Revealing the Face of Water Scarcity

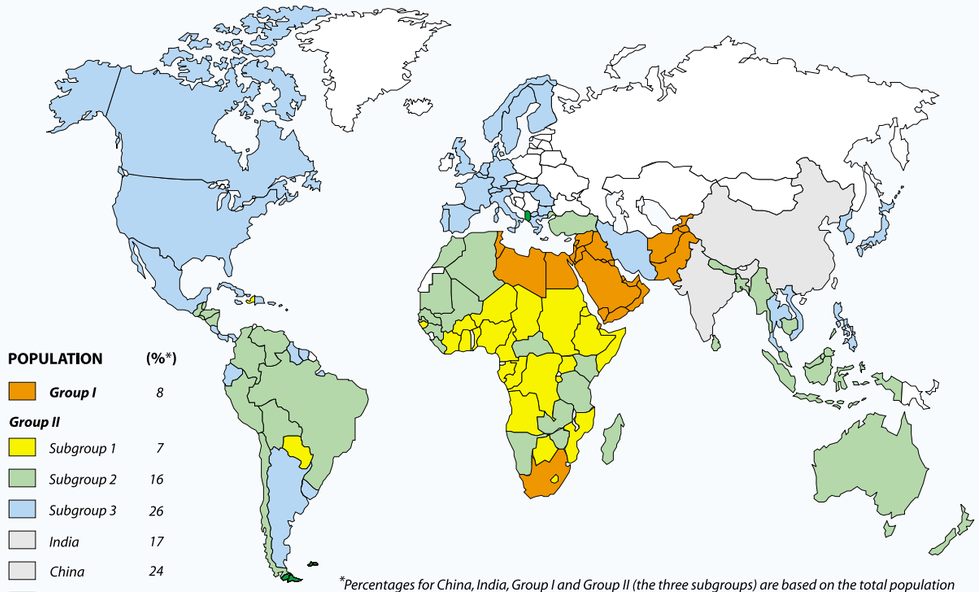
An important component of IWMI's scientific activity is its 'strategic generic research' on water management, food security and poverty issues. These findings support governments in their policy decisions and set the agenda for the Institute's applied research work. With its recently completed Global Water Scarcity Study, IWMI gives the world a new picture of water scarcity and its causes, and pinpoints areas where urgent action is needed.

The scenario that nearly 1 billion people may not have access to water by the year 2025 is now a generally accepted global challenge. A less-known fact is that IWMI's Global Water Scarcity Study has helped define this problem more precisely. The study gives a new factual basis to the worldwide policy discussion on water management and its impact on food security.

This research, by IWMI's Director General, Dr. David Seckler, Senior Advisor, Dr. Randolph Barker and Research Statistician, Dr. Upali Amarasinghe, shows a clear picture of the world's water-scarcity issues. It projects water supply and demand patterns across 118 countries and pinpoints countries and entire regions in the developing world where water will no longer be available in 2025, or where available water resources will not be developed due to other constraints—such as lack of funds or environmental pressures.

IWMI's work picks up where well-known water-scarcity benchmarks, like the UN Commission on Sustainable Development or Falkenmark, Lundqvist, and Widstrand (1989) conclude. IWMI completes the work of these models, by developing a picture of future water scarcity.

IWMI offers a new view by considering the importance of the various competing water users—domestic, irrigation, industrial—and the fact that the overall demand for water is continually changing, and therefore difficult to predict. It looks at the importance of geographical and seasonal water supply variations in some regions. Here, a potential water crisis can hide behind a national average that shows a stable water supply situation.



*Percentages for China, India, Group I and Group II (the three subgroups) are based on the total population of the countries studied.
Percentage of "not estimated" category is based on the world population.

The strength of this study is that it documents the scope and severity of the potential water crisis and highlights the causes. When fully developed, this work will be a prime source of information to support the policy changes that the affected governments must take to address their water-scarcity crises. Over the coming year, the IWMI research team will work to deepen its knowledge of water scarcity, by gathering and analyzing more detailed country and regional data and contrasting this with grain production figures. This will form a global water scarcity/food security picture.

The scope of scarcity: 'Business-as-usual' water use is not an option

The message from this study is clear: *Unless the countries that will experience water scarcity act today to manage their water resources more productively, they will face a series of impossible decisions when the crisis hits. The inhabitants of these regions will have no choice but to reduce the amount of water they use in agriculture and transfer it to competing users—in the industrial, domestic, or environmental sectors.* For the poorest countries, this shift will be catastrophic. Less water in the fields means decreased domestic food production and a requirement to import more food at world-market prices.

More work is needed before the IWMI water scarcity methodology can be used as a planning tool. But the study's value today is that it identifies a series of national and regional disparities in water resources that were not previously known. It also establishes a clear link between water scarcity and food security. This is a problem that researchers and policy makers with a crop focus have not previously considered as a high priority.

The study examines the available economic, demographic, and agricultural data from 118 countries over the 1990–2025 period. It concludes that more than 25 percent of the world's population—or 33 percent of the population in developing countries—live in regions that will experience severe water scarcity. In the next 25 years, some one billion people living in arid and semiarid regions will face absolute water scarcity.

Data presented by this research reveals that the groundwater table is falling at an alarming rate in the semiarid regions of the Middle East and in Asia, the home of some of the world's major breadbaskets.

IWMI defines water scarcity as those areas of the world that, by 2025, will not have sufficient water to maintain their1990 levels of per capita food production from irrigated agriculture. Water-scarce areas will not be able to meet reasonable water needs for domestic, industrial, and environmental purposes. Scarcity of water will create an intense competition among different users, with all the associated political and national security implications that this will bring.

In the struggle for water, it is the poorest of the poor—the primary social group targeted by IWMI's research—that will be left without options. If governments in the affected countries maintain today's 'business-as-usual' scenario for water use, by 2025, millions of the world's poorest people will simply see their water disappear, as it is diverted for use—by wealthier or politically connected users.

The study pinpoints two types of water scarcity—absolute and economic. Countries and regions faced with absolute scarcity will see their groundwater aquifers depleted. Economic water scarcity will hit countries that have sufficient water to meet user demand, but lack the funds to develop the necessary dams or canals to tap the resource. Seckler, Barker, and Amarasinghe predict that economic scarcity alone will hit some 348 million people across Africa and Asia if current water consumption patterns continue unchecked.

Irrigation: Efficiency alone will not solve the problem

Irrigation holds a special place in the water-scarcity debate, as it uses more than 70 percent of the world's total water supply—and up to 90 percent in some developing

The IWMI Water Scarcity Study reveals that, by 2025:

- Some 25 percent of the world's population—or 33 percent of the population in developing countries—live in regions that will experience severe water scarcity (Group I). Some one billion of the world's poorest people will be affected.
- One-third of the populations of India (280 million people) and China (381 million people) live in regions that will face absolute water scarcity.
- The rest of the 118 countries included in the study, theoretically, have sufficient water resources to meet their 2025 needs. But many of these countries will need to produce more than twice their existing water supplies (Subgroup 1). This means embarking on large and expensive water-development projects, which many will not be able to finance.
- Countries such as Latin America, North Africa, and East Asia will need to increase water development by 25–100 percent (Subgroup 2), but many do not have the means.

countries. Any reduction in overall water supply means a reduction in irrigation, which translates into less agricultural production.

The lack of a realistic view of the situation by some policy makers is one of the danger areas surrounding the water scarcity picture, this research shows. It says that many of them do not see water scarcity as an urgent problem; they think that efficient irrigation alone will cure their potential water shortage. Here, the researchers raise a warning flag.

The research shows why this thinking could have dangerous consequences. Many people believe that existing irrigation systems are so inefficient that most, or even all, future water needs could be met simply by increasing the efficiency of irrigation and transferring the water saved to domestic, industrial, and environmental uses. The IWMI research shows a very different picture.

In addition to the fact that irrigation efficiency gains may be lower than projected, the IWMI research tests two common assumptions, to show how governments can easily underestimate the severity of the problem.

First, it examines the conventional view that no additional irrigated area or irrigation water will be needed to meet the 2025 per capita food demands. This belief assumes that all increased food consumption will be met from increased yields—due to better seeds, fertilizers, and agricultural management.

But this may not be the case at all. There are signs that yields of major cereals are stagnating in many of the most productive areas of the world. Urbanization is also eating up much of the existing irrigated area. This problem is further compounded by diversions of water away from agriculture and the increased salt content in water and soil, which make land useless for farming. The study says that, if these trends continue, more irrigated area and water will definitely be required.

The second assumption tested by the water-scarcity study is that the proportion of food supplied by irrigated and rain-fed areas will remain constant. But data gathered by IWMI shows that most of the good rain-fed areas in the world are already being used, or that the financial and environmental costs of developing their water resources are prohibitive. Increased crop yields are slower on the more marginal rain-fed lands than on irrigated lands. So IWMI's view is quite the opposite. Proportionally more irrigation will be needed to meet future food demands, than was needed in the past.

The groundwater paradox

One of the strongest statements to emerge from this research is this team's belief that the combined depletion and pollution of groundwater will be the single greatest water-resources problem in the coming 30 years. This research team feels that the problem does not receive the attention it should—from water experts, government policy makers, and the international organizations that fund development and research work.

Rapid groundwater depletion is a consequence of the explosive spread of small pump irrigation throughout the developing world. India, for example, has more area irrigated by these low-cost methods than by all other surface irrigation systems combined. Ironically, it is precisely this low-tech, high-efficiency irrigation that is sucking aquifers dry today in many highly productive agricultural regions.

In some Indian regions, water is being extracted from aquifers at two-to-three times the recharge rate. Some aquifers are currently being depleted by one-to-three meters per year. The increased energy costs for deeper pump irrigation severely endanger the freshwater supply to villages and causes lakes and rivers to dry up.

Eventually, the costs of pumping become so high that the pumps are shut down and the whole house of cards collapses. Under this scenario, the study says it is not difficult to imagine how India could lose 25 percent or more of its total crop production.

Scarcity is more than drought

Water scarcity is more than the decreasing availability of this resource. This research pinpoints the rise of pollution and salinity in water as other pressing issues—with no evident solutions. This contamination makes plentiful water supplies unfit for drinking, agricultural, or environmental purposes. IWMI has several parallel research projects looking at these issues.

Salinity in soil and water has already reached crisis proportions in some countries today. Pakistan is one example. Its water table is cursed with high salinity, a situation that is complicated by a lack of natural drainage from the agricultural areas of the Indus basin, except the Indus river itself. As salinity and other pollutants enter the river upstream, downstream users become progressively affected by pollution. Downstream crop productivity decreases and water becomes unusable.

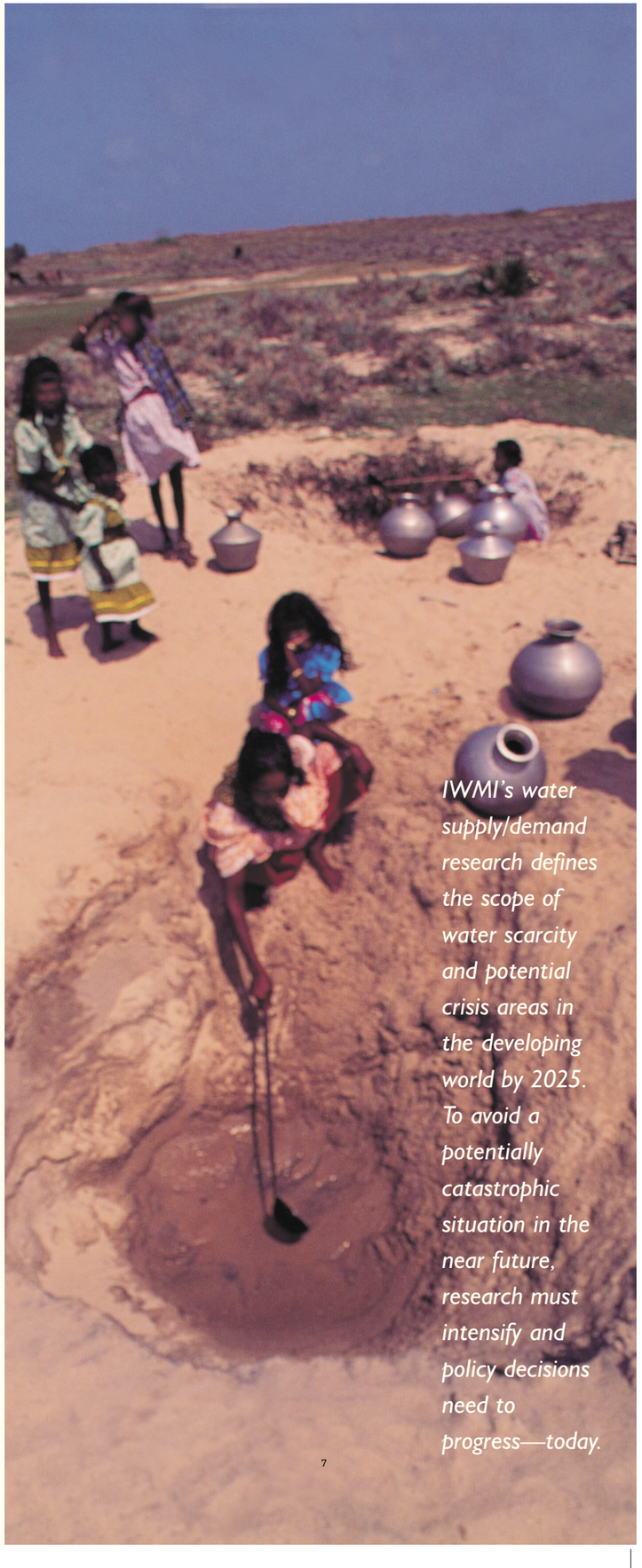
While the IWMI Water Scarcity Study is not yet the benchmark that its creators say it should be, they feel that credibility and recognition will come as the impact of their analysis spreads. In the coming months the study will be used as the basis for discussion in several international policy meetings, and as scientific input to the World Water Vision planned for 2000 in the Hague. Some of the data and findings of this work will serve as the factual foundation—notably on scarcity predictions and groundwater—for this inter-ministerial discussion. The study's dataset is also being refined and expanded to include more complete country and regional data.

Interestingly, the most striking fact this study brings to light is a practical, not technical, revelation. David Seckler believes that there is a lack of specialized knowledge about groundwater and a low awareness of the importance of water resources management as a technical and policy issue that must be followed closely.

The study highlights the "…truly alarming threat of groundwater depletion in the world" and says that it is worrying how little attention it receives—both in research and action. While most professionals involved in water—research, fieldwork, or in the donor community—are trained to manage surface water, groundwater is literally hidden from their view and attention, says the IWMI Water Scarcity Study. It warns that the time is long past for this dangerous situation to change.

The Human Face of Water Scarcity

- Behind the figures presented by the IWMI Water Scarcity Study lies a human tragedy that the lack of water has forced upon millions of poor people.
- Some have to carry heavy pots of water several kilometers everyday to meet household needs. Farmers lose their land and livelihood because they lack enough irrigation water to flush salts from the soil. Wetlands and river estuaries dry and crack because of upstream water depletion.
- Most of the poorest people in developing countries today are forced to drink water that is unfit for human consumption. They suffer from skin problems and other sanitary diseases due to polluted water used for bathing and insufficient water for washing.



IWMI's water supply/demand research defines the scope of water scarcity and potential crisis areas in the developing world by 2025. To avoid a potentially catastrophic situation in the near future, research must intensify and policy decisions need to progress—today.