

ECONOMIC DEVELOPMENT AND WATER

L. Berry

Center for Environmental Studies, Florida Atlantic University, USA

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1. Introduction

Water, because it has so many different functions in everyone's life, is hard to analyze in terms of economic development. Yet there are some clear lessons to be drawn on the role of water in economies of every type. The difficulty of the analysis is that water links with so many other factors in promoting economic well being. Water is a basic essential for all six billion of the world's inhabitants; health has been shown to be dependent on a good supply of clean water, but water is also needed for almost all industry, small or large scale, for agriculture, for animal rearing and for many service activities. In addition, water is an essential part of many recreational activities and not least, water is a critical part of most environmental services on which our ecosystems depend. Thus, this essay, which focuses on water and economic development as the core theme, will draw on specific examples to illustrate the kinds of relationships in which water plays an important role.

What follows is first a general analysis of the linkages between water and economic development followed by case studies drawn from rural Africa, USA, China and South America.

2. Water and Economic Development at the National Level: General Principles

The wealth of economies is most often measured at the national level in terms of Gross National Product, an index of the monetary rating of the economy often expressed as GNP per capita. There are also good measures of the water resources of nations. The Human Development Index (HDI) of the United Nations Development Programme

attempts to express wealth in a broader context, a ranking involving social and other economic factors.

If we look at the statistics for the wealth of nations in comparison with water resources or water availability, there is generally a weak correlation between the two factors. Canada, one of the world's richest countries in per capita GNP, is also the world's richest country in terms of water availability, but water poor Kuwait and Saudi Arabia also have a high GNP (Table 1). Water scarce countries in Africa are also some of the world's poorest, Niger, Chad, Burkina Faso for example; Other water scarce countries are much wealthier in GNP terms; Australia, Israel, Botswana and Bahrain for example.

In HDI rankings there is a general correspondence with GNP per capita and water resources relationships, but also some differences. The three richest countries all have high levels of water resources, but the next four Kuwait, Israel, Bahrain and Saudi Arabia have the lowest index of water availability. At the lower end of the table Chad, Burkina Faso, and Niger are poor in wealth indices, but two of the three have significant levels of water resources, though a closer look at the country shows that these are not well distributed.

But this lack of clear relationships leads to a questioning of the statistics because in so many ways we know that sufficient, good quality, water is a critical part of the well being of people. Obviously many complex factors are at work, not least the stage and pattern of development of the region or country.

Water is a component of all stages of human economic activity. In some cases it can be substituted for but only rarely is it replaced. Early development of civilized society was heavily influenced by water availability. Water sources for humans and animals are a critical part of pastoral society and early-sustained agriculture was a function of irrigation in the Tigris/Euphrates and Nile and in China. The beginnings of the industrial revolution was predicated on water power and a regular water supply for industrial processing and today the location of nuclear power plants is in part a function of water for cooling processes. In a parallel sense the viability and longevity of our fast growing worldwide network of cities is heavily dependent on access to economically sustainable sources of water.

GNP, Human Development Index & Water Resources In Selected Countries			
COUNTRY	GNP/CAPITA U.S. \$	HDI ¹ (RANKING) ²	WATER RESOURCES PER CAPITA M ³
CANADA	22 480	0.932 (1)	94 000
USA	29 010	0.927 (3)	9000
AUSTRALIA	20 210	0.922 (7)	18 500
ISRAEL	18 150	0.883 (23)	289

KUWAIT	25 314	0.833 (35)	11
BAHRAIN	16 527	0.832 (37)	NA (Low)
SAUDI ARABIA	10 120	0.740 (78)	119
BOTSWANA	7690	0.609 (122)	1870
CHAD	970	0.393 (162)	2176
BURKINA FASO	1010	0.304 (171)	1535
NIGER	850	0.298 (173)	346

1: Human Development Index
 2: Parentheses shows UNDP ranking by country
 UNDP Oxford University Press 1999

Source:
 1. Human Development Report
 2. World Resources 1998-99 WRI & OUP 1999

Table1: GNP, Human Development Index & Water Resources In Selected Countries

To quote Lundquist and Gleick, 1997

“Lack of water is a barrier to sustainable socio-economic development; lack of development is a barrier to solving water problems. Because water integrates so many aspects of life, it must be given prime consideration in the context of development objectives. This includes the day-to-day management of water, decisions about allocations for socio-economic activities, and the preservation of natural resource capital.”

They do point out that there are differences between basic human and environmental “needs” for water and the broader sort of human “wants” some of which are detailed in Table 2. “The overall demand for water includes a combination of basic “needs” and a larger set of “wants.”

‘Need’ for water exists independently of economic or political status and, in principle, it cannot be manipulated. It is most evidently illustrated as a ‘basic need’ in connection with human health. (Table 2). The failure to meet basic needs is the cause of enormous human suffering and meeting these needs should be the top priority of water policy makers.”

PURPOSE	RECOMMENDED LEVEL (litres per person per day)
Drinking water	5
Sanitation services	20
Bathing	15
Food preparation	10

Total recommended BWR for basic human needs	50 litres per person per day
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Source: Gleick (1996)

- a. Excluding water required to grow food.
- b. This is a true minimum to sustain life in moderate climatic conditions and average activity levels.

Table 2: Basic Water Needs

More generally, “demand” typically refers to the economic and political demand that is expressed in terms of purchasing power and degree of political empowerment and claims. The “demand” for water in terms of economic development may be an even greater problem in the future than it is at the present. Global water use increased between three and fourfold between 1950 and 2000, and water use at the turn of the millenium is about 5,000 cubin kilometers, roughly 40 % of globally available local water. Many countries and regions within countries are already permanently water short, constraining many kinds of economic activity. Desalination is beginning to be a viable option even in some quite humid areas; for example the Tampa region of Florida. The cost of water and the often greater cost of good quality water will be a more major factor in economic development in the future even more than now for many countries and regions. As stated earlier there are many possible links between water and economic development. Table 3 provides a few examples of these.

USE	HUMAN SYSTEM	EXAMPLES
Animal Watering Lakes, Wells, Ponds	Pastoral Nomads Cattle Ranchers	Sudan, Australia W. USA
Irrigated Farming	Flood irrigation, Controlled irrigation, Pump and gravity flow	Nile, Tigris, N. China, Sudan, India, Bangladesh Argentina
Energy	Textile industry Milling Hydro power supply	Lancashire UK, N. England, Ghana, India, China, Colorado USA, etc.
Cooling and Washing	Chemical Industry Nuclear Power Steel Industry	India, Florida USA, Pittsburg USA, Korea Brazil
Water Supply	Urban residential and municipal Rural settlements	All over the world

Table3: Water and economic development

Table 3 just illustrates the range of positive direct links between water availability and economic development; there is also the sort of relationships which develop where lack of water availability constrains economic development or at least places a higher economic, environmental or social cost on its user. The current use of wetlands for farming in Kenya has excluded the Masai from vital dry season grazing in Kenya: the abstraction of water from the Colorado in the U.S.A. has impacted adversely downstream flows to Mexico; water use for irrigation is impacting groundwater levels and water quality in countries as diverse as Yemen and West U.S.A. One set of economic uses of water in these and many other cases impacts other present and/or future economic or environmental uses.

For almost all countries the issue now is the competing demands for water and the impact of these demands on the quality of water, especially for human use. The transition through time and over different parts of the globe from water for basic needs to water for multiple uses has created fundamental conflicts or threats of conflicts in resource use. The relationship between water development and economic growth depicted in Table 3 as a single-use phenomenon is now often a process of allocation between various uses. An additional factor in the various competing uses of water is the now recognized need for water in rivers, lakes and in aquifers to perform environmental services as well as economic and social services. The list of demands on water related to economic development thus includes:

- Basic human needs
- Urban and municipal supply and dispersal
- Rural supply and dispersal
- Industrial production, processing needs
- Energy production
- Power plant and other cooling
- Transportation
- Recreation
- Environmental sustainability

In summary almost all parts of our lives and society are dependent on water systems. The way in which these water systems are managed is the major factor in the efficient use of water to promote and sustain economic activity.

The following four case studies illustrate some of the complex relationships between economic development and water in a more fundamental way than statistics, yet they only illustrate some of the linkages set out in Table 3. The case study on Sudan illustrates the importance of water to all aspects of the economic development of that country: the example of TVA illustrates the focal point of water in the overall development of a poor part of a rich country; the Three Gorges development in China links the traditional use of water in the Chinese economy associated with land and irrigation, with ambitious plans to harness the country's greatest river to control flooding and provide power and consistent irrigation but with serious questions about the side effects; and the study of the Pantanal in South America illustrates the complex international and environmental issues in major river development for multiple purposes.

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