

# Water and Economy-Wide Policy Interventions

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## Water and Economy-Wide Policy Interventions<sup>1</sup>

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## Contents

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<b>1</b>	<b>Introduction</b>	<b>2</b>
<b>2</b>	<b>What is New? A Short Literature Update</b>	<b>5</b>
<b>3</b>	<b>The Macro–Micro Linkage Framework</b>	<b>7</b>
3.1	The building blocks . . . . .	8
3.2	The farm model . . . . .	10
3.3	The macro model . . . . .	11
3.4	Feedback links . . . . .	13
3.5	How other sectors are linked and modeled . . . . .	14
<b>4</b>	<b>Description of the Policy Issues</b>	<b>15</b>
4.1	Mexico . . . . .	15
4.2	Morocco . . . . .	16
4.3	South Africa . . . . .	16
4.4	Turkey . . . . .	22
<b>5</b>	<b>The Empirical Framework</b>	<b>23</b>
5.1	Features for Morocco . . . . .	23
5.2	Features for Mexico . . . . .	43
5.3	Features for South Africa . . . . .	50
5.4	Features for Turkey . . . . .	54

<b>6 Conclusion</b>	<b>60</b>
6.1 Mexico . . . . .	60
6.2 Morocco . . . . .	62
6.3 South Africa . . . . .	63
6.4 Turkey . . . . .	64
6.5 A word on the value of macro–micro linkage CGE approach . . . . .	65
<b>Annex</b>	<b>66</b>
<b>References</b>	<b>76</b>

## Abstract

Water is a limiting factor for sustainable economic growth and development in many countries. Its allocation has significant impacts on overall economic efficiency, particularly with growing physical scarcity in certain regions. Water also has become a strategic resource, involving conflicts among those who may be affected differently by various policies. This monograph reviews work that models various policy interventions aimed at improving water allocation decisions with an economy-wide context. It focuses on the “macro–micro linkage” framework that facilitates assessment of various linkages among policies and their impacts within individual sectors and the economy. Drawing on country-based studies in Morocco, South Africa, Turkey, and Mexico, the analysis reveals difficult tradeoffs among various policy objectives, including priorities placed on different sectors, regional advantages, and general economic efficiency gains versus broader social impacts. The comparison of policy impacts demonstrates how policy makers can use such information to rank the policy interventions according to the emphasis placed on their objectives. The monograph also compares approaches used in other economy-wide studies that apply computable general equilibrium models in various contexts of water, environment, and agriculture.



# 1

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## Introduction

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Water is a scarce resource in many arid and semi-arid regions, where economies are highly dependent on it. In many countries, due to climate and landscape conditions, water supply and demand nodes may be present in different geographical locations. Therefore, competition over and allocation of water involves serious policy considerations. The state faces difficult decisions regarding management and allocation of its water, as it is linked to land, environmental amenities, and development priorities.

Because of its central role in both developing and developed economies, water resources are the focus of many intervention policies. These policies have been aimed at achieving multiple objectives, including income transfer, food production security, environmental sustainability, and resource conservation. Since agriculture consumes the lion's share (70–90%) of annual renewable fresh water on earth it is a sufficient reason for policy makers to focus their efforts on improved performance of scarce water use in irrigated agriculture. While focusing on policies that target irrigated agriculture may lead to an immediate improvement in irrigation water use, still, other implications may negatively affect other water-using sectors, and indirectly also the agricultural

sector. This system of cause and effect holds also for the urban water sector, as well as for the industrial and environmental sectors. The fact of the matter is that water, to a large extent, plays a central role as an intersectoral mechanism that has to be considered at the economy-wide level when being allocated among competing uses.

For quite some time, the economic literature analyzed impact of policy interventions by governments, using a plethora of policy interventions such as pricing, quotas, water right assignments, and development of water trading, but with focus only on a subset of water-using sectors [e.g., Johansson et al., 2002, Dinar and Saleth, 2005, Tsur et al., 2004a,b,c, Tiwari and Dinar, 2002]. Policy interventions could be water-directed (e.g., water regulations) or not water-directed (e.g., trade policies, labor policies, or other input policies). Another typology of policy intervention could be the level at which they are applied, namely as macro policies imposed on the state as a whole, or micro policies imposed on a region, on a sector, or on individuals (e.g., big farmers). But because interactions among sectors and factors of production are evident, the linkages between micro and macro policy interventions are far more important and allow policy makers to better assess the outcome of their interventions.

While policy interventions at the regional (micro) levels could lead to desirable results, local considerations may also lead to a suboptimal outcome, from a social point of view. This point is demonstrated in recent findings from works on economy-wide considerations and linkages [Roe et al., 2005a, Diao et al., 2008, Hassan et al., 2008, Cakmak et al., 2008, Yunez-Naude and Rojas Castro, 2008, Hassan and Thurlow, 2011]. It was found that reforms in sectors other than agriculture have major impacts on rural households' income, and that water reforms that are designed without taking into account reforms outside the major consumer of available water — irrigated agriculture — may lower overall productivity of irrigation water and have negative impact on the other sectors competing on that limited resource.

In recent years we have also witnessed increased globalization and climate change considerations, both of which strongly suggest that water policy is no longer a sectoral, or regional, but an economy-wide

matter. Recognizing this trend gave rise to studies of an economy-wide nature [see review in Dudu and Chumi, 2008, Johansson, 2005]. While many economy-wide analyses (mainly Computable General Equilibrium — CGE — models) have been published in the economic literature on water, little can be generalized mainly because these studies use different assumptions and structures of the economy. For example, many CGE studies on water that have been reported in the literature treat irrigated agriculture as one sector/activity. Such structures are only appropriate in economies where physical (soil quality, water availability, etc.), economic, and social conditions (crop mixes, proximity to markets, farm size, water delivery costs, etc.) are identical or similar across regions. However, existing spatial variation within economies makes that assumption of little use for simulation of real-world policy interventions.

Recognizing the importance of having the ability to assess different policy-linkage and performance interactions, this monograph considers policy interventions aimed at improving water allocation decisions, and assessing the impact on regions and sectors, by including both macro and micro considerations in a unified analytical framework. The monograph draws upon a recently completed set of country-based case studies on water management policy interventions in Morocco, South Africa, Turkey, and Mexico, all using a similar macro–micro CGE framework [Roe et al., 2005a,b, Diao et al., 2008, Hassan et al., 2008, Cakmak et al., 2008, Yunez-Naude and Rojas Castro, 2008, Hassan and Thurlow, 2011]. The country studies allow, for the first time, a comparison of a variety of policy interventions across various economic, institutional and physical situations, and generalization to situations and conditions in other countries. The results of the analyses of the macro–micro linkage approach that was applied to Morocco, Mexico, South Africa, and Turkey are presented and contrasted so that the tradeoffs between different social allocation preferences are clearly identified in terms of their impact on sectoral productivity and welfare distribution, using economy-wide performance indicators. The monograph is concluded by identifying areas (e.g., climate change, globalization, food crisis, migration, distributional effects) in need for more research. It will provide a proposed framework for their inclusion in such analysis.

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