



GLOBAL ASSOCIATION
Master's in Development Practice Programs



Sustainable Development Practice: Advancing Evidence-Based Solutions for the Post-2015 Agenda

*Proceedings of the 2013 International Conference on
Sustainable Development Practice*

Edited by
Rodrigo Medeiros
Larry Swatuk

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Global Association of Master's in Development Practice Programs
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Global Association of the Master's in Development Practice Programs

The Global Association of Master's in Development Practice (MDP) programs arises from a shared commitment to forge a new profession of sustainable development practice that integrates the social sciences, natural sciences, health sciences and management. Intellectual foundational support was provided in the 2008 report of the *International Commission on Education for Sustainable Development Practice*, supported by the MacArthur Foundation.

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PREFACE

More than a year ago, an ocean away from New York, in the beautiful African city of Dakar, Senegal, the seeds for the First International Conference on Sustainable Development Practice (ICS DP) were planted. At a February 2013 meeting of about 70 faculty members from 24 academic institutions from around the world the idea was discussed. Why not? was the collective and supportive response. All of the attendees at the meeting were in Dakar for one reason— to find solutions to the complex challenges of sustainable development. If a conference could bring others into the dialogue, then a conference would be organized. Thus in an auditorium at Université Cheikh Anta Diop, Dakar, it was decided that the Global Association of Master's in Development Practice programs (www.globalmdp.org) would partner with the Sustainable Development Solutions Network (<http://unsdsn.org/>) to launch the first ICS DP.

Once back in New York City a small handful of people in an office at Columbia University began the task of organizing the conference. And, almost as immediately, students, scholars and practitioners from all over the world responded positively to the call for abstracts and proposals. Even more exciting was the fact that within a few weeks many knowledgeable, skilled and talented people volunteered to assist the organizers; and, it is because of their belief in the need for such a conference that on September 6 & 7, 2013 ICS DP opened its doors to many interested and engaged attendees who participated in the conference.

On behalf of the Global Association of the Master's in Development Practice Programs, we would like to thank everyone who worked on making the First International Conference on Sustainable Development Practice such a success. From the President of the Global Association to the Support Team, everyone played a crucial role in bringing this conference to fruition. Without everyone's time, energy and ideas ICS DP 2013 would not have been possible.

Thank you!

Lucia Rodriguez

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Introduction

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With 2015 just over the horizon, the Millennium Development Goals (MDGs) process is drawing to a close, and there is much stock-taking underway. How well has the world fared over the last 15 years? What worked especially well, what were the stumbling blocks, and what are the challenges that lie ahead? What are the most important lessons to be learned from this complex, global process? Most importantly, in light of what was and was not achieved, what comes next? In the spirit of 'what comes next', the Global Association of Master's in Development Practice – a network of 24 universities worldwide; see <http://globalmdp.org/>) – partnered with the Earth Institute at Columbia University (see <http://www.earthinstitute.columbia.edu/sections/view/9>) and the UN Sustainable Development Solutions Network (SDSN; see <http://unsdsn.org/>) to bring together scholars and practitioners from around the world in the 1st International Conference on Sustainable Development Practice (ICS DP) to reflect on the important theme of 'advancing evidence-based solutions for the post-2015 sustainable development agenda'.

The conference was organized around 12 themes. These themes mirror the Thematic Groups created by the SDSN which comprise 'leading scientists, engineers, academics and practitioners from business and civil society to promote solutions to key challenges of sustainable development. The Thematic Groups are solution oriented rather than research oriented and aim to identify practical solutions to the challenges of sustainable development' (<http://unsdsn.org/what-we-do/thematic-groups/>). These groups are as follows:

1. Macroeconomics, Population Dynamics, and Planetary Boundaries
2. Reducing Poverty and Building Peace in Fragile Regions
3. Challenges of Social Inclusion: Gender, Inequalities and Human Rights
4. Early Childhood Development, Education and Transition to Work
5. Health for All
6. Deep Decarbonization Pathways
7. Sustainable Agriculture and Food Systems
8. Forests, Oceans, Biodiversity and Ecosystem Services
9. Sustainable Cities: Inclusive, Resilient and Connected
10. Good Governance of Extractive and Land Resources
11. Global Governance and Norms for Sustainable Development
12. Redefining the Role of Business for Sustainable Development

Each Thematic Group has been tasked with addressing a set of five challenges: (i) identifying the main risks to 'business as usual'; (ii) identifying critical pathways to sustainable development, as well as highlighting the obstacles and lessons learned from the application of theory to practice; (iii) articulating 'the toughest questions' that need to be resolved within each thematic area; (iv) identifying the solutions presently available, as well

assessing why or why not they are being implemented, and reflecting on the ability to scale-up best practices; and (v) identifying the key metrics of sustainable development that must be developed and monitored; and reflecting on the ways the MDGs provided necessary and relevant data and support for achieving sustainable development. This conference provided scholars and practitioners with the opportunity to engage directly with the SDSN process. Given that one of the main partners in the conference was the MDP Association, there was a strong emphasis on providing young scholars and practitioners with a platform for presenting their work and engaging not only with the SDSN but with each other across MDP partner institutions, with students and faculty from other universities, and with members of the private sector and civil society from across the globe. The conference attracted 68 papers and posters, many of them multi-authored. It also involved keynote addresses from Jeffrey Sachs (Director, Earth Institute), Guido Schmidt (Executive Director, UN SDSN), David Donoghue (Permanent Representative of Ireland to the United Nations), and Amina J. Mohamed (UN Secretary General's Special Advisor on Post-2015 Development Planning), as well as a series of practice-oriented workshops involving members of the private sector and civil society.

Included here are 37 of these papers, constituting an innovative, eclectic and stimulating entry point for thinking about the key issues of sustainable development as we move toward the post-MDG era. As the reader will see, the themes are unequally represented with themes 1, 2, 4 and 6 comprising a total of only five papers. This in no way reflects our priorities, but rather the fact that we issued an open call for the 1st ICSDP and what you see here reflects the research and practice interests and strengths of those who were able to participate. As we move toward the 2nd ICSDP in New York in 2014, we are striving to achieve solid representation across all twelve of the thematic areas. While not following a strict peer-review process, the papers have been vetted for quality in several ways: the submission process was overseen by a scientific committee; the papers were read by scientific committee members who were organized by theme and feedback was sent to authors; the authors were asked to reflect on the feedback they received at the meeting and to incorporate it into their final papers. The editors, acting on behalf of the organizing committee, wanted to be as inclusive as possible with this collection, so it was left to the authors as to whether they wanted to be included or not: 'Ultimately you should sink or swim on your own merits!' they were told. We believe, and no doubt the reader will agree with us, that what we have produced here is a solid set of papers reflective of the spirit of positive change that is a hallmark of both the MDP association and the SDSN.

Despite the diversity of subject area, geographical region, methodology and theoretical approach, there are nevertheless five key theme areas that draw the collection together: (i) actor networks; (ii) tools; (iii) concepts; (iv) innovations; and (v) sustainable development. First, with regard to actor networks, what one sees across the papers is the emergence of creative mixed-actor coalitions: the state and civil society; social movements; (gender- or age-specific) cooperatives and collectives; and, more commonly the state-civil society-private sector arrangements variously labelled as P3, P4 or P5 approaches to development. Not one paper argues for a single-actor, single-focused approach. To the contrary, 'participation' is broadly defined and no constellation of particular actors is ruled out. This is quite surprising when one considers the issues at play: from affordable vaccines to national food security; from urban service delivery to laptops for kids; from earthquake recovery plans and programs to waste management.

The second area of connection involves tools for development. In order to advance evidence-based solutions for the post-2015 world, it is important that scholars and practitioners be able to show the results of their efforts. As shown in the papers in this collection, the tools at hand are often lacking in some way, so new approaches and/or new ways of using information that is already available must be devised. What we see across the papers are innovative ways of gathering information, analyzing data, and framing issues and challenges through such things as: use of 'big data'; creation of multidimensional indexes; utilization of indigenous knowledge and practice; development of community-scoping frameworks for urban sustainability plans; development of simulation exercises, sustainable development techniques and ways of bringing into the public eye issues and concerns that are too often overlooked. New measurement tools and metrics are often introduced, such as

the valuation of water as an economic good, or the addition of 'green water' into water audits. The diversity of these tools matches the diversity of the areas in which they are applied: from improved business performance to establishing empirically-quantifiable baselines of natural capital (forests; biodiversity; water; ecotourism; national parks; and so on).

This leads necessarily on to the third area of overlap: concepts. It is clear that finding sustainable solutions will require, across all twelve thematic areas, new ways of seeing and thinking about the challenges to hand. We often hear the phrase, 'thinking outside of the box', but in this collection we often see it. For example, poverty, which is often thought of as a stock (i.e. there are x per cent of a population in poverty), is here defined as a flow. There are lessons drawn from rural India to suggest solutions to abiding problems of inner-city poverty in Canada. Planetary boundaries are mapped out for humanity in a norm setting exercise. New concepts such as benefit sharing, green water, sustainable diets, wisdom dialogues, eudemonia as a social goal and conditional capacity for achieving food security are articulated to help practitioners better understand the nature of the challenge. Policy coherence is presented, not just as an administrative goal but as a benchmark for good governance. In order to sensitize the public, contaminated 'hot spots' are shown to threaten as many people in the global South as does malaria or airborne pollutants. The Labdoo group show us how to build what they call a humanitarian social network to deliver laptops to schools around the world. Everywhere, the potential of aboriginal groups, youth, women, and the disabled is demonstrated. Simple and long-known technologies, such as tree planting, are shown to be effective not out-dated; new ideas are tested and some are found wanting – but better to have tried and failed than to not have tried at all.

A hallmark, therefore, of the papers in this collection is their belief in the possibility of change. To quote the OECD Environmental Policy Committee, cited in one of the papers, 'resource efficiency is not a choice, it is inevitable'. Rather than fear change, the authors of these papers showcase people's willingness to embrace it. The fourth common theme, therefore, is one of innovation: micro-hydro; food waste and rural sanitation as business opportunities; private goods recast as public goods; critical interrogations of 'business as usual' to maximize both profit and social good; the promotion of resource exchange – be it surplus or waste – among businesses to promote both sustainability and profitability. The list goes on and on.

The fifth area of agreement, then, is the fact that all of the authors accept sustainable development as the appropriate framework for action. To be sure, the authors recognize that the term itself has too often been transformed into a contextual setting for diverse and often ideologically-opposed actors to come together and argue about frameworks for action, which is sometimes code for 'defending business as usual'. But none view this as a reason not to move forward. If we were to sum up the main message that stretches across the vast conceptual, theoretical and empirical terrain of this collection it is this: Do whatever works, wherever it is needed; be as creative as possible with the tools at hand; be critical and reflective; reach out to whoever you need in order to get things done; show the value of the action through better concepts and measures; and don't be afraid to fail.

While this collection offers no systematic approach to answering the five challenges asked of the leaders of the SDSN Thematic Groups outlined above, it does offer a hopeful message for the post-2015 world: there is an incredible amount of energy being expended on a lot of positive things. Granted, there are setbacks as well as successes. As will become apparent to the reader soon enough, in our view it is equally important to show the losses as well as the gains. In that way, perhaps, we can begin to see how to make the most of our efforts, to limit the negative outcomes and to broadly share the benefits of development practice broadly defined.

Section 1

Macroeconomics, Population Dynamics, and Planetary Boundaries

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Chapter 1

The Value of Water: Macroeconomics of Water for a Sustainable Use

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Abstract

The following work deals with a very controversial, but nevertheless very important topic in the sustainable management of water as a natural resource: the value of water and the macroeconomics of water. Population growth, increasing demand, climate change and declining water supplies present a short term and medium term outlook where water stress and shortages may keep arising. Water stress is a situation that arises "when water demand is more important than the amount available for a specified period or when it is restricted by its low quality." This in turn "causes deterioration of resources fresh water in terms of quantity (aquifer overexploited, dry rivers, etc.) and quality (eutrophication, organic matter pollution, saline intrusion, etc.)." (UNEP 2012) If global patterns continue, we can see that we are headed into an increasingly complex landscape where water mismanagement increasingly compromises water availability. Added to this we have the phenomenon of climate change, which is already having an impact on water systems and cycles globally. This is why we must change the ethnocentric approach of our current development model, where resources are exploited without regard for the future. This analysis will use another approach based on sustainable development, and will go beyond ideological approaches and economic or political agendas, to treat water management and the macroeconomics of water pragmatically. Life on the planet depends on our success to manage our water resources in an efficient, responsible, and fair manner; this paper provides the general guidelines and practical recommendations to do so.

I. Introduction

The following work deals with a very controversial, but nevertheless very important topic in the sustainable management of fresh water as a natural resource: the value of clean potable water and water economics.

Population growth, increasing demand, climate change and declining water supply forecasts make the short and medium term outlook where global water stress may keep arising. Water stress is a situation that arises "when water demand is more important than the amount available for a specified period or when it is restricted by its low quality." This in turn "causes deterioration of fresh water resources water in terms of quantity (overexploited aquifer, dry rivers, etc.) and quality (eutrophication, organic matter pollution, saline intrusion, etc.)." (UNEP 2012). If global patterns continue, we can see that humanity is headed to an increasingly complex landscape where water mismanagement can increasingly compromise availability. Added to this, "we have the phenomenon of climate change, which is already having an impact on water systems and cycles globally." (Gabaldón 2012)

This is why we must change the ethnocentric approach of current development models, where resources are exploited in the present without regard for the future. That is why in this analysis we will use another approach based on sustainable development. This approach goes beyond ideological approaches and economic or political currents. It is an attempt to treat the subject of water management pragmatically, by addressing the value of water from both a human development and economic approach.

II. Theoretical Framework

The approach that will be applied to the water economics in this paper is based on the following definition of Sustainable Development: “Meeting the needs of the present without compromising the ability of future generations to meet their own needs.” (Brundtland Report 1987)

This definition came from two different, and sometimes antagonizing, disciplines that had a common concern: sustainability. The first discipline, economics, worries about the effects of unlimited economic growth, and on the false premise that natural resources are inexhaustible. The second discipline, ecology, emerges as a posture of defense of the environment and nature. This defense is given against the attack, caused by the consumption patterns of the world, which points to the progressive and in some cases irreversible destruction of the environment and nature.

These two schools of thought formally conciliated at the World Commission on Environment and Development of the United Nations in 1983. This commission was created by the General Assembly of the United Nations in 1983 and bears the fruit of the Brundtland Report. This report, also called “Our Common Future” is a socio- economic report prepared by different nations to the UN in 1987, and its development was headed by Dr. Gro Harlem Brundtland. In this report we see the formal convergence of sensitive economic and environmental schools giving way to a new development paradigm under the name of Sustainable Development.

This definition is the basis for the analysis that will be undergone in this work. Sustainable Development’s five dimensions will be considered. These dimensions are: political, social, economic, environmental, and cultural. (Duque 2012) Even though one might tend to associate water to a particular dimension, its underlying importance extends to all five dimensions.

When referring to water as a natural resource throughout this work, the reader must think of clean potable water. The definition, components, and overall quality of clean potable water will inevitably vary globally. The management and specific valuation analysis may also vary locally due to the aforementioned variables. However, the main general analysis and economic principles discussed can be applied globally.

The analysis brings forth the dilemma that presents an inescapable dichotomy between economic development and environmental conservation. This tradeoff seems to be an apparently unsolvable dilemma, but sustainable development, supported by analysis of this sort, aims to become a viable alternative.

III. Current Outlook

Access to clean water has been recognized by the countries of the world as a basic human right. The sixty-fourth session of the UN General Assembly in 2010, declared water and sanitation as a human right through the following resolutions:

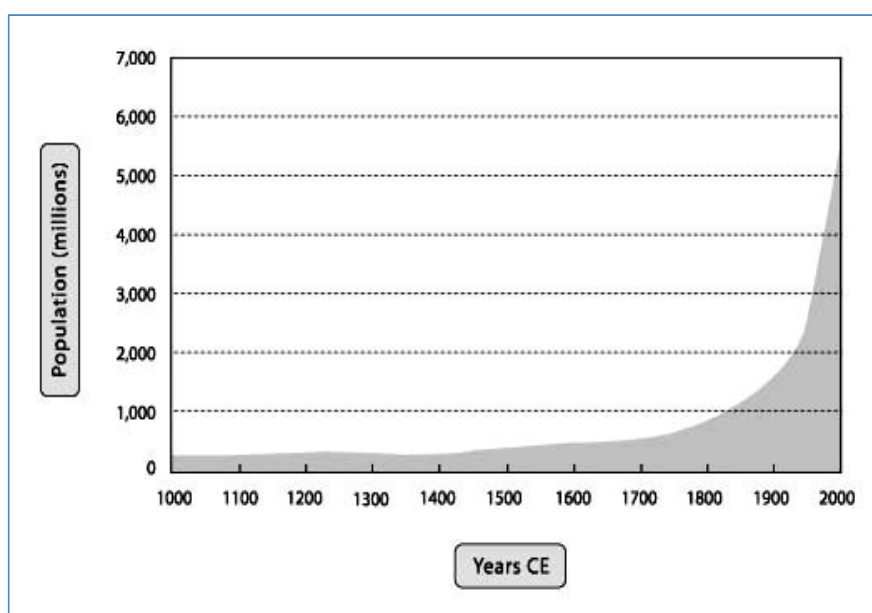
1. “Declares the right to safe drinking water and sanitation as a right.
2. Calls upon States and international organizations to provide financial resources and foster the capacity building and technology transfer through international assistance and cooperation, in particular to developing countries, in order to intensify efforts to provide all people affordable access to safe water and sanitation;

3. Welcomes the decision of the Human Rights Council to request the independent expert on the issue of human rights obligations related to access to safe drinking water and sanitation present an annual report to the General Assembly 17, and encourages the independent expert to continue working on all aspects of its mandate and in consultation with all agencies, funds and programs of the United Nations, to include in its report to the Assembly at its sixty-sixth session of the main difficulties related to the realization of the human right to clean drinking water and sanitation, and the effect of these on the achievement of the Millennium Development Goals.”

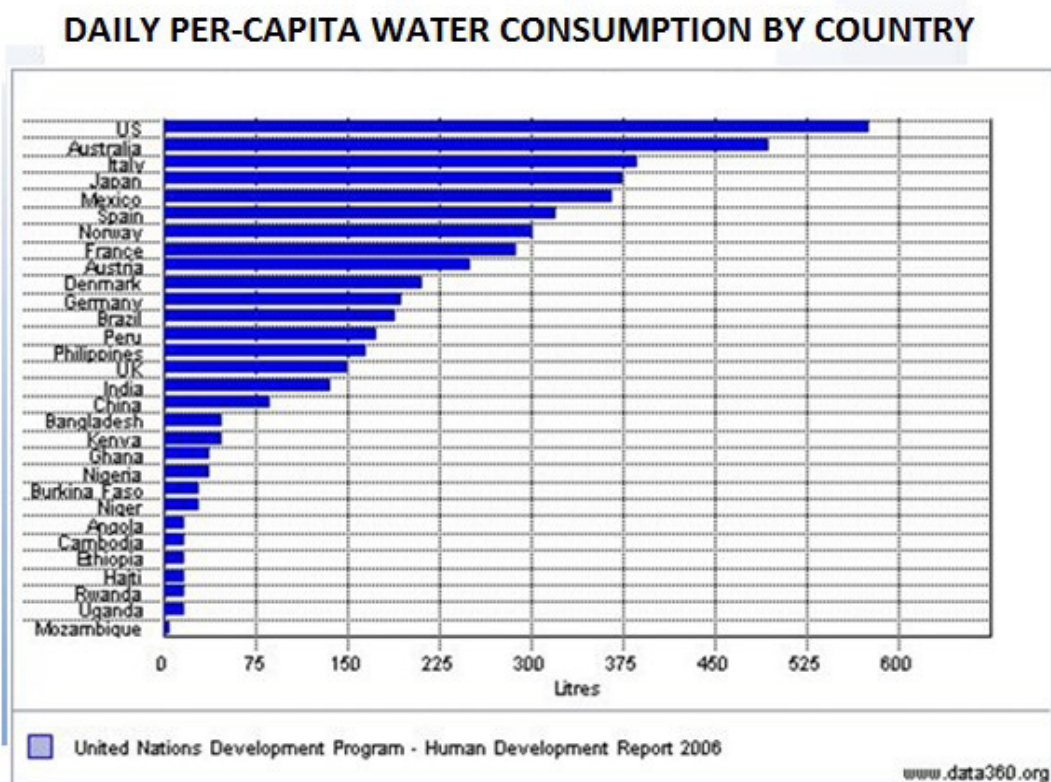
Thus, water is recognized as a human right essential to the full enjoyment of life and all human rights. Water is the basis for life on the planet and central to the life and development of human beings. Among human development goals of the Millennium, MDGs, the UN provided the basis for an agreement between 193 countries that agreed 8 goals to be met by 2015. Water plays an important role in human development. So much so that within Goal 7 (Ensure environmental sustainability), the main indicator to be achieved is “halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation.” (UNDP 2013). Furthermore, ongoing UN My World 2015 global survey from 194 countries is showing “access to clean water and sanitation” as a top five priority among a pool of 16 human development priorities.

If we consider that currently only 83% of the population has access to drinking water, then we have more than one billion people that are left without access to safe drinking water (WHO 2004). This alarming figure of 17% of the global population without access to safe drinking water presents a significant challenge for the countries of the world. Furthermore, “each year about 1.5 million children under 5 years die, and 443 million school days are lost, as a result of diseases related to water and sanitation” (UN 2010). Governments are faced with a difficult dilemma, diminishing water resources versus growing demand. This is where another big dilemma comes into play; the value of water. Is the natural resource of water a universal human right or a scarce economic good?

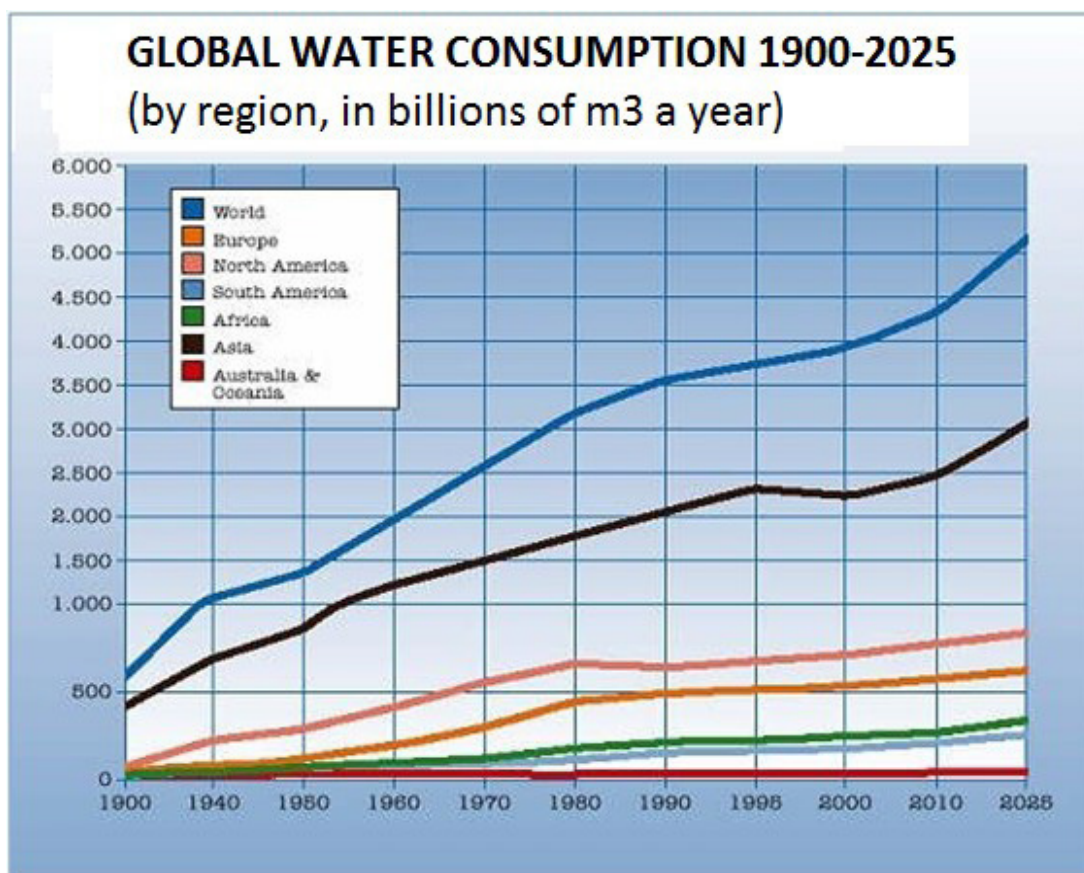
Population growth in the last 1000 years



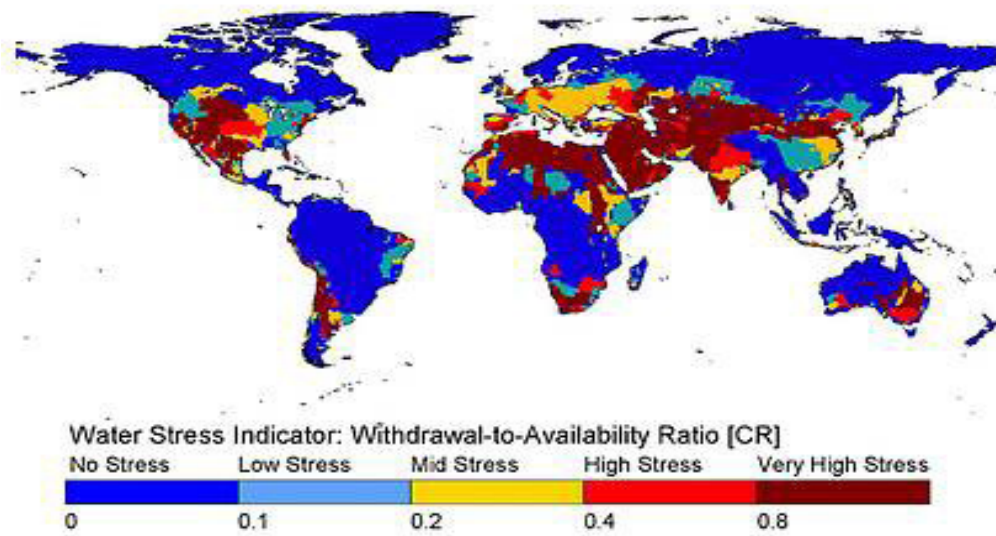
Source: World Bank 2012



Source: UNDP 2006



Source: UNEP 2010

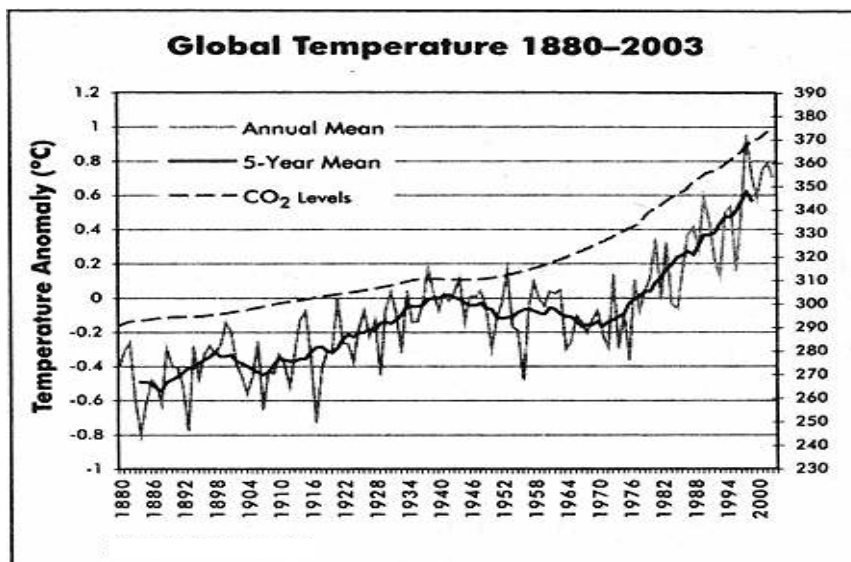


Source: Alcamo et al. 2000 at Gabaldón 2012

IV. Climate Change

Climate change and its causes, is another issue of great complexity and great controversy. This is why we will only contemplate and consider the effects of this phenomenon. All this in order to avoid getting into controversies of causality, but rather directly address the subject that interests us: climate change and its impact on the global potable water supplies.

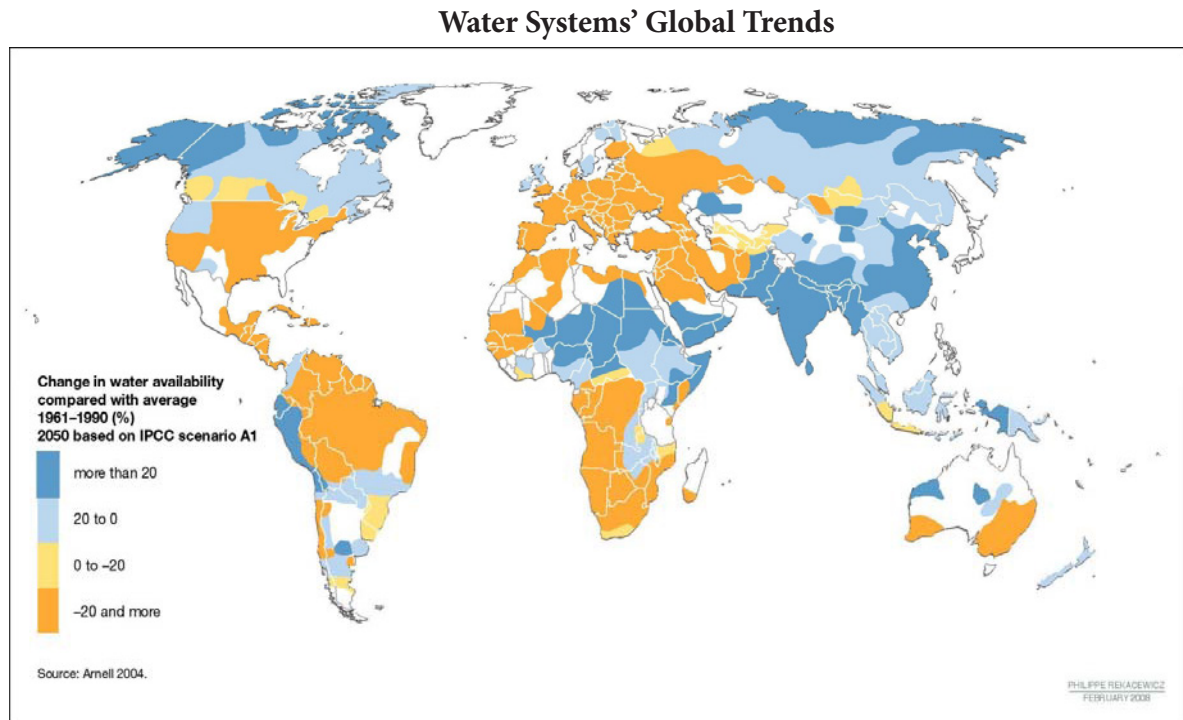
Climate change, comprises two stages, natural climate variability and changes arising "directly or indirectly to human activity." The latter "alters the composition of the global atmosphere and adds to natural climate variability observed over comparable time periods." (UNFCCC 1992). The first and most obvious effect of climate change is global warming understood as the general increase in global temperatures caused by increased greenhouse gases. The following graph shows the historical trend in the global temperature increase.



Source : giss.nasa.gov

The overall increase in temperature has affected the hydrological cycle. Not surprisingly, this occurs because water systems that are intrinsically linked to the levels of rainfall and runoff. These in turn are dependent on the evaporation and air currents, which are directly determined by the temperature and atmospheric composition.

It is so that we have global water systems have intensified sometimes bringing disruption and crisis. The general trend shows that in high rainfall areas, rainfall has tended to continue to increase, while in the lower rainfall areas, rainfall has tended to continue to decline. This phenomenon can be seen clearly in the figure below:



Source: (Arnell 2004)

Based on this data, we have that climate change will tend to reduce runoff in areas of low rainfall, becoming another negative factor as to what concerns water stress. This is why we should seriously consider the effects of this phenomenon on water planning in the long term.

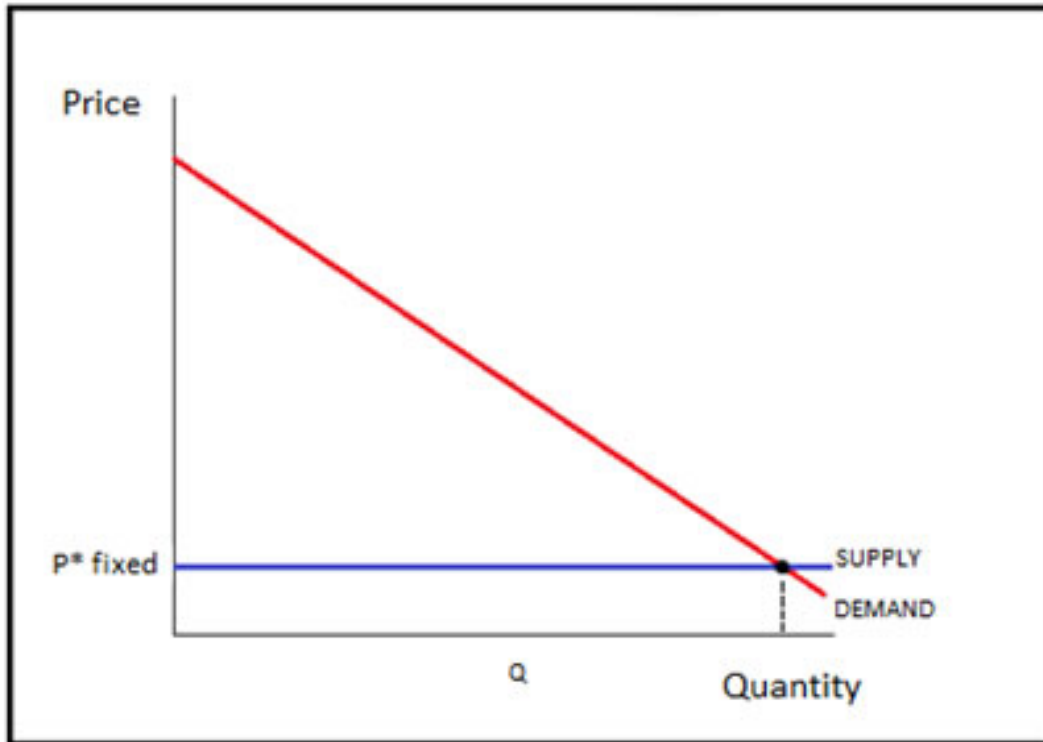
V. Water as a free Universal Human Right?

If we speak of water as a basic human right, then we must assume that governments of nations must ensure free, or low cost of water resources to the most needy. This school of thought is very popular in developing countries, with high levels of poverty. This is the case “especially in Latin America, where privatization efforts have led to catastrophic social effects.” (Gabaldón 2012) Such is the case of the so-called water war in Bolivia in 1999, where poor planning, corruption, and social insensitivity shot a series of protests that ended with the failed privatization of water in Cochabamba.

We can say that social justice and sustainable social development involve universal access to safe drinking water. However, one cannot assume that we have an unlimited supply of potable water in the world. On the contrary, more and more we are destroying basic ecosystems that support water cycles, more and more polluting groundwater reservoirs, and with population growth that puts pressure on water demand. This is why water,

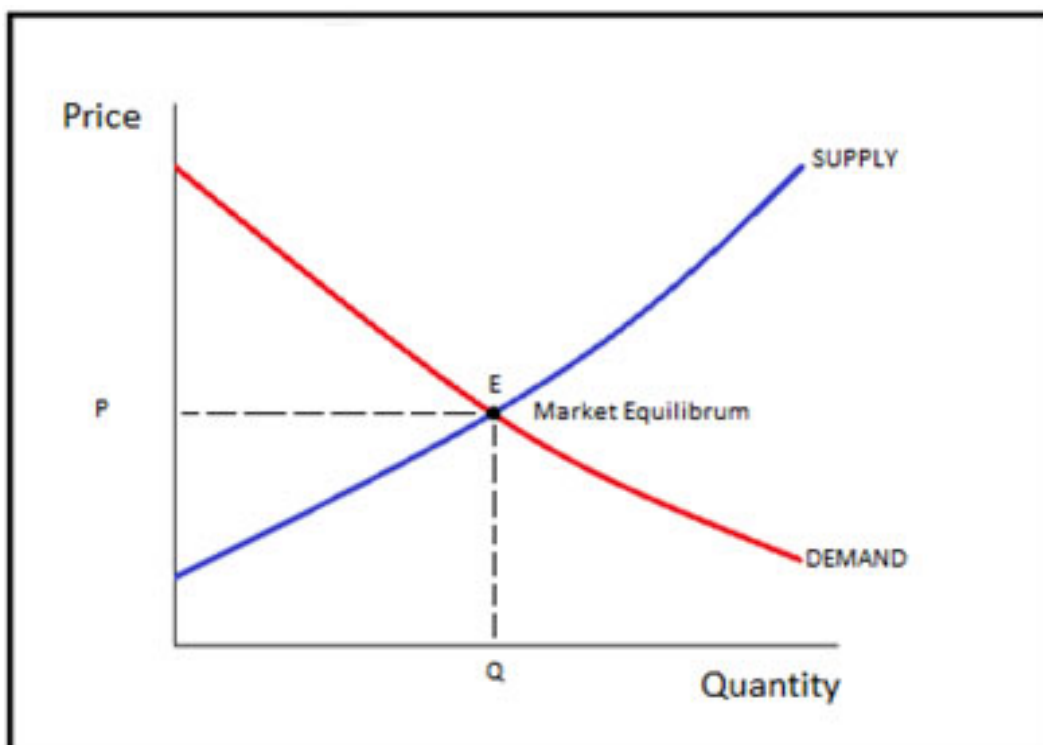
despite being a basic human right, is also a resource that has economic value. It is a scarce resource; therefore it has an intrinsic economic value. According to basic economic principles, increasing the demand of a finite good or service, results in a price increase. The price increase, in turn motivates a higher offer of good, as supply increases, prices are matched and stabilized in equilibrium:

Figure 1. The Market.



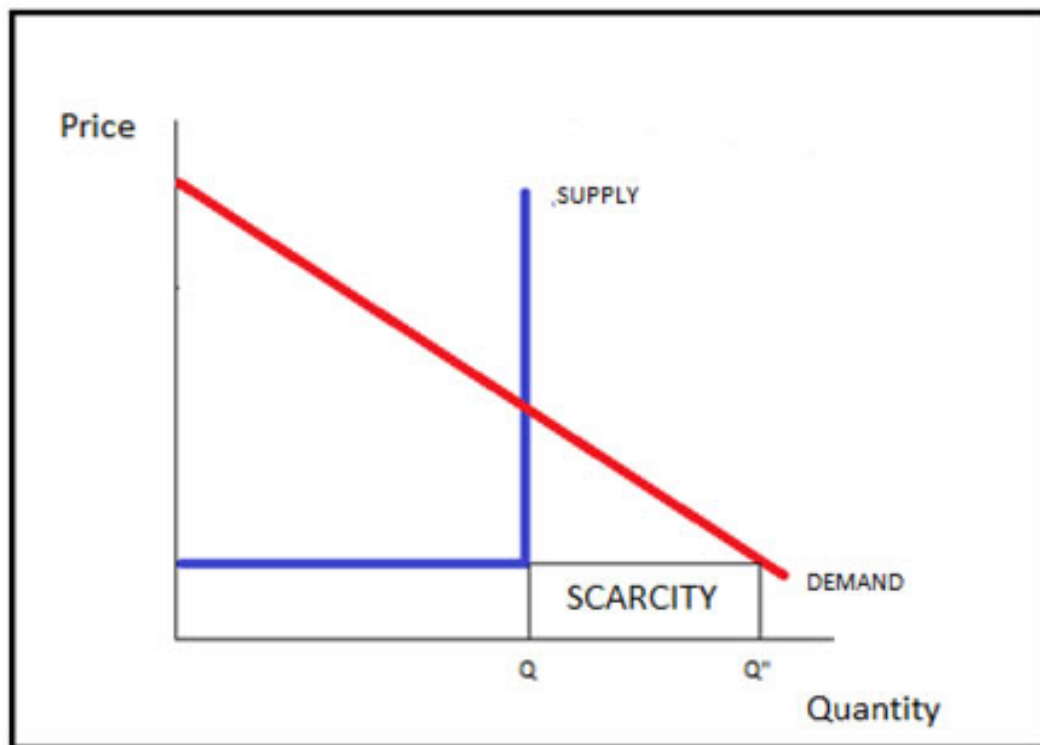
This situation of supply and demand leads us to consider the effects of undervaluing water as a free commodity.

Figure 2. The water market. Fixed price or free supply

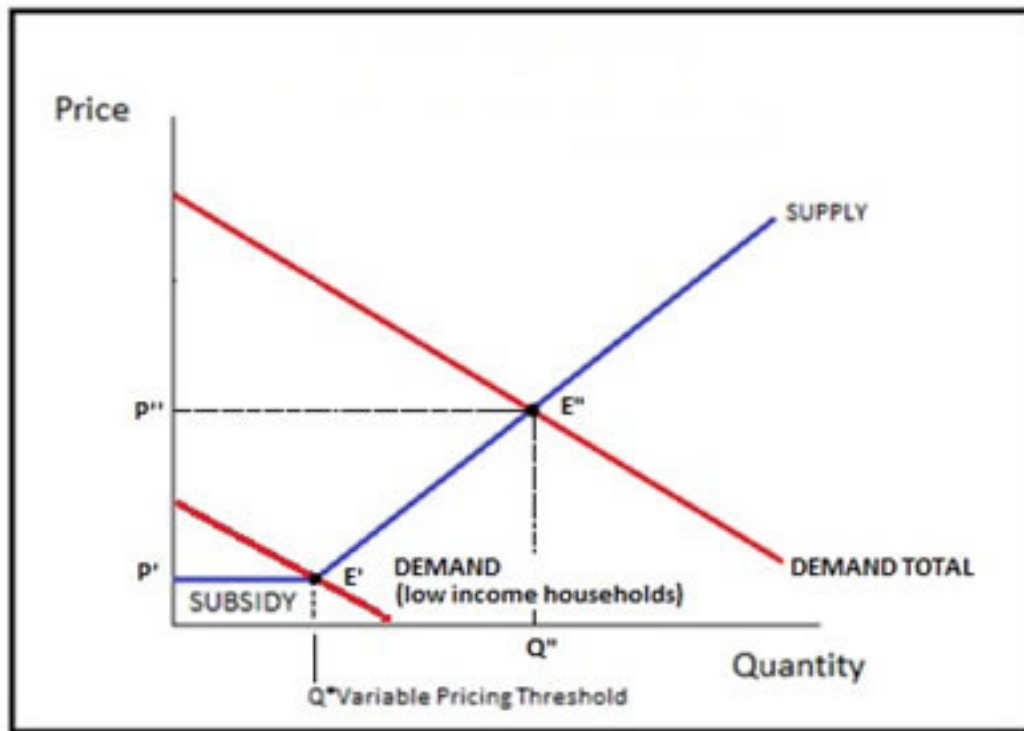


In Figure 2. We note that whenever water is considered as a free commodity, assuming for a perfectly elastic supply of water, the quantity demanded increases. This can lead to wastage. These cases occur when a locality, settlement, or city does not control the use of water and provides a free supply. Such is the case of Mexico City, where “for every 10 liters of water 3.8 are lost due to leakage of the network, the misuse of the liquid in homes and because some have not registered consumption meter” (Miranda 2010). If a situation like this is maintained in the long term, water resources will be depleted to the point that the water supply will be severely limited and become inelastic. This situation is exactly what Mexico City inhabitants have to live with: daily rationing and water shortages. Moreover, shortages usually tend to affect the most remote or poorly planned areas in urban or rural settings, where low income families are demographically present. This type of situation further increases inequalities, and hampers human development.

Figure 3. Free or fixed supply in the long term



On the other hand you can ensure access to clean water for those in need through a subsidy, while applying variable pricing from some consumption levels. This ensures that high intakes are controlled by a high price variable. In other words, the price increases relative to increased consumption. This way, price serves as a detriment to wasteful or inefficient water use. Policies that penalize resource wastage can also be implemented. These types of measures are now being implemented in Mexico City, and are “expected to reduce overall water From this basic economic relationship we can infer that water should not be regarded as a free good in order to be a basic human right. Considering water a free good, incentives inefficient use and in the long run, this policy of apparent social inclusion only leads to a situation of scarcity. These situations are usually catastrophic, given that these scenarios are usually difficult to correct in the short term, they require structural reforms such as appropriate measurement and fair pricing. In addition, the most affected families under scarcity usually are those in the lower-income strata. Lower income families do not have the means to acquire or construct large water storage tanks, or purchase water delivery services. On the other hand, supply can be ensured through a mixed-variable pricing policy that includes subsidies to low income households. Therefore, considering water’s economic value therefore paves the way to an efficient use of the resource. “When water comes below its fair price, tends to be wasted. This is why it is said that the most efficient investment in water services is that aimed at reducing waste.” (Gabaldon 2012).

Figure 4. Subsidy with variable pricing

VI. Water as an Economic Resource

According to the Dublin Declaration, Principle 4°. “Water has an economic value in all its competing uses to which and should be recognized as an economic good.” However, this feature must not take precedence over the basic human right of access to water. On the contrary, this feature searches the appropriate valuation of water, in order to preserve it.

Oscar Wilde aptly said, in criticizing the market model: “Nowadays people know the price of everything and the value of nothing.” Globally, water is undervalued, and misused and low prices reflects this. More than 70% of available water is currently used for agriculture irrigation (FAO 2013). In many cases farmers enjoy subsidies, and rarely use water efficiently. Moreover, “higher prices of irrigation water, which are generally

very low due to subsidizes, can promote more efficient and selective farming, expand grid systems to un-irrigated areas and thus help to bridge the food gap.” (Gabaldón 2012). On the other hand, poor governance, or poor legal framework, in many cases allows farmers to waste water resources, not to mention the high pollution by pesticides and chemical fertilizers that are percolated into the blue waters and groundwater.

We also have industrial and mining activities, which are activities with a high degree of water pollution. Government mismanagement, coupled with poor legal framework allowed industrial and mining activities to develop with few environmental controls. As a result, mining activities continue to proliferate in areas of high biological diversity, where water resources are contaminated with highly toxic substances such as mercury and lead. As population pushes industrial and agricultural use of water, this leads us to believe that “appropriate pricing policy can help achieve a more efficient use of water and provide access to clean water to those who lack it” (Prager 2006).

VII. Water Privatization

Although privatization of water management and distribution has been contagious in recent decades, “today more than 90% of world water supply is in the hands of public bodies” (Prager 2006). The theme of a universal solution to the water problem has a kind of utopian prescription away from pragmatism. Privatization has to be seen from a pragmatic, non-ideological, human approach. In many countries or regions where the state does not have the resources or means to efficiently manage water supply, water privatization can be beneficial. This provided that management complies with people’s human right to access to clean drinking water. On the other hand, in some countries with different cultures, and with an unsuitable legal framework, private interests may conflict with the interests of users. This may be reflected in unfair rates and discriminatory service, unjustified rates, etc. Interestingly enough, extreme undesirable situations rarely prevail in the long run because of massive public unrest. On December 1999, in Cochabamba, Bolivia, people’s unrest caused a reverse to public ownership. In these cases, the state is responsible for ensuring better water supply to the citizens by creating the appropriate legal framework and regulation.

VIII. Recommendations to policy makers

- Take into account that water supplies globally are finite.
- Consider that phenomena such as climate change and population growth sharpen water stress situations worldwide.
- Consider water as a universal human right, vital for life and human development.
- Consider that water is scarce and of finite proportion, and therefore should be valued accordingly.
- Take into account that mixed pricing systems can guarantee the supply of water as a universal right, while punishing its indiscriminate use.
- Emphasize the rational and efficient use of water as the most economical and feasible way to improve the situation.
- Introduce systems and technologies to enable universal and efficient measurement of consumption, and also help generate a greater supply with less waste of the resource.

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X. Attachments

Recommended Practices for Responsible Consumption of Water (Government of Catalonia 2010)•

- Water as a municipal jurisdiction and, as appropriate, is the same town who makes the supply or charge a service concession company. This approach generally tends to be more efficient and successful than centralized systems.
- Using water meters can be owned or rented and you will be discharged in supply. These are vital to monitor the consumption of subscribers.
- The rates of water consumption must be authorized by the commission of national or local prices as appropriate. This ensures consumer protection.
- The invoice can be generally coincides with the quarterly meter reading. When you can do the meter reading, it is an estimate of consumption. So is accounted for using a fair and adequate.
- The bill details the concepts and service fees (service fees and consumer segments) and other tax (canon water, sewer rates, VAT and other). These revenues must ensure the updating and maintenance of the infrastructure for the management, supply, and water treatment.
- The company can cut off the supply for non-payment, but not without first notifying vividly. This ensures the entry of vital resources necessary for the successful operation of the supply company.
- The company is responsible for the exterior of the water pipe to the entrance of the property. This ensures access to drinking water in remote areas.

- Adhesion contracts (eg water supply contract) should be available in local language. In order to have clear statutes.
- The water supply companies (being a basic service) must have a free telephone service care incidents and complaints.

Technique	Advantages	Disadvantages	Savings in Percentage (%)
<i>Metering</i>	-Easy to implement -Higher potential for savings	-High initial capital investment	25% in non-metered areas
<i>Leak Repairs</i>	-Reduces amount of not metered water	-Costs may be higher than that of water saved	9% approximately
<i>Fares</i>	-Can strongly lead to strong savings	-Objection by users -Requires properly designed structures for efficiency	10%
<i>Efficient Devices</i>	-Cheap -Fast efficiency	-Requires users' cooperation	At least 10% of residential use
<i>Regulation</i>	-Great potential for savings -Reduces residual water amounts	-Possible resistance by users	More than 10% of residential use
<i>Restrictions of use</i>	-Effective in home exteriors, especially during droughts	-Requires users' cooperation -Hard to establish	10 to 20% of residential use
<i>Recycling and Efficient Gardens</i>	-Significant savings -Low maintenance of water plants	-Low acceptance by users -Users' preference for determined water plants -Appropriate water plants may not be available	25% of residential use
<i>Education</i>	-May change bad habits -Long-term results -Promotes voluntary participation	-Requires a well planned and balanced effort	5%