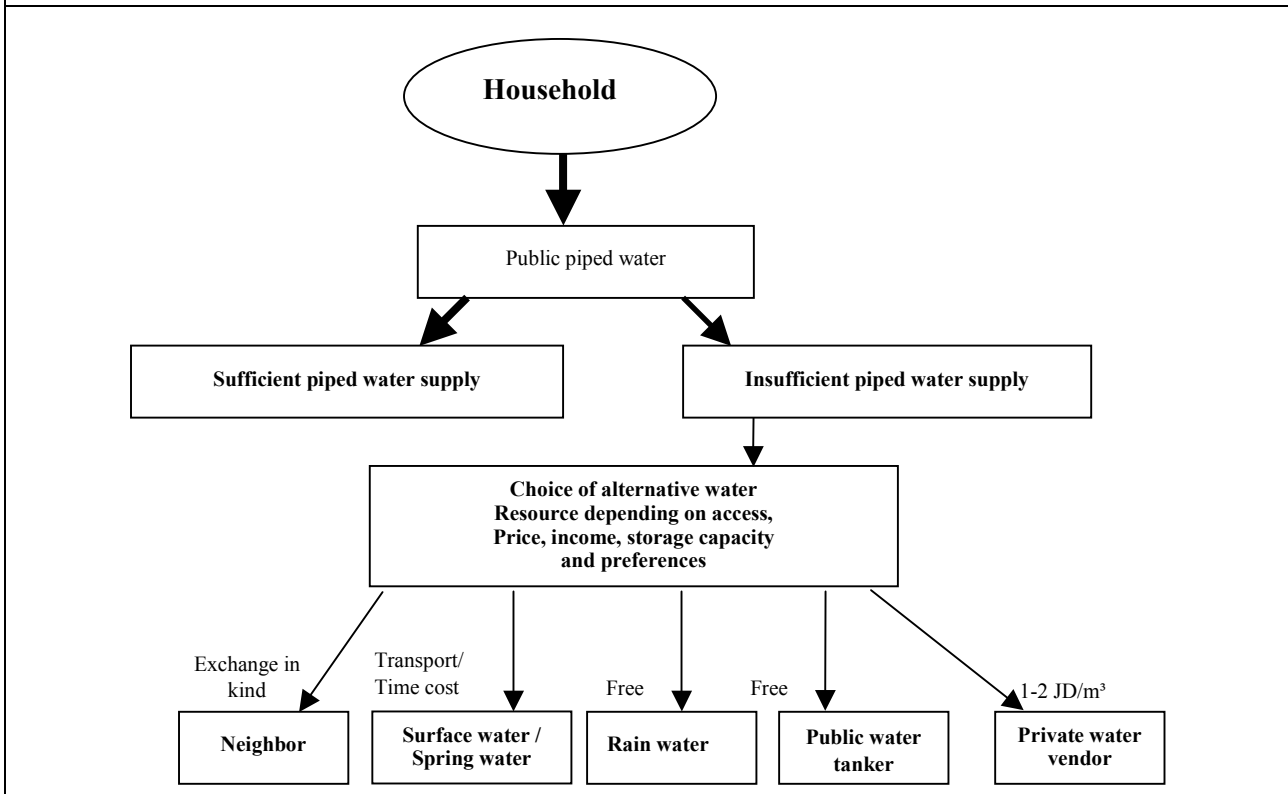


Figure 3: System of domestic water source choice in northern rural Jordan



both urban and rural households, the main approach to water conservation is to use less water for laundry, and the second means to conserve water while washing dishes. Nevertheless, common cleaning behaviour – sweeping the house with a lot of water– in the summer shows that water-saving awareness is still low. A study conducted by the Academy of Educational Development (AED) comes to the conclusion that Jordanians generally find personal cost savings by conserving water more important than the country's water scarcity. They also tend to believe that others will consume water if they do not consume it themselves.¹³

Only 8 % of the urban households and 3 % of the rural households interviewed use water-saving technologies such as low flow shower heads or water-saving taps, which shows that there is still a high potential for the application of such devices and thus for water saving. People are often not informed about such technologies, or they as too expensive.

Nevertheless, water reuse within the household plays a significant role among the available means of water conservation, particularly in urban households. 63 % of the urban households but only 31 % of rural households interviewed stated that they reuse water within the household. In particular, laundry water is reused for house (bathroom) cleaning and toilet flushing.

7 Conclusion with Perspectives on Household Water Security in Jordan

Household Water Security in Jordan has many facets and essentially depends on water availability, access to water and intra-household usage behaviour. Due to resource degradation and infrastructure deficits, but also due to weak institutions and the intersectional allocation policy favouring de facto the agricultural sector, Jordanian house-

holds are vulnerable to water insecurity. Other determining aspects include inefficiency of intra-household water usage, low levels of awareness building in terms of water-saving behaviour, and lack of water saving technologies.

The study has shown that households use various strategies to overcome water insecurity, sometimes incurring high opportunity costs. Storing water and obtaining additional water from other sources in order to secure household water needs involves additional costs, which have to be taken into account when assessing water-related expenditures and water prices.

The challenge for Jordan remains to improve domestic water supply infrastructure and management and to implement an intersectional water reallocation by redistributing water from the agricultural sector to the domestic sector. So far, WAJ has been quite inconsistent in managing the available water resources economically – water losses remain very high and tariffs are far from being cost-covering. International donors have induced WAJ to introduce the concept of Public-Private-Partnership (PPP) into the Jordanian water sector, thereby improving supply efficiency and quality. But political will and an institutional framework (e.g. adequate tariff design, allocation policy) are needed to support PPP and ensure its success.

Furthermore, it needs to be examined whether savings from eliminating indirect and private vendor water costs by increasing public supply coverage and tariffs would improve equity, reliability, and economic efficiency of water supply. However, it is also imperative to both, acknowledge and to act to ensure that the drinking water sector generally has priority in water supply, because access to safe drinking water is a human need and is essential for health and well-being.

13 Cf. WSSCC / IRC (2001).

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Wastewater Reuse in Agriculture – A Challenge for Administrative Coordination and Implementation

Susanne Neubert

1 Introduction

In many countries of the world wastewater has been used for centuries in irrigated agriculture by farmers on an individual basis. Originally the main purpose of farmers was to make use of the nutrients contained in wastewater. Against the background of increasing water scarcity, the current motivation of farmers using wastewater is the lack of other sources of water.

At the national and administrative level, wastewater reuse was long neglected, either because administrations did not feel the need to save on conventional water sources or because of health and environmental risks connected with reuse strategies, particularly if raw wastewater is reused – the usual case in developing countries.

In recent years wastewater reuse has assumed considerable significance in water-scarce countries. Countries which have institutionalized the strategy include, for instance, Mexico and Tunisia,¹ but in South Africa, Pakistan, Vietnam, and Peru the institutionalization of treated wastewater reuse is also making headway. Australia, the US, Israel, and Saudi Arabia as well as some Mediterranean countries are among the well-off nations that are attaching growing importance to the systematic reuse of treated wastewater.

The reasons for this growing attention within the last ten years are increasing water shortages in irrigated and rainfed agriculture and growing

costs for the mobilization of conventional water resources. In addition, fast-growing cities and increasing outflows of untreated and treated wastewater – which, if not reused, has to be disposed of in one way or another – are problems that point in the same direction.

On the other hand, up to now no real breakthrough of a planned reuse strategy has been observed in any country – neither in more advanced, water-scarce countries with high-tech treatment plants nor in developing countries. Certainly, there is very little reliable quantitative data available on the current importance of wastewater reuse in different countries. But it can be stated that in countries which are more advanced in systematic water reuse and are at the same time numbered among the newly industrialized countries, the rate does not exceed 20 % of treatment plant outflows, the figure for Tunisia. In developing countries, where a wastewater treatment strategy has yet to be implemented and wastewater is reused on an unplanned basis, the rate is for the most part unknown (e.g. Morocco, Egypt, Syria), and only in a very limited number of cases does it exceed 20 %, as in the case of Yemen.²

The present paper seeks to provide some explanations of why it is so difficult to achieve breakthroughs for the strategy of reuse. The paper examines the pros and cons of the strategy in the view of different actors and sectors involved and discusses some possible approaches to minimizing risks and maximizing benefits. Some experiences made in Tunisia, which addressing the acceptance levels on the strategy by farmers, are additionally reported. The paper finally points to some questions that still remain to be answered in identifying a policy which might prove feasible and acceptable to all actors involved and thus encourage a breakthrough of the reuse strategy.

The author would like to thank Peter Wolff, Witzenhausen, for his comments on a draft version of this paper.

1 Cf. IWMI (2001), p. 6.

2 On the Regional Workshop on Waste Water Reuse in the Middle East and North Africa, on July 2 - 5, 2001 in Cairo, an overview with quantitative parameters about the importance of reuse, treatment plants, sewerage generated, regulations and project examples for several countries was presented, cf. World Bank / SDC (2001), p. 33 - 37.

2 Basic Considerations and the Need for Institutionalization

Basically, the aim of wastewater reuse is to close local water and nutrient cycles, in this way saving or more efficiently using energy and water. In principal, the reuse strategy is an cross-sectoral approach which is in line with the ideas of integrated water resources management, its aim being to transform competition among sectors into co-operation. The idea is to create win-win-solutions, with wastewater reuse releasing freshwater by removing it from the irrigation sector and making it available for municipal water management.

But whether the strategy of wastewater reuse is also ecologically sustainable depends crucially on the way in which it is implemented. As experiences in several countries show, substantial ecological and health risks can occur if wastewater reuse is not embedded in an overall strategy, and wastewater is not treated prior to reuse.³ Even today – as noted above – institutionalization of the reuse strategy is still in its infancy in most countries. National regulatory arrangements differ enormously, and clearly defined and comprehensive institutional frameworks are still the exception.

Conversion to systematic wastewater reuse not only requires concrete measures, it also calls for rethinking, since the concept cannot be realized without cooperation between various institutions. Particularly in extremely water-scarce countries like Jordan, the responsible authorities often view each other with a competitive eye, and this often means that the aim of every sector or subsector is to secure for itself as great a share of water as it possibly can. Since in most countries conversion would require four or more ministries and institutions – the ministries for agriculture, the environment, water, and health, with their regional and local units – to change their ways, what is called

for here is a conscious system of change management.

The concept of wastewater reuse offers many advantages, though it also entails some disadvantages and is bound up with a variety of implications. In view of the multiplicity of the aspects involved, it is clear that a broad, hygienically acceptable, ecologically reasonable, and commercially profitable implementation of the concept calls for substantial know-how, creativity, innovativeness, and flexibility. It also calls for mobilization of financial resources and for new systems of recovery. Until now, the municipal sector has paid for the treatment of wastewater, but if water is treated directly to serve the needs of farmers, they could be called upon to bear a share of these costs.

Since a number of institutions would be affected by any such decision, competences would have to be redefined and coordinated across institutional boundaries. This could be done in the form of memoranda of understanding or similar agreements. Coordination of this kind is nevertheless difficult, and institutional fragmentation has in many cases already meant missed chances to incorporate individual components of wastewater reuse in projects on irrigation and municipal water management.⁴ But Tunisia has managed to solve these competence problems in a positive way.⁵ Here the groundwork for institutionalization and a redefinition of decision-making and action-related competences was laid at the top, i.e. at the ministerial level. In most countries, however, the project of wastewater reuse has still not been accorded a high place on the political agenda. What we see instead is a number of unconnected, locally independent projects being conducted at the same time. And this often means locally limited learning effects and learning costs that recur time and again.

Tunisia solved the problems posed by overlapping and competing competences by setting up, as

3 While today, worldwide, the wastewater generated by some 2 billion persons is systematically treated, the corresponding figure for untreated wastewater is 4 billion persons.

4 Cf. World Bank / SDC, (2001), p. 9.

5 Cf. World Bank / SDC, (2001), p. 7.

early as 1975, an independent wastewater agency (*Office National de l'Assainissement*, ONAS) that has drawn together many of the tasks that were otherwise scattered across a number of different institutions.⁶ One of the consequences of this consistent policy is that today well above 80 % of Tunisia's urban wastewater is treated, a favorable condition for systematic reuse.⁷ Another advantage is that all users and beneficiaries are subject to the same rules, controls, and costs. The wastewater authority is also responsible for training and advanced training for administrations, treatment personnel, and farmers - a task that would otherwise have resisted clear-cut assignment to a given institution. Overlapping tasks, which still exist in Tunisia as well, are steered by an interministerial committee, which is one more reason why the nation is the leader in the field of water reuse in the region.

The reason for listing these positive points is not to create the impression that Tunisia has solved all of its wastewater problems. The evidence cited is intended only to provide reasons to look more thoroughly into this country as a next step on the way to a viable reuse strategy.

In Tunisia there are also projects aimed at privatizing treatment plants, and in this way it might well prove easier to graduate prices along differentiated quality criteria. Privatization can, however, also entail disadvantages, and it is not a *sine qua non* for realization of the concept of wastewater reuse. In terms of current planning, water resource allocation will in any case remain a government task.

It is essential to anchor the option of wastewater reuse both in irrigation projects and in municipal water management projects, since otherwise the outcome may be planning conflicts that impede or even prevent implementation.⁸ Institutionalization, however, would not only serve to regulate

environmental and health risks, it would also open the door for essential investments in adapted treatment technologies and the development of separate duct systems, in this way encouraging a breakthrough of the technology. Another challenge facing institutionalization today is an ex post (re)structuring of reuse and subsequent adjustment of standards in areas where wastewater is already used, though not in the proposed, safe way.

On the other hand, these investments appear realistic only if the tariff policy predominant in most countries is changed. In nearly all countries water prices are still subsidized and tariff rates are not geared to different water qualities. Reducing subsidies or a clear differentiation between high-quality and low-quality water could give rise to new incentives to implement the reuse strategy on a broader basis.⁹

But – as experienced in Tunisia – a suitable legal framework, political will, functioning institutions and high-standard treatment plants are still not sufficient to absorb high percentages of wastewater in the agricultural sector, as discussed below. To reach this objective, the legal framework and treatment characteristics should be adapted to the actual demands of the recipients / users of wastewater. This indicates that further steps are also needed in countries like Tunisia.

3 Anticipated Risks and Benefits for Sectors and Actors Involved

A look at the various aspects of wastewater reuse and the benefits and disadvantages they may entail clearly indicates that the anticipated risks and benefits associated with them are quite unequally distributed between sectors and actors.

6 Wastewater treatment, environmental compatibility, distribution issues, monitoring, restrictions, and the like.

7 Cf. El Bech (1996), p. 1.

8 Cf. World Bank / SDC (2001), p. 2.

9 Cf. Saghir et al. (2000), p. 10.

Table 1: Risks and benefits of institutionalized wastewater reuse in agriculture: perspectives of different stakeholders	
<i>Anticipated benefits</i>	<i>Anticipated risks / costs</i>
Perspective: society at large / national economy	
Rise in productivity per unit volume of water, and thus enhanced efficiency of water use. Saving funds for "supply" investments.	Investments in treatment technology, infrastructure and transportation costs
Attractive possibility to beneficially eliminate growing quantities of wastewater	Investments in institution-building, regulatory and control mechanisms
Perspective: drinking-water sector	
Increased availability of freshwater	
Perspective: operators of treatment plants (advanced / emerging economies)	
Possible cost advantages because denitrification treatment stages are unnecessary: nutrients remain in wastewater (nitrogen / phosphate)	Need for investment to reliably comply with hygiene standards (disinfection)
	Costs for additional training / qualification of plant personnel
	Costs for increased control needs / quality management
	Costs for construction and maintenance of systematic treatment systems (developing economies)
Perspective: agricultural sector, farmers	
Lower-cost, reliable, additional source of water for irrigation	Less freshwater available for irrigation
Effective use of residual nutrients in wastewater (nitrogen, phosphorous, potassium)	Need for investment in irrigation systems (separate duct systems) as well as in new equipment, transportation costs, storage infrastructure
Humus accumulation in soils due to input of additional organic substances in wastewater; protection against erosion	Effort and expense needed to sensitize the public and train personnel with a view to conveying the needed know-how and preventing image problems
	User health risk due to pathogens in wastewater or improper use in farming
	Dirty work, e.g. removing wastes from canals etc.
	Possibly lower yields, plant intoxication, clogging of microsprinklers and soil capillaries due to inputs of organic substances
	More effort required to handle different water qualities; rising management needs
	Constant supply in the face of fluctuating water demand (possible creation of storage capacities / wastewater-collection tanks)
	Risk of negative impacts on chances of marketing of produce (esp. export)
	Acquisition of know-how on new management strategies
Perspective: consumers	
Stable water supply (substitution of wastewater for freshwater units in irrigation sector)	Possible health risk from consumption of plants / fruit / produce irrigated with wastewater)
	Health risk due to creation of breeding places for disease carriers
	Risk of increased disturbance by odorous substances (should more treatment plants be based on anaerobic processing to meet the nutrient needs of farmers for reuse).
Perspective: environment	
Less wastewater in receiving bodies and surface water	Risk to groundwater: contamination with nitrates, nitrites, and other toxic substances
Reduced extraction of groundwater	Risk to soil: salinization, contamination with toxic substances (heavy metals)
Lower energy use due to substitution of fertilizer production	Eutrophication of wastewater channels

Table 1 shows that various costs and benefits, also in financial terms, may be expected if the wastewater strategy is institutionalized and that these costs and benefits will be distributed unevenly among different stakeholders if there is no provision for systematic compensation. Whether the overall costs or the overall benefits dominate the picture, and how these costs and benefits are distributed, largely depends on the policy, tariff system, technology, and regulatory regime adopted and can therefore be quantified only for concrete cases.

The table shows in addition that every stakeholder involved can benefit from the strategy of wastewater reuse. But it is in particular farmers who are exposed to risks and adverse effects if mistakes are made by upstream sectors which mobilize and allocate water, supplying it to the drinking water sector, treating it, only then supplying it to farmers. When we take a hard look at the benefits and risks, these interdependencies between actors become obvious. Good practices are therefore essential at every stage if damage is to be avoided in reusing wastewater. Under the circumstances given, adequate action is likely only if regulatory and control mechanisms are in place at sensitive points.

Using existing country experiences as examples and pointing to windows for action that may enhance the overall strategy, the following chapters analyze some of the risks listed above and discuss benefits and possible regulations designed to control them.

4 Health Risks and Possibilities of Regulating them

In legal terms, wastewater reuse must not be allowed to adversely affect the health of consumers and users; this is an issue of the utmost priority. The health risk involved depends on the degree of wastewater purity, though it also hinges on irrigation method, crop type, application technique, and other factors as well. Health risks can thus be

regulated both with the aid of limit values for wastewater components and restrictions on specific agricultural uses. In 1989 WHO formulated wastewater reuse guidelines as a basis for national legislation.¹⁰ These guidelines focus mainly on the microbiological contamination of water and are geared to avoiding any acute health risks. Since chemical contaminants tend more to be bound up with long-term impacts, biological contaminants must, in WHO's view, be given priority. In scientific terms, however, assessment of actual health risks continues to be a controversial matter; there are either too few epidemiological studies available to permit any precise weighting of risks or the studies are not sufficiently practice-orientated to permit the results to be translated into concrete policy.¹¹ But as the available epidemiological studies show, the sanitary risks posed by irrigation with raw wastewater – both to users and to food consumers – should not be underestimated.¹² Yet even simple treatment procedures are sufficient to comply with the WHO guidelines. Furthermore, users and consumers can themselves make an important contribution to minimizing risks by, for instance, complying with sanitary standards in processing and using wastewater, i.e. by handling it on the basis of the information available.¹³

In the view of most experts, if the WHO standards are observed, the residual risk is very low and may be termed *acceptable*.¹⁴ The question is, however, whether any health risks at all may be regarded as "acceptable", though against the back-

10 Cf. WHO / UNEP (1989).

11 Cf. Peasey et al. (2000a / b). Risks can, however, be hierarchized. According to Engelhardt (quoted in Peasey et al. (2000a / b), the greatest risk is that posed by intestinal nematode infection; this is followed by worm diseases and bacterial infections. Viral infections, including hepatitis A, range lowest on the scale.

12 Cf. Peasey et al. (2000 a / b).

13 Examples of such measures: users should wear protective overalls, wash their hands, keep at a safe distance; consumers should thoroughly wash the outside of produce to be consumed uncooked.

14 Normally contaminated municipal wastewater takes roughly 20 days in unaerated wastewater ponds to reach the limit values.

ground of actual practice and growing water shortages this question is of a more academic nature.

In the past ten years many countries have adopted national regulations, some of which are oriented to the WHO guidelines and others of which were formulated at earlier points of time, as in the cases of Namibia, Israel, Japan, and Tunisia.¹⁵ The factor crucial to the stringency of regulations is whether or not individual countries set their sights on the concept of wastewater reuse as strategic goal. This will differ in terms of whether or not such countries have the technical and financial wherewithal to use regulations covering individual biological and chemical wastewater discharge values or whether their main instrument of regulation consists in rules restricting the use of wastewater.

Development of National Legislation and its Implications

The US, Israel, and Saudi Arabia have, in the context of their technical standards, set a number of individual limit values for microorganisms and chemicals. This type of differentiation was pioneered by California, which as early as 1918 undertook some initial efforts concerning the reuse of wastewater; and later, with the growth of technical potentials, the US further differentiated and tightened up these regulations, the final outcome being extremely low limit values (California State Water Code). These strict limit values have no grounds in medical science and take considerable effort to monitor and enforce. As early as the 1980s, many developing countries began patterning their efforts on the California Code, even though compliance with such standards was for them neither feasible nor affordable; then, by the mid-1980s, the regulatory efforts undertaken by many countries began to falter. It was only in 1986 that World Bank engineers examined the medical foundations of these minimum standards;

15 USEPA (1992) has published an overview of existing national regulations.

they concluded that far higher limit values would be justified. The 1989 WHO guidelines reflect this view.¹⁶

In their legislation many developing countries focus on use restrictions. Often, for example, such regulations ban wastewater irrigation for vegetables that can be eaten raw, or for edible plant parts in general, and require a minimum time interval between irrigation and crop harvest. The main problem with such use restrictions is that they cannot be monitored without functioning oversight agencies. Other conditions required for compliance include a functioning system of water distribution management and high market values for the crops covered by such regulations.¹⁷ Another problem involved in use regulations is that this approach makes it possible to detect environmental damage only *ex post*. One possibility of compensating for this problem is to mark for reuse only certain areas with defined cropping patterns that can be monitored without undue effort and cost. This is the strategy pursued, for instance, by Tunisia.¹⁸

The serious problems involved in monitoring use restrictions have led several countries, including Mexico and Tunisia, to combine these two approaches: use restrictions plus easy-to-measure limit values for chemical and biological sum parameters (BOD₅ and COD) and micro-organisms, a practice that has given rise to a comprehensive and yet uncomplicated approach that, while doing justice to minimum safety needs, is still comprehensive enough to be generally conducive to the strategy of wastewater reuse.¹⁹

16 Cf. Raschid-Sally et al. (2001), p. 5.

17 <http://www.fao.org/docrep/W5367E/w5367e03.htm>, p. 28.

18 Cf. Westcot (1997), p. 3.

19 Mexico combines four water qualities with different irrigation methods and defines general limit values. It also uses crop maps and timeframes to formulate use restrictions. In addition, Mexico has defined some limit values aimed at safeguarding plant health and environmental compatibility. Tunisia also mainly relies on use restrictions. For instance, it has banned irrigation with wastewater (treated or untreated) for vegetables that are

One negative example of a promotion policy of this kind is Jordan, with its highly restrictive reuse regulations. One of the reasons for this practice is presumably the importance the agricultural export market has for Jordan. Since the export market tends to respond more sensitively to quality issues than the domestic market, the Jordanian government fears economic losses if it officially promotes wastewater reuse. In this case it could even make sense to set stricter limit values.²⁰ But, in general, retaining strict and comprehensive restrictions is counterproductive in that this approach may lead in the long term to more severe environmental and health problems than occur under more generous regimes: a) irrigation is still done on an individual basis with wastewater, and there are no controls; and b) discharging wastewater into receiving bodies (which is the usual procedure) in any case impairs surface-water or groundwater quality.

5 Environmental Risks and the Use of Nutrients in Wastewater

Wastewater components may have both positive and negative effects on plant growth, crop yields, and the environment. At the international level, the UN Food and Agriculture Organization (FAO) is responsible for regulating agriculturally relevant (and environmental) aspects. At the end of the 1970s the FAO published wastewater reuse guidelines on salinity, exchangeable ions, boron,

eaten uncooked. The same applies for heavily used pastures. These restrictions on allowed uses are supplemented by biological and chemical sum limit values (BOD₅, COD, organic substances) and limit values for nematode eggs. Tunisia continues to permit wastewater irrigation for golf links, public parks, and the like, i.e. mainly for areas and crop types that pose little risk to consumers since the plants in question are not consumed or the crops do not come into direct contact with the wastewater used. Cf. Pescot (1994). However, the reuse restrictions in Tunisia will be overthought soon, as the policy makers decided to lift the treatment standards by adopting another treatment stage for disinfection as standard.

20 Cf. Rose (1999), p. 6.

heavy metals, etc.; in subsequent years it extended the list to include further elements as well.²¹ In developing countries salinity is usually the dividing line between water suited or unsuited for irrigation uses. Heavy metal concentrations are as a rule still relatively low in these countries and are not yet responsible for any major problems.²²

High salt concentrations in irrigation water hamper the water intake of crops and lead to yield losses for many crops. In addition, high sodium contents in loamy soils lower their permeability for water, which results in lower soil aeration. The consequences of these effects are also yield losses. In the case of high subsoil permeability, there is an additional risk of groundwater salinization. In view of the fact that risk severity depends on specific soil structures and compositions, and can also be influenced by management measures, the FAO guidelines must be seen as orientation values that are in no way intended to replace case-to-case assessments. High salt concentrations are an indication of highly concentrated wastewater, a factor typical for arid countries. Here wastewater is for this reason often mixed with freshwater as a means of reducing salinity. This practice must be seen as ambivalent, because mixing high-quality water with low-quality water means deliberately diminishing its quality before it has been used for the first time.

Another important aspect is wastewater nutrient content. Raw wastewater contains nitrogen, phosphate, and potassium in concentrations sufficient to cover or even exceed overall plant fertilization needs.²³ The presence of trace elements and organic matter also favors plant growth and raises soil humus levels.²⁴

21 Cf. FAO (1976) and FAO (1992).

22 Cf. Rowe / Abdel-Magid (1995), p. 23.

23 Cf. FAO (1992), p. 2. For a quantity of 5000m³ / ha x a, inputs due to wastewater reuse are: N = 250 kg /ha x a, P = 50 kg / ha and annum, and K = 150 kg / ha x a, Cf. also Westcot (1997).

24 One negative side-effect is that inputs of organic matter may, under certain circumstances, clog soil pores.

These substantial advantages for farmers are offset in part by environmental risks consisting in the danger of nitrate-leaching. Other agrobiological risks are bound up with the fact that nitrogen can, in later phases of growth, have negative effects on plant growth. The nitrogen, however, stimulates undesirable algae growth on cultivated soils. Appropriate management methods are called for here.

Today, additional stages of modern treatment plants eliminate most nitrogen and phosphorus from wastewater. So the question is whether these treatment stages should be bypassed in a strategic reuse of wastewater or whether they should be retained for environmental or other reasons. Experts are not wholly in agreement on this issue. Some see the reuse of nutrients as one of the concept's important benefits and regard the risks as manageable, while others continue to favor elimination of nutrients in treatment plants.

Wholly depriving wastewater of its fertilizing value would cancel out a substantial share of the ecological and commercial-operational benefits associated with the strategy.²⁵ This would eliminate an important incentive for farmers to use this technique. It must also be considered that the mineral fertilizers that are replaced by wastewater likewise entail a risk of leaching, i.e. ecological farm management is called for one way or the other. Protective or buffer zones should be able to ensure groundwater protection in either case. In Germany, for instance, such water conservation zones have been an established practice for many years.

Suitable Treatment Methods

Another important consideration is how best to adapt treatment technology to the altered demands of wastewater recipients. Only when treatment plants mainly rely on aerobic processes that nitrify organically fixed nitrogen and ammonium nitro-

gen is nitrate the dominant nitrogen compound found in municipal wastewater. This nitrification stage, with the subsequent denitrification it requires, releases nitrogen into the air, and this nitrogen is thus no longer available to the system. This approach is used systematically in today's modern treatment plants to prevent ammonium nitrogen, which is toxic for fish, from getting into aquatic environments.

Reusing wastewater in agriculture would change this picture. Neither nitrification nor denitrification would be necessary, since the wastewater would in this case not be discharged into aquatic environments. Instead, the ammonium nitrogen would remain in wastewater, and similar naturally induced biochemical processes would then take place in the soils. The main advantage would be that it would in this way be possible to simplify the treatment technology and reduce a highly relevant amount of costs in the treatment process. One of the drawbacks anticipated are odors that cannot be fully avoided if anaerobic processes are predominant.

If nitrogen is to be made available in the form of ammonium, anaerobic wastewater treatment processes of the kind encountered in some near-natural treatment methods are sufficient; these include unaerated wastewater ponds and plant- and root-zone-based treatment plants geared farmers' needs. Such plants are robust, i.e. "error-friendly" and cost-effective, and are thus generally well-suited for use in developing countries, assuming that the amount of land needed for natural treatment methods is available.²⁶ Further research and development are needed to come up with more clear-cut assessments. Research projects aimed at answering this and related questions are currently being conducted by several universities and research institutes, including the *International Water Management Institute (IWMI)* in Pakistan as well as in Morocco, Mexico, Vietnam, and South Africa.

25 Closing nutrient cycles, saving energy and resources in fertilizer production.

26 Cf. Rose (1999).

6 The Farmers' Perspective

It is often noted in the literature one problem faced in practice by increasing reuse is insufficient acceptance of the reuse strategy by farmers. The reasons for this are often described as *sociocultural*, but they are rarely analyzed in detail.

In the case of Tunisia, where the legal, technical, and political framework for reuse are relatively favorable, the low motivation of farmers to reuse wastewater is in fact reported to be the most important obstacle to increasing the current level of reused water. In the northern part of the country there are some public irrigation schemes which provide farmers with treated wastewater. The most frequently grown crops are fodder plants, fruit, and industrial crops. Vegetables are not grown because of legal restrictions which prohibit the use of wastewater for such crops.

Looking more carefully at the factors determining farmers decisions as well as their experiences with wastewater reuse, it is easy to understand why farmers still prefer to use conventional water under the given circumstances.

- The tariffs for treated wastewater are lower than for those for conventional water,²⁷ but the price of conventional water is also low, and is probably not an important determinant in the decisions of farmers.
- The supply of wastewater is reported to be less reliable than the conventional water supply.²⁸
- The advantage offered by the residual nutrients in wastewater is usually not known to farmers, and they for the most part continue to add full doses of fertilizer.²⁹

- The legal framework for reuse is favorable in principle for farmers, but there are strict irrigation restrictions on vegetables.
- Working with wastewater is reported by farmers to be "dirty", and wearing protective clothing can be very uncomfortable, especially in the heat of the sun. In addition, microsprinkler clogging is reported to be a problem.³⁰
- Though health risks for farmers are very low,³¹ they are not zero as long as treatment plants are not equipped with a disinfection stage. Farmers are not fully informed about the results of risk assessment and the possible impacts for their families.

Aside from the fact that it would be interesting to conduct direct interviews with farmers to learn more about their particular experiences and preferences, the aspects pointed out show that the incentives for farmers to use treated wastewater are not very numerous, while some serious reservations continue to exist even under the favorable conditions in Tunisia.

One of the most important reasons for this is the legal restriction concerning the use of wastewater to irrigate vegetables.³² Since vegetables are the most profitable and most easy-to-market crops in Tunisia, this legal restriction is sufficient to explain the slow rate of adoption by farmers.

Recently the Tunisian government decided to add the disinfection stage as standard technology for all existing treatment plants. This step could raise acceptance among farmers significantly, since it would eliminate any health risks associated with the reuse of wastewater, making it possible to lift crop restrictions. At the same time, this disinfection stage would make it easier and more con-

27 Cf. Bahri (2002), p. 6.

28 Cf. Bahri (2002), p. 6.

29 Cf. Benabdallah (2002), oral communication.

30 Cf. Benabdallah (2002), oral communication.

31 Two epidemiological studies didn't show an increased health risk for the exposed group compared to the control group (cf. Bahri, 2002, p. 6).

32 Cf. Bahri, 2002, p. 6.

venient for farmers to handle wastewater. But since the technology involved is very costly and energy-intensive, the question remains whether this highest-standard treatment technology is cost-efficient for society at large, ecologically sustainable – and the most reasonable solution for the problems involved.

7 Conclusion and Outlook

The option of using treated wastewater as a resource for agricultural irrigation can no longer be neglected in arid countries, where increasing water shortages occur and – at the same time – growing amounts of wastewater have to be disposed. To eliminate risks and fully utilize the benefits, systematic institutionalization of the wastewater reuse strategy is the most important prerequisite. It is of course not possible to discuss the institutionalization of wastewater reuse in isolation from a country's overall water sector. Institutionalization must therefore go hand in hand with the existing structure of wastewater management as a whole.

The vision of action-oriented governments and institutions smoothly translating the strategy of wastewater reuse into practice is the one side of the coin. The other is a reality largely marked by weak institutions with, as a rule, insufficient financial and organizational endowments and, at least for the time being, little interest in a strategic reorientation of this kind. For this reason alone it is essential that water users themselves, i.e. farmers and consumers, speak up. It would in this way be possible for the strategy to be boosted to a breakthrough, so to speak, from *the bottom up*. It is therefore essential to be familiar with the interests and concerns of water users, i.e. farmers, to adapt the framework to their demands, and then to focus and structure the numerous individual projects already in existence, for instance by organizing wastewater user groups. This would make it possible to gather and exchange valuable experience as well as to reduce learning costs. Successes in wastewater reuse bound up with

heightened safety could win more confidence among farmers, consumers, and decision-makers alike, paving the way for institutionalization.

It is also important to train farmers in dealing with special management problems which arise in the reuse of wastewater, the aim being to enable them to make real use of the potential advantages wastewater irrigation implies (e.g. nutrients).

But as long as water shortages are not perceptible to farmers, economic incentives are also essential to reaching a breakthrough in wastewater reuse. Since freshwater prices do not reflect actual water scarcity in a given country, farmers clearly prefer conventional water sources for irrigation.

Different economic conditions in different countries call for variable approaches, also as far as wastewater reuse strategies are concerned. While in Tunisia a countrywide high-input wastewater treatment technology may be the best solution to existing problems, in developing countries cheaper methods, such as near-natural treatment plants and a legal framework that includes crop restrictions, may be a more realistic and thus more desirable option. Thus it is important to develop particular wastewater reuse strategies along the framework and conditions typical of a nation or region.

Finally, it should be examined thoroughly whether uses of wastewater other than agricultural might also be economically interesting and ecologically sustainable. The reuse of wastewater in industry, recreational areas, in forestry, and on golf courses could also increase the percentage of reused wastewater, in this way contributing to increasing the efficiency of a country's overall water use. It will probably be a mixed approach that leads to a rational management of our wastewater resources.

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Low-quality Water Resources and their Impact on Regional Supply and Inter-sectoral Water Allocation in the Jordan Valley

The Framework of a Research Programme in the Near East

Heinz-Peter Wolff / Werner Doppler

1 Introduction

Already in the 1950s (Arabian Peninsula, Israel, Palestine) and 1960s (Jordan), most countries in the Near East ran out of sufficient 'indigenous' water to meet total water needs, including water for food production.¹ Since then, demographic and economic growth has aggravated competition for scarce freshwater resources between consumption sectors and increased the search for alternatives to cover the growing need for water. Nowadays, about 90 % of the water withdrawn in the Near East is directed to agriculture, while domestic and industrial consumption account for only about 4 to 5 % each.² The domestic needs of a rising population as well as the growing demands for freshwater from industry and tourism constitute a highly controversial situation, since freshwater can only be withdrawn from agriculture, thus limiting its potential to meet the simultaneously rising demand for food production and economic growth in rural areas.

This development emphasizes the relevance of low-quality water resources and in particular the re-use of wastewater in alleviating water scarcity. Environment-friendly and non-hazardous methods of wastewater treatment and the use of treated waste water are in different stages of their technical development and offer an important potential for improving the situation of regional water supply in the future. In 1997, however, treated

wastewater accounted for only 0.23 % of the water withdrawal in the Near East,³ which indicates that the reasons for the slow pace in exploiting wastewater resources have their origin in institutional and management limitations rather than in technical potentials.

Current wastewater legislation in the countries concerned, i.e. the formal institutions that govern wastewater use, considers upper boundaries of accepted contamination for water re-use. There are at best distinctions for water supply for domestic consumption and individual crops. A regulated, sustainable incorporation of treated wastewater in schedules of regional water supply, however, requires consideration of interdependencies within water consumption sectors of and of the relations between these sectors.

Establishment of complex approaches for wastewater utilization is still hampered by a substantial lack of knowledge about potential social, political and economic consequences. Little is known about informal institutions, e.g. cultural restrictions and people's perceptions of working with wastewater and consuming and using agricultural products that stem from wastewater irrigation. Economic impacts from changes in farming systems due to replacement of freshwater by low-quality water thus remain unpredictable, and this prohibits the development of quantitative models for a socially and economically optimal distribution and allocation of water with different qualities between economic sectors and regions.

The research programme LOQWA (Low-quality water resources and their impacts on regional water supply and intersectoral water allocation in the Near East) focuses primarily on the Jordan Valley and tries to cope with this complexity by combining experience from German, Israeli, Palestinian and Jordanian scientists. The objectives are to (1) assess future potentialities of the use of low-quality water, especially of the re-use of waste water; (2) to analyse the role of agriculture in the use of low-quality water and people's attitudes to

1 Cf. Allan (1998).

2 Cf. FAO (1997).

3 Cf. FAO (1997).

using waste water and consuming the resulting products; (3) to determine the consequences on the availability of water, procurement costs and pricing and allocation between agriculture and competing sectors such as industry, tourism and domestic demand by modelling future scenarios; and (4) to analyse cross-border potentials of water use and management in the Israeli and Palestinian areas of the West Bank.

2 Institutional Aspects of the Present Approach

One of the key objectives of the research programme is to provide information on and analytical tools for the improvement of the current formal rules or, in the annotation of analysts in the fields of new institutional economics and public choice theory,⁴ current formal institutions on the use of low-quality water. Existing legislation and administrative regulations in the research area consider guidelines from international organizations such as the World Health Organization⁵ but rarely deal with questions of water distribution and allocation according to different water qualities.

Dealing with unwritten rules of moral, cultural or traditional origin – i.e. informal institutions – in the use of low-quality water is more difficult, since only little is known about the shaping and impact of these rules. It is not possible to distinguish between institutional 'rules' and people's behaviour or practices on the basis of the current state of knowledge, though this would be required for an understanding of the dynamics of institutional change and the changing patterns of endowment and entitlement mapping.⁶ The hypothesis of the present approach in this regard is that in the case of the research region, behaviour of stakeholders in decisions about water use and al-

location essentially follows formal institutions. Aspects that are likely to be linked to informal institutions are part of the analysis of consumer and producer reactions to the use of low-quality water. Specific research on the distinction between rules and behaviour, however, will be considered only if results indicate a substantial need for the respective knowledge in order to achieve the program goals.

3 Work Packages in Research on Technical Issues and People's Attitudes

As for most countries in the Near and Middle East, a large number of studies on water resources, water use and water management are available for the Jordan Valley watershed.⁷ The first work package of the research programme makes use of this existing information by summing up available knowledge on regional water resources of all qualities, in this way providing the framework for planning of and impact analyses on the overall water resource situation (Figure 1).

Gaps in the knowledge on the potential treatments and applications of wastewater and the lack of conclusive and comparative analyses on their effects require three technical work packages. The first of these packages, i.e. work package 2, deals with the definition of treatment processes and their prioritisation according to criteria such as treatment costs, level of water quality and environmental impacts. Work package 3 is concerned with biological and technical consequences of the use of different water qualities in agricultural and selected non-agricultural applications, such as industry, public areas and recreation zones. A further topic in this package is the potential use of sludge as fertilizer. Research in work package 4 tries to determine the suitability of low-quality water in different applications with regard to product quality, potential residues and their impact on human health and the environment.

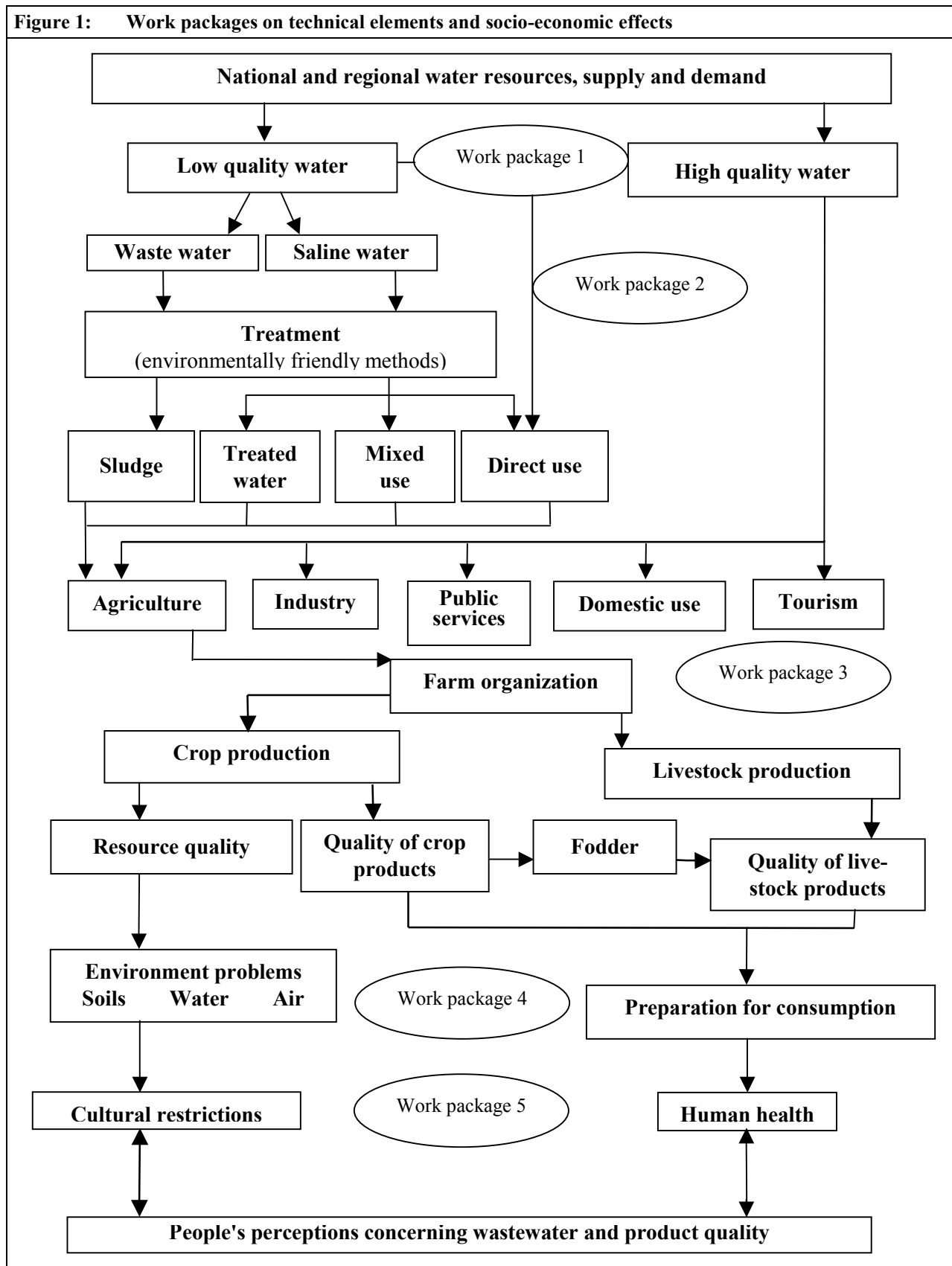
4 Cf. e.g. North (1990); Ostrom (1986).

5 Cf. WHO (1989).

6 Cf. Leach et al. (1997).

7 Cf. e.g. World Bank (2001), Palestinian Water Authority (1997).

Figure 1: Work packages on technical elements and socio-economic effects



The logical link between these three packages is that the outcome of work package 2 provides information on different qualities and quantities of water, which can be used in agriculture (work package 3). Use in agriculture concerns a wide range of farm organisations and market relations and will finally provide the type of products and costs of production using different water qualities. This information determines the residual and environmental analyses of work package 4 which in return provides information to agriculture and waste water treatment on whether the residual and environmental results require adjustments to treatment (work package 2) and production (work package 3).

Work package 5 deals with the components of attitudes and is aimed at gaining knowledge on cultural and social barriers, resulting restrictions for water allocation and impacts on competition between sectors for freshwater. Research in this work package therefore focuses on the understanding and definition of people's perception of wastewater products in urban and rural areas. Key issues are the investigation of cultural, ethical and medical norms and restrictions on the re-use of water, analysis of consequences on strategies of low quality water use and definition of relationships to existing formal institutions.

This research targets the attitudes of people who (i) work with domestic wastewater in treatment plants and distribution systems, (ii) use wastewater in farms and industry and (iii) consume products that may stem from wastewater irrigation. The latter also include the element of possible impacts from wastewater use on export of products. The link between this work package and the technical packages and the more economy-oriented packages 6 to 8 is that it determines the socio-cultural border for the technical and economic potential of future strategies and options in the use of low-quality water.

4 Work Packages in Research on Socio-economics and Formal Institutions

The link between the technical packages and work package 6 to work package 8, which deal with socio-economic, economic and policy issues, is in one way the provision of basic technical information for socio-economic analyses and strategy testing and in turn the impact of socio-economic findings on the potential of techniques for implementation. Research on socio-economic issues and policy formulation follows a vertical logic from the micro level – such as farms and sewage plants – in work package 6 via a meso level in work package 7, where water management and allocation between the individual enterprises takes place, up to sectoral competition and cross-border cooperation in work package 8 (Figure 2).

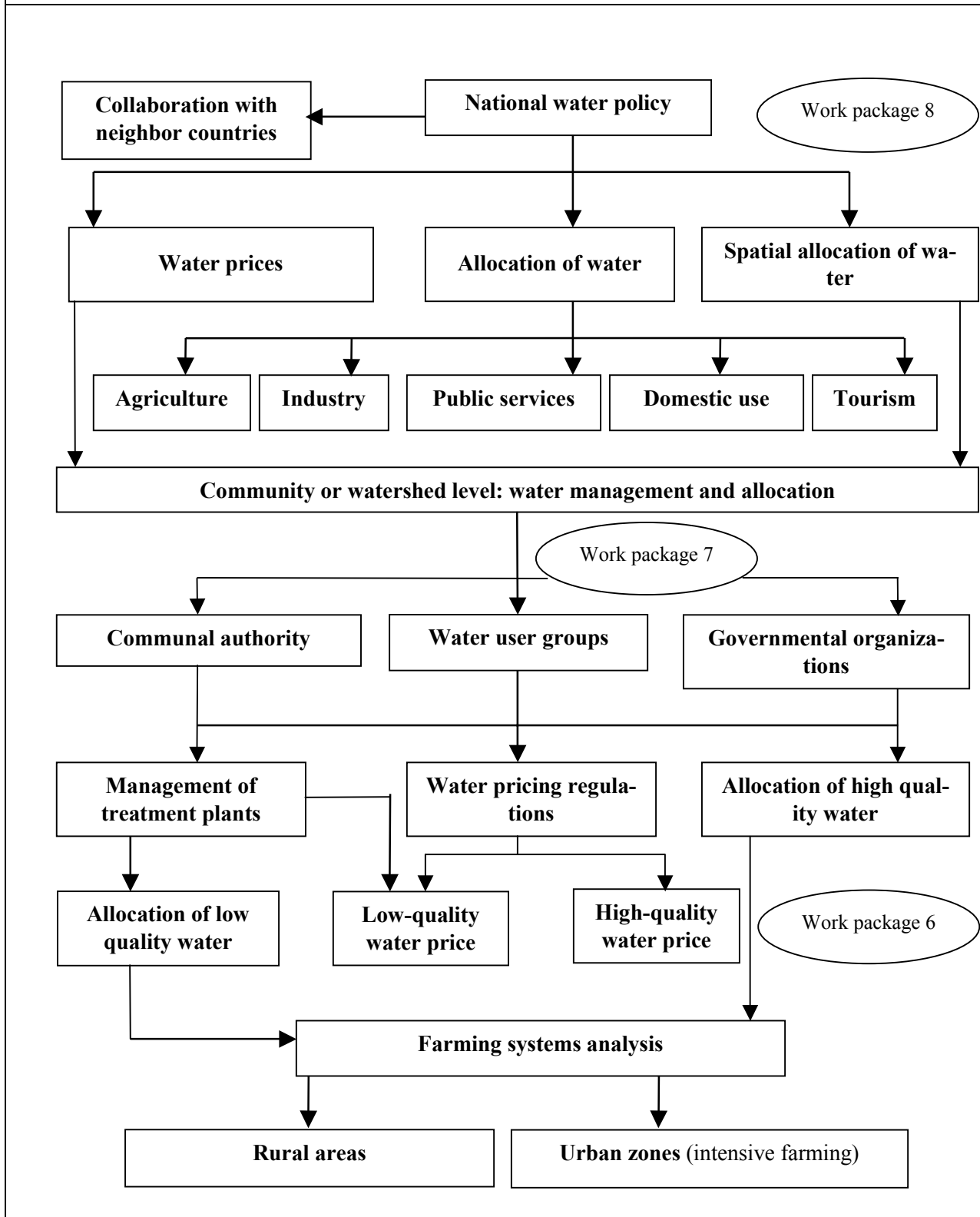
Upward along this vertical line, decision-making on water use and all related consequences become increasingly complex and extend from private business-oriented thinking to a more society- and policy-oriented thinking. On the upper end of this vertical line, decisions on water allocation at the national level are likely to be based on policy criteria (which may include economic and social issues) and sectoral preferences. Down the line, criteria for decisions may change through communal institutions to private farmers, where interest groups may try to gain influence on the general policy of water allocation and pricing. Work packages 6 to 8 focus on these relationships and try to reveal the consequences of different strategies on all levels.

Work package 6 deals with impacts of water-use strategies at the farm-family level in different farming systems. Its task is to determine the impact of low-quality water use on a sustainable living standard of families in different farming systems and in different political and ecological zones. Key issues in production include economic and socio-economic impacts of low quality water use on crop and livestock husbandry, farm organisation and the quality of natural farm resources such as soils and analysis of markets for low-quality water. It is expected that the combination of these results with those from work package 5

will explain farmers' behaviour and decisions in response to people's perception of the use and consumption of products produced with wastewater. The combined results are the precondition for

defining future strategies on wastewater use in different farming systems as well as for formulating the respective political and administrative requirements.

Figure 2: Work packages on socio-economics, policies and formal institutions



Research in work package 7 fills the gap between questions of individual living standards on the micro-level and national welfare on the macro level by investigating factors that determine water allocation on the communal level. The objective is to design management concepts for integrated wastewater treatment and re-use systems in a spatial context by relating available resources to allocation decisions. Empirical work considers rural regions as well as urban zones and its surrounding areas, where a lower level of intensity and lower capacity of capital investment are typical characteristics of agriculture

Work package 8 integrates all analyses and planning that deal with priorities for water allocation between sectors, impact assessment of national water management strategies, water pricing and requirements of cross-border co-operation. Key issues include the competitiveness of different types of water in the different sectors of national economies and the reasons for differences in this competitiveness between the countries of the research partners. Combination of these results with the outcome of work package 6 and work package 7 is intended to allow for the definition of optimal water allocation and pricing policies at the national level under different scenarios of low-quality water use. Optimal national policies based on adequate formal institutions and giving consideration to existing informal institutions, may then help to evaluate cross-border potentials for the sustainable exploitation of regional water resources.

5 Situation of the Research Programme and Preliminary Results

The development of the joint research programme was based on the results of discussions with members from four Universities in Jordan, Israel and the Palestinian Authority in 2000. The changing political climate in the Near East hampered the programme, mostly due to its negative impacts on the possibilities to raise funds, while the pro-

gramme's structure, with the German partner as a hub, remained intact.

Initial steps in research got underway immediately with two contributions to work packages 5 and 3 in Jordan and the West Bank, and preliminary results will be presented at the 5th Symposium of the European Group of the International Farming Systems Association (IFSA) in Florence, Italy, April 8 to 11, 2002. These results emphasize the urgent need for a sound strategy for incorporating low-quality water resources in water supply and inter-sectoral water distribution in the Near East. Water scarcity forces farmers to use all available water resources, independently of water quality. The lack of formal institutions of water allocation and use according to water quality lead to higher individual profits on the farm level, but engenders potential hazards for environmental resources and human health.

Low-quality water is an alternative resource in the water-poor Near East region and may be used to substitute for part of the freshwater used in agriculture. The substitution process, however, requires simultaneous consideration of effects in all other sectors of an economy. In the case of the Jordan Valley, at least some farming systems may not survive this process in their current form, if regulations on the application of low-quality water lead to rising water prices, restrictions on the choice of crops or a reduction of market prices for products from irrigation with low-quality water.

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