

# **Water, Human Development and Economic Growth:** Some International Perspectives

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# Rationale

- There is renewed interest globally on how water insecurity threatens progress in human development and economic growth
- International development debate is heavily polarized:
  - Some believe policy reforms in the water sector would be crucial for bringing about progress in human development
  - Some others believe that economic growth itself would help solve many of the water problems
- Such debates delay in water sector investments in the developing world.
- The underlying concern is that water insecurity could decouple economic growth and human progress.

# Rationale

- Theoretical discussion on the returns on investment in water infrastructure and institutions is rich (Sadoff & Grey, 2005).
- Scholars and international agencies have provided robust evidences to the effect that water security can catalyze human development and growth (World Bank, 2004; 2006a & b; Briscoe, 2005).
- But, the number of regions for which these evidences are available is too limited for evolving a global consensus on this complex issue.
- The water poverty index (WPI), conceived and developed for countries by C. Sullivan (2002), and the international comparisons now available from Laurence et al., (2003) for 145 countries enable us to provide an empirical basis for enriching the debate.

# Rationale

- WPI is a composite index consisting of five sub-indices viz., water access index, water use index, water endowment index, water environment index and institutional capacities in water sector.
- In order to realistically assess the water situation of a country, which can capture the crucial attributes like access to water for various uses; level of use of water in different sectors; condition of the water environment; and technological and institutional capacities in water sector, a new index called Sustainable Water Use Index (SWUI) is derived from WPI.

# What do we like to achieve from this work?

- Analyze the nature of linkage between water situation of a country and its economic growth
- Understand the role of large water storages in boosting economic growth and changing human development indicators of countries which fall in hot and arid, tropical climates.

# Propositions

- *First*: improving the water situation through investments in water infrastructure, institutions and policies would help ensure economic growth through the human development route.
- *Second*: nations can achieve reasonable progress in human development even at low levels of economic growth, through investment in water infrastructure, and welfare policies.
- *Third*: countries in tropical & arid climates need to invest in building large water storages to support economic prosperity
- *Hypothesis*: 1] improved water situation supports economic growth through the human development route; and 2] arid tropical countries can support their economic growth through enhancing per capita reservoir storage that ensure water security for social advancements.

# Analysis and data sources

- The values of SWUI were calculated by adding up the values of four of the sub-indices of Water Poverty Index, viz., water access index, water use index, water environment index and water capacity index.
- The first hypothesis is tested using a regression of global data on: SWUI, and per capita GDP; SWUI and GHI; and SWUI and HDI. Since regression between SWUI and HDI showed a strong relationship, the causality, i.e., whether SWUI influences GDP growth or vice versa, can be tested by running regression between per capita GDP and a decomposed HDI, with health and education indices.
- The underlying premise is that if economic growth drives water situation, then it should change the indicators of HD that are independent of income levels, such as health and education.

# Analysis and data sources

- The second hypothesis is tested by analyzing the link between per capita GDP (ppp adjusted) and per capita dam storage ( $\text{m}^3/\text{annum}$ ) of 22 selected countries falling in hot and arid tropical climate.
- Data on per capita GDP and HDI were obtained from Human Development Report 2006. Data on GHI for 117 countries were obtained from Wiesmann Doris (2007).
- Data on WPI for 145 countries were obtained from Laurence et al. (2003). Data on dam storage and human population in 22 countries were obtained from FAO AQUASTAT-2006.

# Can water security drive economic growth?

- Worldwide, experiences show that improved water situation leads to better human health and environmental sanitation; food security and nutrition; livelihoods; and greater access to education for the poor
- This aggregate impact can be segregated as:
  - Irrigation having direct impact on rural poverty; food security, livelihoods and nutrition, with positive effects on productive workforce
  - Domestic water security having positive effects on health, environmental sanitation, with spin off effects on livelihoods and nutrition (+ ive), school drop out rates (- ive) and productive workforce.

# Can water security drive economic growth?

- According to the HDR (2006), 1 in every 5 people in the developing world has access to an improved water source.
- Dirty water and poor sanitation account for vast majority of the 1.8 million child deaths each year from diarrhea-making it the second largest cause of child mortality.
- In many of the poorest countries, only 25% of the poorest households have access to piped water in their homes, compared with 85% of the richest.
- Water insecurity linked to climate change threatens to increase malnutrition to 75–125 million people by 2080, with staple food production in many Sub-Saharan African countries falling by more than 25%.

# Can water security drive economic growth?

- Global data analysis shows a strong inverse relationship between water situation and global hunger index
- Improved water situation therefore reduces the chances of impoverishment and infant mortality
- Hence improvement in water situation should improve HDI, as it captures three spheres of human development
- Analysis of data from 145 countries shows water security improves progress in human development
- Further analysis shows Water security improves economic conditions of nations

# What comes first: economic growth or water security?

- If the stage of economic development determines a country's water situation rather than vice versa, the variation of HDI should be explained by variation in per capita GDP.
- Regression analysis of HDI Vs economic growth shows that the relationship is weaker than that of SWUI & HDI
- Reasonably high level of progress in human development can be achieved even at low level of economic growth
- More than economic growth, "country's governance" has great influence on the human development
- Hence, water security drives economic growth of a nation through the human development route

# Storage development and economic growth

- Water development is a pre-requisite to improving the access to and use of water
- The amount of storage that needs to be created to improve access to and use of water depends on the type of climatic conditions.
- In temperate and cold climates, the demand of water for irrigation, which is the largest user of water in most regions with agricultural base, would be negligible.
- Hence, links between storage development and economic growth need to be explored for tropical and hot climates.
- [Analysis of per capita dam storage and GDP of nations show strong direct relationship](#)

# Are large storage projects an environmental catastrophe?

- The overall impact of water storages on economic growth would depend on the nature of water uses promoted, the effectiveness of the institutions for water allocation, and policy regimes.
- Local groundwater development, and water harvesting were mooted as alternatives to creating large storages
- But, the basins that are facing problems of environmental water scarcity and degradation in the world due to large water projects, have their river-flows used up for various consumptive needs
- Most of these regions also face problems of groundwater intensive use due to excessive draft for agriculture
- Without these projects, the negative impacts agricultural growth in these regions might have caused on groundwater resources would have been far more serious.

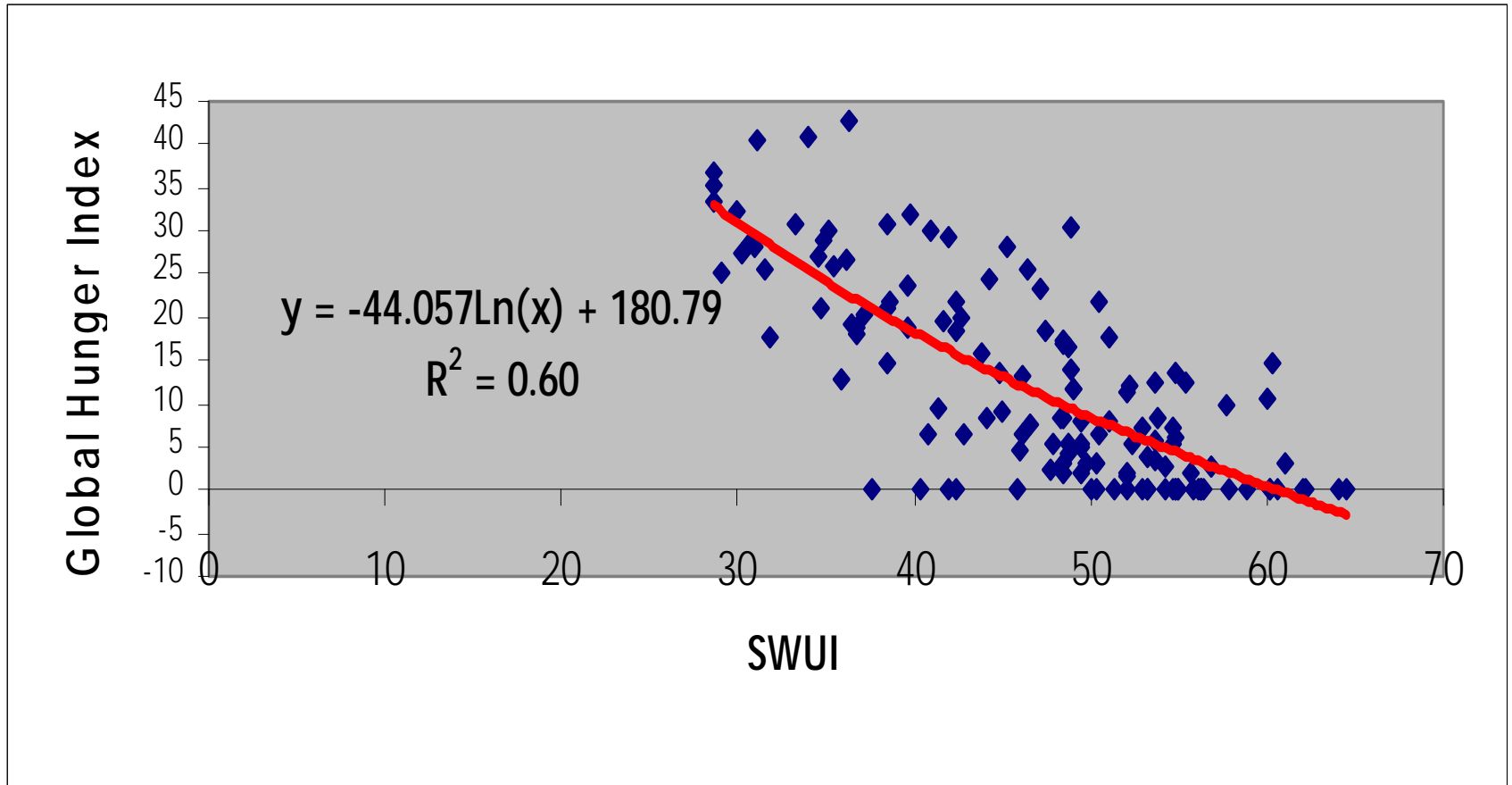
# Impact of storage on malnutrition and infant mortality

- Development of water storages significantly reduces malnutrition and infant mortality around the world.
- “Increased availability of irrigation water reduces the risk of crop failure; enhances the ability of farmers to produce more crops to improve their own domestic food consumption of food, and take care of the cash needs.
- Also, increased irrigated production improves food and nutritional security of the population at large by lowering cereal prices in the region in question as the gap between cereal demand and supplies is reduced” (Hussain and Hanjra, 2003)
- [Regression analysis for 22 countries reinforces this point](#)
- Some countries having high per capita dam storage, but has very high incidence of hunger (Zambia, Zimbabwe). They use it for creating hydropower, which is sold to their neighbors for earning revenue

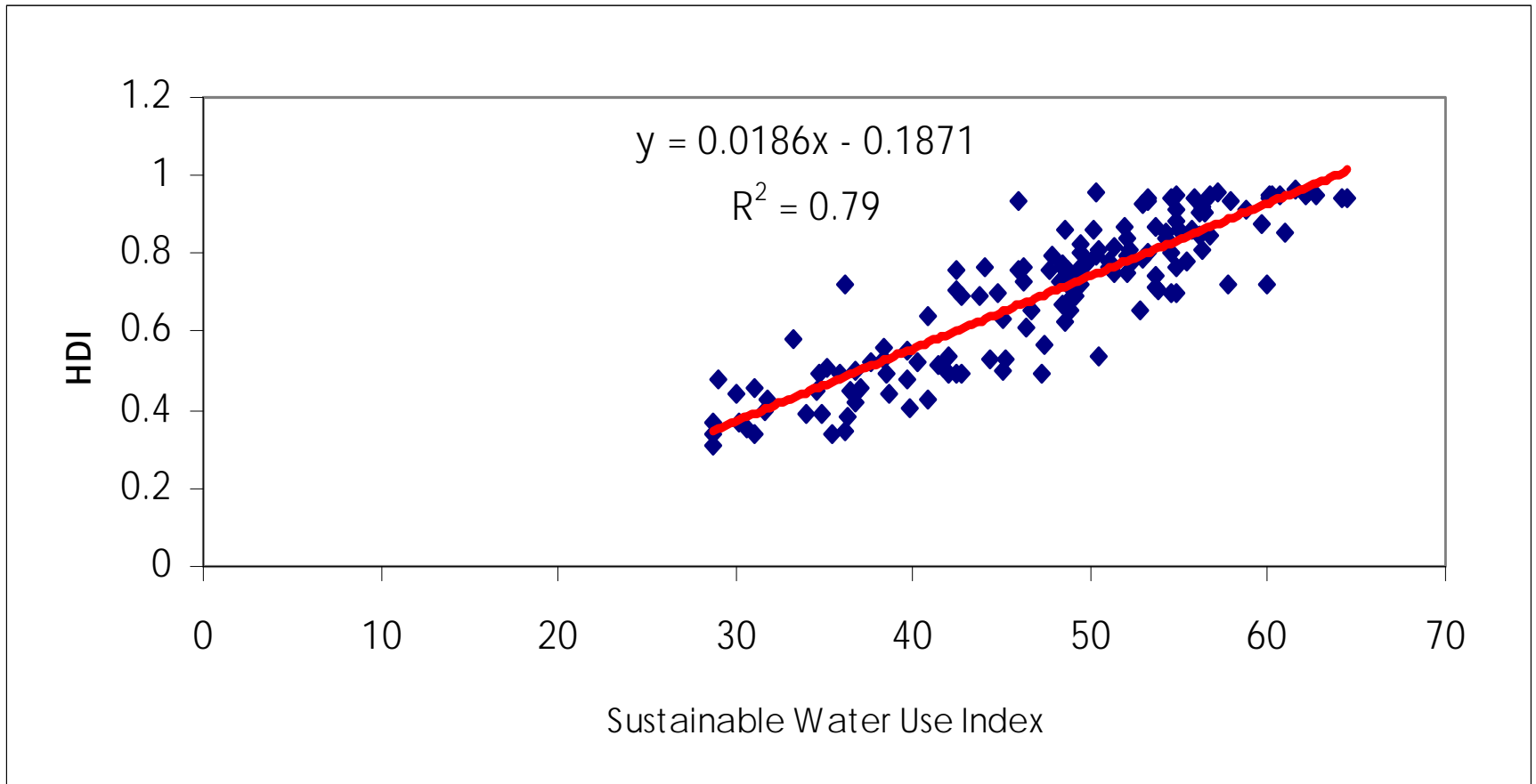
# Conclusions

- Economically poor countries, which also show very poor indicators of human development, should start investing in building water infrastructure, create institutions and introduce policy reforms that could lead to improved water situation vis-à-vis access to and use of water, water environment and institutional capabilities.
- Only, this can support progress in human development, and sustain economic growth, through poverty reduction; food security, improved livelihoods and nutrition; and domestic water security.
- But, a pre-requisite for hot and arid tropical countries is that they invest in large water resource systems to raise the per capita storage.
- The study also provides a methodology for analyzing the linkage between water situation and economic growth.

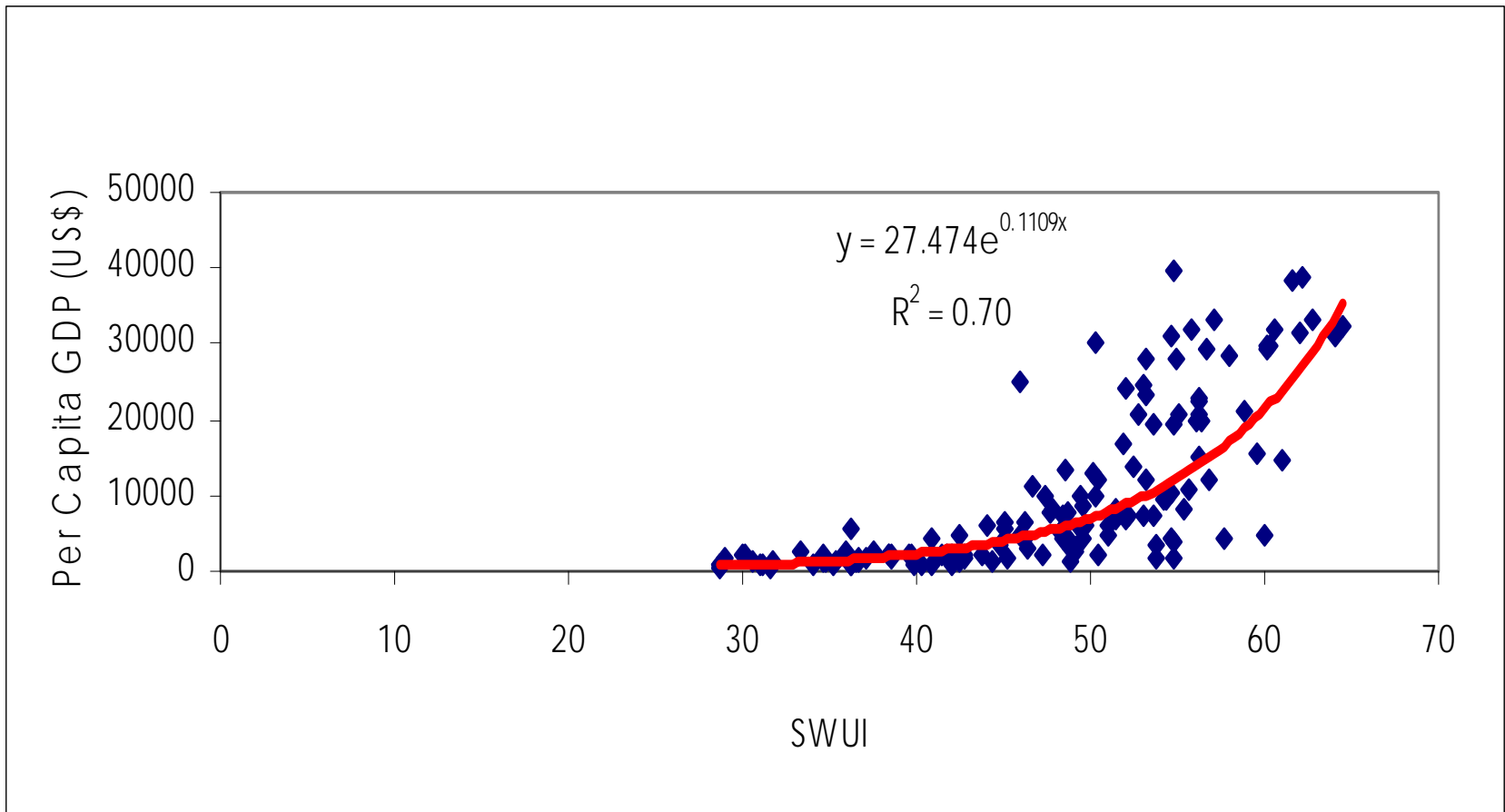
# Can improved water access drive away hunger?



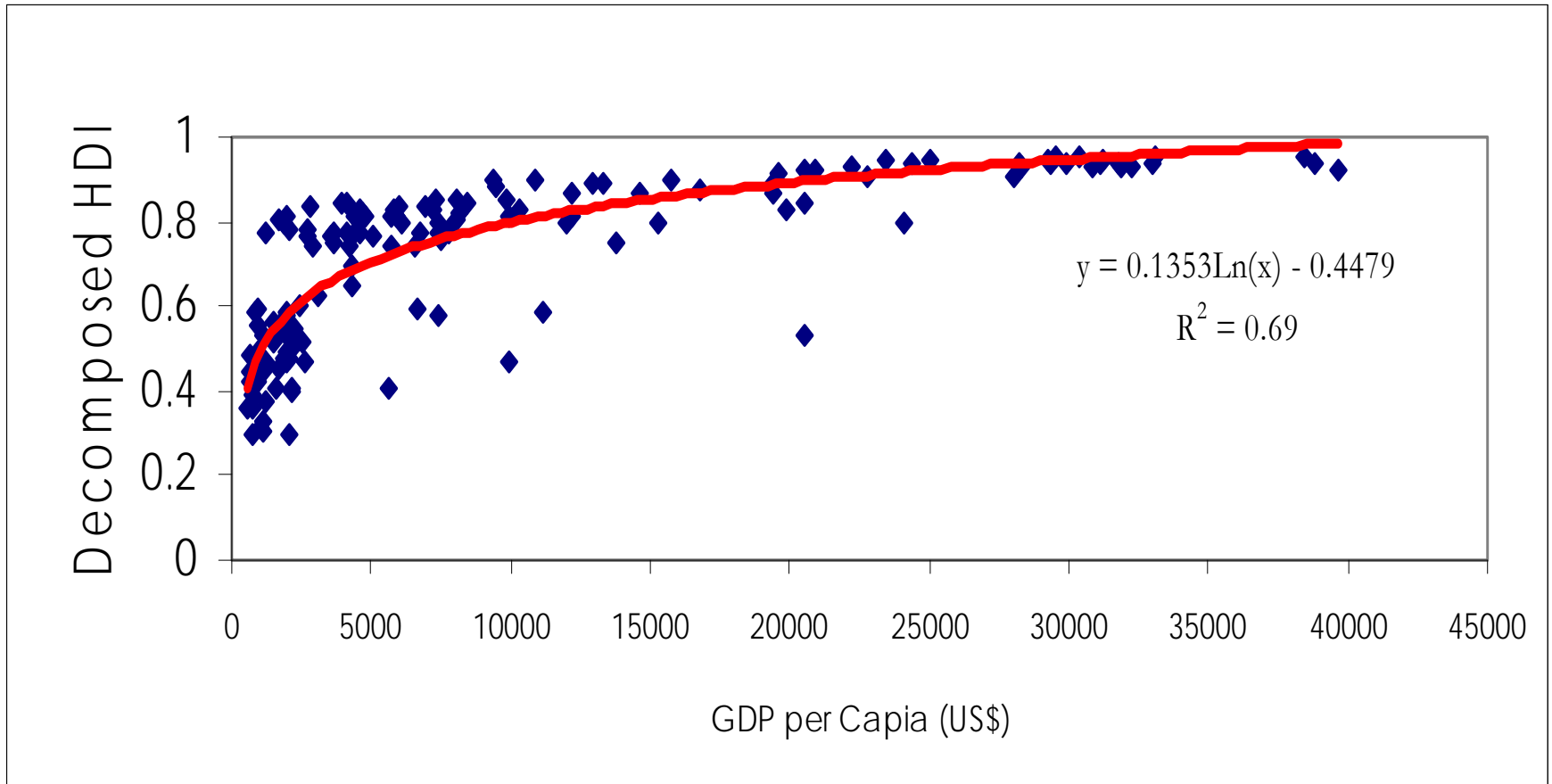
# Linking human development to water security



# Can water security drive the growth engine?



# What matters: money or good governance?

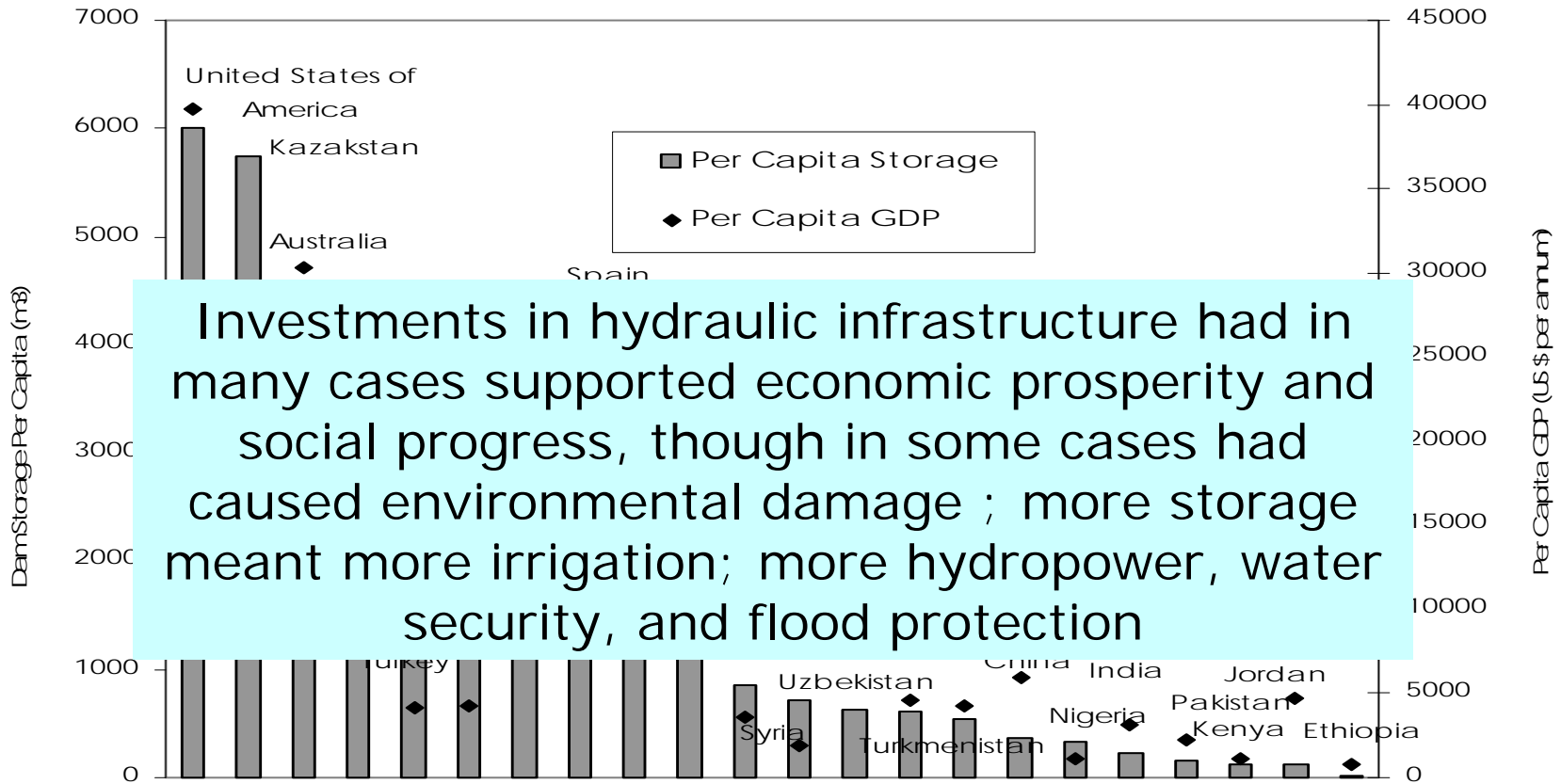


# Good governance matters!

- Many LICs that show high HDI have good governance systems and institutional structures to ensure good literacy and human health. For instance, Hungary in eastern Europe; some countries of Latin America viz., Uruguay, Guatemala, Paraguay, Nicaragua and Bolivia; and countries of erstwhile Soviet Union viz., Turkmenistan, Kyrgyzstan and Armenia have welfare-oriented policies. They make substantial investment in water, health and educational infrastructure
- Many LICs, which have extremely low HDI, have highly volatile political systems and ineffective governance. They are characterized by corruption in government. The investments in building and maintenance of water infrastructure are very poor in these countries.
- Sub-Saharan African countries, viz., Angola, Benin, Chad, Eritrea, Ethiopia, Burundi, Niger, Togo, Zambia and Zimbabwe; and Yemen from Middle East belong to this category.

# Rich countries storage more water

Per Capita GDP & Dam Storage in Selected Countries



# Can greater storage reduce hunger?

