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PRESENTATION

Habitat International Coalition, HIC, the international NGO alliance on human settlements, publishes this essay by Jean Robert, *Water is a Commons*, with the conviction that it will contribute with its fresh and profound vision to the debate on the options available to the majority populations in the implementation of their basic right to water.

The interest of HIC in this issue stems from its conceptualization of the human right to a place to live as not limited to housing alone, but rather encompassing the broad human habitat as a whole, with access to water constituting one of the most important components of this right. Furthermore, HIC refuses to accept the perspectives that limit the analysis and formulation of policies in the habitat field to technological, financial and macro-economic oriented considerations, understanding that the full enjoyment of the right to a place to live also has cultural, philosophical, historical, social, political, environmental, and of course territorial implications.

In this perspective HIC formulated a plan of action that established as one of its first steps the convocation of various persons at the forefront of thought on distinct issues in the relationship between human habitat and the environment, for the preparation of a series of analyses of contemporary approaches to these issues. Such analyses were considered fundamental to the development of the HIC position on complex issues which must reconcile respect for the environment and the fulfillment of basic human rights such as access to water, land, and shelter.

The joint HIC-LIFE Project, "Promotion of Sustainable Technologies in Drinking Water and Sanitation Services in Urban Settings", funded by the UNDP LIFE Program, presented the opportunity to pursue the first of these analyses on the crucial question of access to water and sanitation.

For this study we turned to Mr. Jean Robert, an architect born in Switzerland in 1937 and who currently resides in Cuernavaca, Mexico. Jean Robert studied in the Polytechnical Institute of Zurich, ETH, following which he practiced his craft for a number of years in Holland and Switzerland, where as he notes he was "dedicated to a large extent to the construction of banks." A series of factors began to radically redirect his activities around the mid-1960s, including ecological concerns, interest in peoples' grassroots architecture, contact with Mexico, and especially contact with persons such as Ivan Illich, Gustavo Esteva and John Turner.

Jean Robert has produced a number of essays and books on diverse themes in which it is always possible to detect his profound concern for the conflict which has historically developed, especially through industrial modernization, among peoples' subsistence founded in local cultures on the one hand, and the modern culture which cancels the peoples' skills and abilities in order to impose the concept of goods and services held by the State, the business interests, the accountants and the technocrats, on the other. Among his publications stand out: "La Trahison de l'Opulence" written in 1976 together with Jean Pierre Dupuy; "Le temps qu'on nous vole", 1980; the entry on "Production" for the "Development Dictionary" published in London in 1992; "Ecología y Tecnología Crítica", 1992, which unites a series of newspaper articles published in Mexico; and "Zu Hause und Unterwegs", 1993, which deals with the history of perceptions in ancient and medieval Europe. His intellectual work has not distanced him from the practice of his trade through which he has sought to translate his concerns, most notably through the development and promotion at the grassroots level of alternative sanitation technologies. Jean Robert currently teaches in the school of Architecture of the University of Morelos in Cuernavaca.

The work of Robert responds to our wish to set aside the economist's vision of urban questions so much in vogue in these times when all is being reduced to the laws of the market, and instead opt for a more integral historical, philosophical and reflective vision of water to better stimulate radical debate - the primary goal of the essay. It will be found to counter all three of the more traditional perspectives on the

fulfillment of water and sanitation needs: the economic vision which sees them as a problem of pricing; the political vision of water and sanitation as a problem of servicing; and even the social vision which might label them a problem of participation. Robert's perspective has grown out of his historical vision of the management of water (and other basic gifts of nature as land for example) as *commons*: neither private nor public but of equal gratuitous access to all members of a given basin, who share common understanding towards its conservation in accordance with its limits in the given context. Such an approach traditionally also guaranteed access to such vital elements as water for the meekest - or, in more modern terminology - for the most vulnerable.

The primary end goal of this effort is to search for elements which contribute to the clarification of the position which HIC and other interested people and organizations should assume with respect both to the protection of the environment and to peoples' access to the fulfillment of their fundamental living requirements, in this case for drinking water and sanitation. The crises now being faced in settlements around the world, and the subsequent growing recognition that contemporary approaches to the provision of water and sanitation are neither sustainable nor meeting the needs, point to the present as a time when new perspectives must be opened up and dynamic new approaches must be developed in the resolution of the rights of access to vital basic elements such as water, land and shelter. We hope that this study is a step in that direction.

Enrique Ortiz

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CHAPTER 1

A LOOK AT PRESENT SITUATIONS

1. NATURAL BOUNDARIES

The certainties of industrial societies concerning water are becoming so shaky that they could crumble from one moment to the next. Water in the modern age is promised in potentially infinite supply and yet it is scarce; it is piped indiscriminately from one basin to the other, and is therefore scale-less and place-less. On the other hand, if there is a constant in water's relation to man in history, it is that, up to modern times, water was always in place within a scale.

Throughout history, the availability of water for human use has been bound by cosmic conditions. Water was limited without being scarce in the *strict economic sense*. Modernity seems to have inverted that relationship: never have such huge quantities of water been readily and conveniently accessible for human purposes, and yet never has water been proclaimed so scarce.

This essay is written in the conviction that the fashionable planetarization or globalization of 'water problems' is part of our predicament, because it makes water conceptually and then practically place-less and scale-less. The more *global* water will be perceived, the more scarce it will be experienced. The riddle of scarcity is that the bigger the cake is made to appear, the less limited it should be to satisfy all expressed and imputed needs. Yet limitedness is part of water's nature. Does that mean that it has to be scarce?

In order to disentangle the paradox of scarcity in global abundance, we must take a look at the boundaries both *limiting and shaping the use* of water by humans. A preliminary remark must be made: for the first time in history, those boundaries are no longer perceived to be local, defining for every region a kind of hydric horizon.

We will begin in this chapter with an examination of the ultimate limits of claims to 'planetary' water. In the second and third chapters we will

attempt to re-embed local water within limits which are themselves place-bound.

Joyce Starr writes:

What most people cannot understand, is that the quantity of available water on our planet did not increase since the beginning of times. (Starr, 1992, p.7)

Leonard Bays adds:

Only a tiny fraction of the waters which cover the earth is of use to humanity. 97% is salt, filling the oceans and the seas. Of the remaining, 99% is out of reach - frozen in icebergs and glaciers or buried deep underground. We depend on what is left to quench our thirst, wash away our wastes, water our crops and, increasingly, to power our industries. In most parts of the world, this limited supply is overstrained." (Bays, 1991, p. 11)

Though it is often expressed in numbers, this fundamental limitedness of water is not well understood. The belief that, like all given horizons and limits, it will be transgressed - if not today, then tomorrow - seems to be an integral part of the modern ideology. Unlimited amounts of freshwater are among the illusions generated by technical and scientific progress. Desalinization of sea water is indeed possible in the lab. But only at excruciating costs can it be performed in Israeli and Arabic deserts. The over-exploitation of fossil groundwater is another attempt to outwit nature by trespassing on its limits. For obvious reasons, it can only generate expectations that in the long run cannot be fulfilled.

1.1. THE 'NATURAL' AND THE 'ANTHROPOGENIC' WATER CYCLES

The decade of 1965-1975 was proclaimed International Hydrological Decade. 101 countries were actively involved in scientific surveys addressing such questions as:

- What is the repartition of water on earth at any given moment?
- How much water is there in the atmosphere?
- How much in water tables?
- How much in organisms?
- Can the quantity of available water be increased?
- Is a 'world control of water' desired? If yes, which type of legislation does it call for? (Aylesworth, 1968, p.151 ff.)

Following are some of the findings reported:

- The earth contains some 1.350 billion km³ of water (Aylesworth, 1968; Bätjer, 1980).
- Only one third of the water from the sky can be used. The rest returns to the atmosphere or is absorbed by plants.

But the International Hydrological Decade could not decide if desalination of sea water, chemical synthesis or other technical means could ever realize the impossible: make water available in unlimited supplies to all.

Since science and technology do not offer us a concept of limits that can inspire politics, but on the contrary distill the illusion of unlimited availability of all that is good, let us turn to a tradition that founded its wisdom on the acknowledgment of limits.

Water is distributed in nature in a way reminiscent of the ancient distinction between the inhabitable and the uninhabitable parts of the world. For Aristotle and his contemporaries, the *oikoumene* or inhabitable part of the world represented only a small fraction of the earthly globe. A separation line called the diaphragma distinguished the *oikoumene* from the rest of the earth, deemed to be submitted to cosmic conditions that rendered it uninhabitable and which could not be modified by man. That is why Strabo, the Greek 'father' of

geography who lived in the first century B.C., said that the study of the uninhabitable part of the earth did not belong to geography, the study of the *oikoumene*, but to cosmography. Only inside of the diaphragma did thus "the ineffable stuff called water" (Illich, 1985, p. 8) give dwelling spaces their specific styles of freshness. Beyond that fringe, water was as strange to humans as the universe in which it flew. These 'cosmic' waters limited and contained the 'oecumenical' water that shaped dwelling spaces.

Though modern geography has forgotten Aristotle's diaphragma and Strabo's 'ecological' limitation of geography, water seems to remember these old divisions. The water that irrigates the inhabited world - the 'anthropogenic cycle' or, as I would prefer to say: the ecumenical cycle - is but a tiny fraction of the overall 'cosmic' water present on earth - the 'natural cycle' - but inaccessible to humans, at least as house water. And, lest the poor and even the rich must support unaffordable costs and indescribable sufferings, that condition cannot be changed by humans. Most projects consisting of expanding the anthropogenic cycle by displacing that frontier are simply foolish.

Grosso modo, the breakdown of waters on earth is as follows:

saltwater 97%
sweet water 3%.

The 3% of sweet water is distributed as follows:

polar caps and glaciers 79%
deep water tables 20%
superficial, accessible water 1% (Falkenmark, 1992, p. 23)

It is this last 1% of 3% which irrigates and refreshes the inhabitable part of the world. It consists of:

lakes 52%
soil humidity 38%
atmospheric water 8%
organic water (water in living organisms) 1%
streams and rivers 1% (Falkenmark, 1992, p. 23)

Thus rivers and streams represent only 0.0003% of the earth's water, the same quantity as organic water. Yet about 80% of our drinking water comes from them, while most of the other 20% is extracted from underground water tables (Tageszeitung, 1992, p. 30). The over-exploitation of deep groundwater, the most common form of the attempt to bypass the given limitedness of water, is in the long run unsustainable at present rates (Stolpe, 1982).

It should be clear that in this study I will exclusively concentrate on the 'anthropogenic cycle'. As I already said, I would prefer another expression. This study is about the portion of the world's waters ascribed to the *oikoumene* or inhabitable world. Since man is not the father or generator of water, I would prefer to speak of the ecumenical water cycle.

The amount and proportion of this part of the earth's waters captured for human use on a worldwide annual basis is as follows:

agricultural irrigation 2.680 km³
households 300 km³
industry 1.000 km³
total 3.980 km³ (Tageszeitung, 1992, p.30).

Since one cubic kilometer is one billion cubic meters, the total amount of water consumed worldwide in a year is, if numbers ever have a truth to tell:

four thousand billion cubic meters,

or, if you prefer more domestic measures,

four thousand trillion litres,

or about

one thousand trillion gallons.

Lest all rivers be dammed and all lakes tapped, the whole anthropogenic cycle of water cannot represent in a year more than a

fraction of three millionths of the natural waters of the earth (Starr, 1992). Water - 'ecumenic' water - is limited by ecological and cosmic conditions. This does not mean that it has to be scarce. Paradoxically, the failure to acknowledge the cosmic limits in which water shapes man's dwelling only exacerbates the disharmony between means and ends which is the essence of scarcity. We must acclaim the *Dublin Statement on Water* for having recognized, in its first point, that "Fresh water is ... finite and vulnerable" (International Conference on Water and the Environment, 1992).

1.2. THE PREDICAMENT: ARE WE RUNNING OUT OF WATER?

The alarm bell has been pulled:

The twentieth century has broken the earth's water balance!...

In the ninety-two years that elapsed since 1900, population has increased fourfold, water consumption ninefold...

Industry uses forty times more water than it did at the beginning of the century. While in 1900 it claimed only 7% of the water tapped worldwide, in 1992 it consumed more than 25% of it. (*Tageszeitung*, 1992, p. 30)

Shall the "curve of increasing population" catastrophically collapse on the "curve of decreasing water resources"?

Mr Alfred M. Duda, a World Bank water and resources expert, warns that if his and his colleagues' advice is not followed,

... the 21st century will begin with enormous water scarcity, international water conflicts, and significant environmental degradation on every continent. (World Bank, 1993)

Duda's admonitions echo his colleagues' from the same institution:

Around the globe, surface and underground sources are dwindling. ... the supply of water is ever scarcer, sparking serious conflicts among various users with industry, agriculture,

and the public competing over who should have priority. (World Bank, 1991)

In which measure can catastrophe mongers make us wiser? Without a concept, not very much, answers Malin Falkenmark, professor at the Royal University of Stockholm. Instead of insisting on "the population pressure on limited supplies", she is wise enough to question development itself. Her concept: a comprehensive administration of the 'soil-water matrix' considered as a whole. First, the permeability of soil must be restored so that the water tables, and with them the quantity of water available for plant roots, can increase again. Second, a change in economic evaluation standards must occur. 'Productivity' in tons per acre of agricultural soil is a 'development concept' which has shown its counter-productivity by causing the ruin of soil and water. It must be superseded by a comprehensive appreciation of the efficiency of agriculture per unit of irrigation water and of the long term effectiveness of irrigation projects (Falkenmark, 1992; Cochrane, 1972).

2. SCARCITY AND THE GLOBALIZATION OF 'WATER PROBLEMS'

Fresh water is in limited supplies. It has always been and will always be. What is new, 'specifically modern', is the affirmation that since water is limited, there is not enough for all.

The contradiction between the promise of ever more and perceived restrictions is called scarcity. As Paul Dumouchel has convincingly shown, scarcity is not an inherent property of nature. It is a relation and is therefore not directly dependent on effective quantities (Dumouchel, 1979; Achterhuis, 1988). The existence of low supplies is compatible with low degrees of experienced scarcity, but the opposite is *fortiori* true: immense supplies can coexist with unbearable levels of experienced scarcity. This relation is witnessed in, and indeed is a broad characteristic of, the modern industrial world, especially in relation to water: never have the readily accessible quantities been so great, and yet never has water been experienced as so scarce.

Many water studies confuse the scarcity of water with its limitedness, an error with catastrophic political consequences. Even serious

economists tell you that "water being by nature scarce" - confusing limitedness and scarcity - "it is the economy's role to reveal that scarcity and let the mechanisms of price-determination force us to adapt to it".

All proclamations that water is 'an economic good', that it must not be gratuitous and that economic pricing must regulate access to it, stem from the same fundamental confusion between the limitedness of water and its scarcity. The 'water scarcity revelation proclamation' has even become a mandatory ritual of most international meetings on water (International Conference on Water and the Environment 1992, Principle No. 4).

If access to water were to be governed by the law of scarcity, its price would skyrocket in such a way that the poor would not get a drop of it. Even if it seems wise to impose high water tariffs on industries, agribusiness and private over-consumers, the poor's access to gratuitous water must be guaranteed.

This claim is nothing else than the modern expression of the unwritten law of traditional societies: protect the subsistence of the weakest (Polanyi, 1977; Dumouchel, 1979; Sahlins, 1972). On that, modern legislation represents a groundless break with common law and the rule of the commons. A common law of water alleviating or opposing the spirit of scarcity-prone modern legislation is urgently needed. Before any debate on the style of its pricing, water must be recognized as what it has always been: a commons (Pucci, 1991).

2.1. 'A DROP OF WATER FOR LIFE', OR THE RISE OF A NEW EMBLEM

During a meeting on water-saving celebrated in Canada in 1993, a huge balloon was solemnly let rise into the blue sky. It had the likeness of a gigantic drop of water, and participants were instructed to see it so. Herewith, a new emblem was launched into the cloudy sky of modern certainties.

Years ago, in a seemingly quite different context, for an apparently different public, an identical ceremony took place. A similar amorphous

airy piece of rubber was launched to celebrate the public fetus (Duden, 1993) as a new emblem for life. This similitude is worth a reflection.

The fetus is the objectified not yet, a hope made an object by the technique of visualization. This token for 'a life' that is still not a person, because it has no face, is becoming the emblem of 'lives' which are no longer persons but the tokens of a planetary body-count. But "to live" is a verb. It can further be noted that in most languages 'I live' is synonymous with 'I dwell' (Illich, 1985, p. 8). The transformation of an intransitive verb - I cannot be lived - into a non-verbal substantive is far from innocent. In the late 20th century, 'a life' is the emblem of the supreme value and the ultimate waste. As a value, it needs to be globally protected as 'the blue planet' and connected, as our needy bodies, to life-sustaining technologies like water pipes. As a waste, it is the dangerous sperm thrown away with the rubber after safe intercourse, as well as the corpse left by military eradication campaigns and protected from the worms by a plastic bag.

In the register of public emblems, 'the drop' evokes 'water for life'.

I oppose this with the old perception of water as that which quenches the thirst of women and men that have a face, water that is drunk from the hand, like Diogene's, or from glasses, gourds or jars. Water that was, and still is, taken in cups, as tea (Blume, 1992).

There is a big difference between the 'global drop' and local water embodied in culture. Only by stressing that distinction can the entire debate on water be re-oriented.

The image of the 'global drop' suggests that, just like the air that inflates the balloon, water comes from a pipe. Blown up to the scale of the blue earth, the drop becomes the planetary supply of 'life'.

The emblems of 'the drop of water' for 'life' on the 'blue earth' bespeak very concretely the making of 'global problems' expressible in conceptual globes and semantic balloons.

Just forty years ago, those semantic globes were still hardly thinkable. Living was a verb. The earth was not yet the lonely planet glowing

upon the dark vastness of the universe, but the soil under our feet; and water, as it spouted from the soil, was still sparkling and spoke of freshness.

Since then, we have learned to 'think globally' only by articulating global emblems into a new type of discourse.

However, for most people in Africa, Asia and Latin America, these emblems of modernity are still the tokens of school, television and development. For she who still perceives her pregnancy as her fruit's quickening and hasn't internalized its sonographic image, what she bears is not 'a life', not 'a fetus', but her future child. For he who sows when the signs in the sky are favorable, gently banks the young plants with earth when the time comes so that the sun does not dry them, weeds his field on the prescribed days, and celebrates the crops with festivities, the earth is not the 'planet' but the soil toward which he bends. To him, water is rain: a gift of the sky. And for she who fetches her water from a drying well, the 'globalization of the water problem' is just the pump of the next city's public utilities that lowers the water tables. The emblems of modernity connote different things depending upon which side of the line you are on.

For experts, who speak globally, water is scarce. It is not given freely as rain, nor fetched at domestic wells. It comes from the pipe. The logic of pipes is the logic of scarcity: there is never enough for the rich, and the poor's wells are drying out (Dumouchel, 1979).

No wonder that experts in water-supply often describe their work in words, and even more often in pictures, as a 'life-giving' profession: think of the poster periodically distributed in diverse guises to schools, in which a greening orchard is pictured in such a way that it seems to be the output of a water pipe. By substituting themselves for Providence, the clouds or a good monsoon, these experts give a modern expression to that ultimate arrogance that the old Greeks called *hybris* and that their gods chastised with *Nemesis* (Illich, 1976).

Many of the water predicaments of our time have the structure of a *Nemesis*: they cannot be discussed without considering the underlying *hybris*.

2.2. THE PRICE OF WATER AND THE NEW 'SANITARY REVOLUTION'

The majority of affluent urban dwellers in developed and developing countries do not realize how many cubic meters of water their households consume annually, and they hardly even know how much they pay for it. Not for long any more. Ecology-oriented economists proclaim that the scarcity of water is not expressed well enough in pricing mechanisms. What do they mean with their slogan of 'real prices'?

In the countries of the European Economic Community for instance, the price of domestic water is expected to increase four- to fivefold over the next five years, so that the water taxes paid by an average household will soon rank with its telephone bill (Geiler, 1992).

This 'tax explosion' is officially justified by the increasing costs of treating sewage water, which in turn manifest increasing technological requirements.

The nitrogen content of waste water is just one example. Experts agree that the nitrogen compounds contained in black waters (excrements) and in grey waters (detergents) are a source of eutrophy - an excessive 'feeding' or fertilizing effect - for watercourses and soils. As a consequence of these excessive nutrients, planctons proliferate on the surface of rivers, lakes and the coastal parts of the sea, taking away the oxygen and light from higher forms of fauna and flora, and causing, as one example, the seals of the North Sea to die out.

Instead of avoiding the problem at the source by not mixing excrements with water, limiting the use of detergents and ruling out the mingling of excreta and industrial waste, society asks experts for a solution that can allow its members to maintain their unsound habits, and industry to export costs to the public. Consequently, these experts discover that if the eutrophic effects of waste waters were to be curbed, the volume of every existing and new treatment plant would have to be increased fourfold. If other toxins were to be removed from waste waters, the yearly costs of their transport and treatment would also increase four times.

A new brand of ecologically-oriented sanitation professionals awaits the hour of covering Europe with longer and thicker sewers and more extended and ever more expensive treatment plants. On both sides of the Atlantic, the trends are towards centralization and new monopolies on the provision of drinking water as well as on the disposal of waste water. Yet the paradigm of a privately owned and hugely centralized water-supplying firm is unexpectedly not American, but French. With its 140,000 employees and its twenty billion dollars a year, the Compagnie Générale des Eaux is one of the world's biggest servicing firms. If it will try to assert a continental monopoly on water distribution is an unknown of the European 'water-front'.

The new sanitary regulations are extremely expensive, which economists interpret to say that "they open new markets"! However, the drawbacks of this new technological escalation should be kept in mind. According to Pierre Lehmann, a physicist converted into an alternative technologist, the centralization made necessary by the new regulations entails:

- the ultimate de-responsabilization of citizens,
- the monopolization of the sources (withdrawal points),
- dangerous discharges,
- the mixture of organic matter (useable) and chemicals (dangerous),
- unmanageable peaks in heavy rains (in part due to the absence of a separation between storm and sewage waters),
- high energy costs in treatment plants,
- increasingly complicated, expensive, and vulnerable treatment plants,
- secondary pollutants such as toxic sludge, and
- high costs - or even impossibility - of their 'elimination' (Lehmann, 1982).

Twelve years ago, Switzerland already spent more than two billion Swiss francs a year (one and a half billion dollars) on 'improved sanitation'. This represents a cost of 300 dollars a year per capita (Lehmann, 1982).

Since many cities use recycled water from rivers, lakes or even directly from treatment plants to supplement the insufficient supply of their wells, an increasing number of American households switch to bottled spring water. Following the American example, ever more Europeans prefer mineral water, in the sometimes deceptive hope that it contain less pollutants than usual tap water (Verbrauchsinitiative Bonn, 1992).

In the developing countries, home-comers from the US or Europe, eager to bring home the new norms of 'ecologically sound sanitation', generally precede political decisions and the attribution of credits. For these epigones, there is no salvation without modern sanitation: "Have us build your new-look treatment plants in every town, or live in your own sludge!" seems to be their motto. What follows is a haphazard sequence of 'demonstration projects' which most of the time end up as white elephants. Rather than clear sanitation policies, they express the World Bank's or other lending agencies' readiness to play a game which they know has no outcome. Much of the skyrocketing debt of the poor countries is fueled by technologies whose only aim is to undo what the flush toilet does, namely mix water with shit. Meanwhile, the inhabitants of great Latin American cities like Lima continue to live above an underground sea of black water (Caba Martín, 1992).

Are there really no other options than that techno-cultural mimetism, ending up again and again - for lack of funds as well as for the inadequacy of the imported technologies - in the same failures?

Is 'scarcity made evident through prices' a means to protect watercourses and water tables and curb the pollution of soil, or is it the 'new deal' of the privatization of services?

As stated by the NGOs in the Montreal Charter, access to water is a fundamental right (Montreal International Forum, 1990). But access to water must be understood radically - that is: at the root - as access to where free water is. Governments intending to rule water consumption

by price mechanisms should remember that only as long as water is a commons, freely accessible to the poor, can the over-consumption of the rich be curbed by high tariffs without causing the poor's ruin. In Lima, for instance, where the government has tried to regulate the use of water by that means, prices are too high for the poor, who buy water by the drum, and too low for the rich, who bribe the drivers of tank trucks giving service to the slums and use the poor's water to wash their cars (Lange, 1992).

3. ECOLOGICAL REPERCUSSIONS

The ecological effects of the created scarcity of water must be understood as a consequence of the reckless absorption of this life-giving element into the economic cycle. Since the economy fixes no limits to needs and requirements and ignores the thresholds respected by all traditions, the anthropogenic cycle of water can only explode, disturbing the natural balances in which it was previously held. Below we will recall some aspects of that rupture.

3.1. DEPLETION OF GROUNDWATER TABLES

Large cities such as Manila, Mexico City and Bangkok are dangerously depleting their water supplies (World Bank, 1993, pp. 6, 7). As surface water becomes increasingly polluted, industry and cities turn to groundwater for alternative supply. But they are finding it to be more expensive than expected, already contaminated or depleted.

Numbers tell us that groundwater makes up about 30% of the accessible water and 20% of the effectively tapped water (Tageszeitung, 1992, p. 30). The total amount of water extracted from groundwater tables is estimated worldwide at 650 km³, that is 650 billion cubic meters (ibidem).

THE CASES OF GERMANY AND THE UNITED STATES

Of the 4.7 billion cubic meters withdrawn yearly for public use, only 1.4 billion come from rivers and seas. 2.7 billion (70%) come from groundwater (Bätjer, 1980, p. 232). As a result whole portions of the landscape are drying out, especially around big cities, as more water

is pumped than is given back for water table repletion. For example: in Vogelsberg in the state of Hessen, 50 million cubic meters are withdrawn yearly for the city of Frankfurt. Consequently, streams are drying out, and trees are dying (Bätjer, 1980, p. 232).

In Germany, like in most industrial countries, groundwater tables are fully utilized and often overstrained. Until now, public attention has principally focused on surface waters, without looking at what is at stake underneath (Bays, 1991). It is time to look.

The case of the United States is no less worrisome. After the white man had exterminated the buffalos and the Indian cultures, he proceeded to the agricultural exploitation of the Great Plains. The Dust Bowl of the 1930s was a first warning of the danger of ploughing the Plains. However, when huge reserves of groundwater covering about two thirds of the territory were discovered, the warning was forgotten and heavily irrigated industrial agriculture took over. Now that the reserves are almost exhausted, desertification threatens (*Fourth World Review*, 1993; McPhee, 1993).

3.2. SOIL POLLUTION

Precipitations dissolve the pollutants contained in the air and on the land surface. According to the Technological Institute of Aachen, 1000 kg of chlorine and 1370 kg of nitrates per km² seep yearly into the German groundwater tables. In the Rheinland-Pfalz region, 54 of the sources feeding the Moselle have a nitrate content higher than 50 mg/l (Bätjer, 1980, p. 233).

In poor countries, water pipes are often empty during the dry season. The city utilities are prone to cut off water from poor quarters when the amount of available water diminishes. At such times the danger develops that waste water will seep into the temporarily empty pipes through cracks (which always exist), sparking epidemics of water-borne diseases, such as cholera, which is currently hitting Latin America (World Bank, 1991).

The mixture of water, excreta and industrial waste that we call sewage water or sludge is also an extremely dangerous pollutant. In certain

countries, the soil is poisoned with sludge up to a depth of 30 feet or more (Achterhuis, 1992).

3.3. THE MACADAMIZATION OF THE SOIL AND THE COLLAPSE OF MICRO-CLIMATES

The loss of permeability of the soil causes increasing amounts of rain water to flow downhill, eroding soils on their way to the sea. As water tables fail to replenish themselves due to the soil's lost permeability, they dry out, as does the land. Once luxuriant landscapes turn into kinds of steppes or quasi deserts (Falkenmark, 1992; McPhee, 1993).

4. RADICAL POLICIES OR REPAIR-TECHNOLOGY TRANSFER?

Today, the struggle against pollution addresses symptoms, not causes (Lehmann, 1982). Instead of a change of approach, technocrats generally propose conspicuous - and expensive - repair technologies. This trend is characterized by a responsibility transfer from the citizen to the technocrat, who has acquired a prepotency that now allows him to define needs (Illich, 1987).

4.1. REPRODUCCION OF ERRORS

4.1.1. SLUDGE: A DOMESTIC-INDUSTRIAL POISON

A major pollutant in almost unlimited supply, modern sewage water is a very peculiar mixture. It results from the mingling of three classes of substance that any sound householder would keep separated: rain water, human excreta and industrial waste.

A radical sanitation policy would curb the production of sewage water by limiting the mingling of its ingredients. Policies that do otherwise do not go to the roots. Though they may temporarily alleviate situations of sanitary stress, they are but mendings on a widening gap. Technologies that take the growth of sewage water for granted and attempt to process it according to ever new hygienic or ecological requirements are, in spite of all underlying good intentions, nothing more than repair technologies. And for most of the world, such repair technologies are too expensive. Ruled out by their costs before having

been implemented, the blueprints of these repair technologies should no longer be allowed to inspire the planners and the lawmakers of the poor and not too rich countries.

Before criticizing this technological package, one must examine its rationale. The mingling of industrial waters with domestic waste water is a comparatively recent phenomenon, as is the growth of the volume of water consumed by industry (up to about three times that of domestic water worldwide in 1990). In fact, the connection of industrial outlets into the sewers is an escalation of the wrong principle of 'combined sewerage', that is of the mingling of sludge and rainwater in one pipe.

4.1.2. THE MONOPLY OF THE CONVENTIONAL SANITARY 'TECHNOLOGICAL PACKAGE'

Since the beginning of indoor plumbing, users of tap water - that at the time were subscribers to privately managed waterworks - found it convenient and cheap to discharge their fixtures into the rain water drainage canals. Retrospectively, mixing human excrement with water does not appear as a very ecologically sound practice. Mingling that mixture with rain water was one more step toward the globally insolvable problems that we face today. The last was adding industrial wastes to that already explosive mixture. The compound of biologically highly active organic matter and toxic chemicals thus obtained is an epidemiological and ecological time bomb that repair technologies are manifestly unable to deactivate.

But there is more: the introduction of tap water generally precedes the establishment of a sewer. This pattern, which corresponds to the historical modality of the introduction of indoor plumbing, is still observable in Third World countries: indoor tap water almost inevitably generates black and grey waters for which there are no provisions. Experts reinterpret this fact by claiming that people "lack sanitation", and some of them propose that convenient dispositions (sewers, septic tanks) be taken before the introduction of tap water and indoor plumbing. This 'sanitation first principle' neglects the possibility of not mixing excrement with water in the first place (Añorve, 1994; Nguyen, 1984; Lehmann, 1983; ENDA, 1987). Such a situation in which experts

and technocrats contribute to make radical alternatives socially unthinkable by using a language that precludes them corresponds to what Illich terms a radical monopoly.

4.1.3. THE DEMISE OF CONSERVATION IN DOMESTIC USE PATTERNS

Indoor plumbing did to water supply what gas and electricity connections did to cooking and lighting: it substituted public services for private toil. In this domain, too, consumption replaced productive labor. Consequently, one of the first noticeable casualties of indoor plumbing was the careful habit of conserving water and of giving it several successive uses.

She who only obtains her water through a laborious process will be very apt to stint her measure of it. Not so he who takes water from a domestic faucet (Strasser, 1982). Water begins to be perceived as a flow, a 'throughput', rather than as a quantity subject to conservation rules. As a result, statistics show that water consumption in households recently connected to the water-distribution network rapidly grows up to one order of magnitude. Water conservation inevitably begins to subside as soon as running water becomes available in unlimited supply. In chapters 4 and 5 we will examine the principles and the technologies that can allow a new, modern culture of conservation to flourish.

4.2. THE 'BIGGER IS BETTER' FALLACY

When external agencies transfer water and sanitary technologies to third world countries, they generally operate at scales which are unusual even in the countries of origin of these agencies' experts. In Asia, Africa and Latin America, the World Bank for instance finances 'water development projects' that in Europe and North America could hardly be proposed without causing popular upheavals. In order to constitute huge water reservoirs for future irrigation agriculture and industry, valleys are dammed and, as a disillusioned expert uttered it, their inhabitants 'damned'. While in Europe and North America rain feeding is the rule for cereal crops, in India and Mexico heavily irrigated

wheat fields yield up to 35% more than in the North (*Fourth World Review*, 1993; Borgstrom, 1971). What for, if bread is neither of these countries' staple food?

But gigantism has still another, less conspicuous but perhaps more perverse consequence: it blurs watersheds. What does that mean, and what are the consequences?

Traditionally, just as the landscape reveals itself within a particular horizon, water makes itself available to humans within watersheds that delimit specific basins. When the quality and the quantity of water available in every basin determine patterns of use and of conservation, water policies may be said to be basin-consistent. The respect of watersheds and the recognition of every basin's specific hydric style are some of the traditional means to prevent water from being perceived as scarce. On the contrary, basin-inconsistent water policies can only exacerbate the scarcity of water, often in spite of conspicuous overflows.

Third World cities have imported patterns of domestic water consumption from the North, often exaggerating them. Thus certain quarters of Mexico City present average daily per capita consumption rates twice as high as well-to-do districts of London or New York, while many informal settlements at the periphery are reduced to biological daily allowances, e.g. the water necessary to drink and a small amount more to cook the beans.

Even so, the rich's consumption sets the standards. Instead of fixing a common roof for rich and poor, water utilities act as if the poor were to reach the rich's levels, tomorrow. Since local sources cannot match such projections, water is pumped to dammed reservoirs from a radius of more than two hundred miles. While Superpump and Big Sewer become the panacea of urban development, local wells dry out and on-site treatment of waste water is officially discouraged (Warshall, 1980).

5. WATER AS A 'WAGER' OF MODERN GEOPOLITICS

The socially constructed scarcity of water defines new fronts and new conflict lines, externally as well as internally. The discussion of these

lines often resembles 18th and 19th century debates on 'scarcity and violence', 'scarcity and "the war of all against all"', 'scarcity and poverty', 'poverty and the "Two Nations"' (read: of the rich and of the poor), 'poverty and disease', and 'poverty and public health' (Polanyi, 1957, p. 151 ff., 290 ff.; Thompson, E.P., 1966).

5.1. WATER AND WAR

Before enumerating alleged or real water-bound war risks, some basics should be recalled.

Throughout history, water has been a motor of peace rather than of war. Since time immemorial, people riparian of the same watercourse have learned to make peace by concluding agreements about the use of their shared water.

Yet, in order for water conflicts to be solved peacefully and their resolution to enhance peace, water politics, as the Dublin Statement stresses, must be basin-consistent. In other words: "the most appropriate entity [for water politics to be effective] is the river basin, including surface and groundwater" (International Conference on Water and the Environment, 1992).

Water policies in a transboundary river or lake basin, the Dublin Statement insists, have similar institutional requirements as the ones of a basin entirely within one country, so that water agreements can found transboundary solidarity between neighbors. Governments should favor and not disturb these agreements. The formation of transboundary basin organizations (*ibid.*, p. 4) habilitated to solve conflicts locally could help foster peace between riparian countries. This should facilitate the conclusion of watershed agreements in which direct neighbors or those riparian of the watercourse are directly involved.

Since those basic facts of political history are frequently ignored or forgotten, there is a lot of war mongering among those who think that local conflicts should be solved by distant agencies, e.g. governments. "The only issue that could lead Egypt to war is water", said for instance

President Sadat in the spring of 1979, after the signature of the treaty with Israel. The warning addressed Ethiopia, from which comes an affluent of the Nile (Starr, 1992, p. 7).

According to U.S. government estimations, there are at least ten places in the world where war could break out due to conflicts related to shared water. These 'estimations' are in fact speculations that consider possibilities of conflicts because of the scarcity and/or the pollution of water.

Twenty-five nations are said to suffer chronic water shortages. According to the same U.S. estimations, they will be ninety by the year 2000, affecting half of the world population. Following the logic of scarcity - that negates watersheds as well as transiparian solidarities among political 'strangers' sharing the same hydric horizon - there might soon be a wild competition for the world's 214 shared lakes and rivers.

Water should not be a pretext for war, but an opportunity for coming to terms and thus making peace. But is that possible when water is placed under the shield of scarcity?

Journalists who speculated on oil wars in the Middle East now foresee water wars. They stress that 90% of the Arabic speaking people get their water from non-Arabic nations (World Media, 1992, p. 3), and that resources decrease while demands grow.

Nevertheless, a sound voice is sometimes heard: "Water transfer from one basin to another is a futile option..." (*World Media*, 1992). And if transbasin transfers - often rightly perceived as spoiliations - were at the root of the commented war threats? One line of friction due to such transfers runs between Israel and the occupied territories.

About 70% of Israel's water requirements are for agriculture. Israeli productivity per cost unit of water is very low. In fact, Israeli farmers benefit from undue subventions to the price of water. Many analysts and economists have recommended that part of Israel's irrigation agriculture be discontinued unless the real costs of water can be covered without exportation subsidies (*World Media*, 1992, p. 3).

Israel consumes about 80% of the water reserves within its territory. Palestine, together with Cisjordania and the Gaza Strip, have a global consumption per capita - that is including agricultural and industrial uses - of 134 m³/year, compared with 404 for Israel and 237 for Jordan. Water consumption of Israelis in the occupied territories is 5 times the Palestinian consumption. Water-related frictions are also reported between the Arabic countries, setting Iraq against Syria, Egypt against Sudan, and Lebanon against Syria.

States have often favored trans-basin water policies that negate riparian rights, fostering conflicts.

East Europe has many rivers, but they are almost all extremely polluted. For instance, 95% of the water in Polish rivers is not drinkable. Due to eutrophication by fertilizer residues, the 'murderish algae' of the Mediterranean is proliferating and threatening to invade affluent rivers (Tardieu, 1992).

According to the reports of Christian Taylor in the *London Financial Times* (July 1989), the ecological catastrophe of the Aral Sea in Central Asia is worse than Chernobyl's. In Karakapakia, the general pollution of the sea and the toxins poured by the water-dependent cotton industry have contaminated all the available drinking water. Mothers are discouraged to breast-feed their babies because their milk is polluted. The inhabitants of the region speak of the 'salty sea of death'. Where shall they go?

The now United Nations Secretary General, Boutros-Ghali, in 1985 foresaw that millions of inhabitants of Africa and the Middle East - he did not then mention Eastern Europe - could attempt to flee to Western Europe for lack of water during the 90s. He proclaimed that "our problems cannot be solved with classical formulas", and added that without political imagination Egypt could become a second Bangladesh (Starr, 1992). In the U.S., as underground fossil water becomes exhausted, a 'water war' opposes environmentalists and water developers (McPhee, 1993).

When neighbors and riparians can no longer reach agreements on concrete water issues, be it because their power of concertation is

negated or because of basin-inconsistent water policies, the worst can effectively occur. One country's drinking water may become another's waste disposal unit. Deforestation upstream may cause flooding or shortage downstream, while one country's hydroelectric, irrigation and water supply projects may cut off a neighbor's water supply.

Forty per cent of the world population depends on water from a neighboring country, and more than 200 large rivers are shared by two or more countries (Bays, 1991).

But has water sharing been a major cause of war in past times? Upon careful investigation, the opposite might appear to be true.

5.2. WATER AND POVERTY

During the International Drinking Water Supply and Sanitation Decade, water and sanitation services were provided to millions of people. Yet, as Bays points out, this number was outmatched by population increase, somehow jeopardizing the results (Bays, 1991). After the 'decade', one out of three persons in the Third World is still said to "lack these services". So one has to seriously question the goal, "for the World Community ...to achieve sustainable water and sanitation systems for all" (Safe Water 2000, 1990). Even before stating that "access to water and sanitation is a fundamental component of social and economic development" (ibid., p. 1), the right of access of the poorest to gratuitous water should be affirmed. Before water be seen as a 'service', one should not forget it is a commons.

The poor are the first to suffer from the transformation of water into an economic good. When they are deprived of access to gratuitous water, services to them - often woefully inadequate - are the first to be curtailed: when demand is greater than supply and pressure in the system drops, utilities shut off the flow intermittently, mainly at public taps in poor neighborhoods.

In that respect, a World Bank expert had an excellent idea: "The poor," he wrote, "should never be the target of 'water pricing policies'..." (World Bank, 1991); 15-20 litres per person a day as opposed to an average 50-125 should endow them with a right to water 'as a

commons', referring to gratuitous water. Even the World Bank can rediscover the anthropological rule of the protection of the weakest's subsistence without which there are no commons!

Meanwhile, other experts endlessly discuss the price of water, e.g. which 'pricing policies' are more adequate. Some insist that, in order to achieve conservation, charges must be raised. Others argue that water must be cheap to accommodate the poor. But according to one Mr Biscoe, it is not the poor who benefit from low prices: their communities, he says, often lack water and pay to vendors as much as ten times more per litre than those who can turn on the tap at home. Thus higher-income groups are the ones that gain from low rates. As already alluded to, the style of these discussions sometimes recalls the debates on the poor in 18th Century England (Polanyi, 1957).

5.3. WATER-RELATED DISEASES

The macabre dance of numbers: Water-related diseases are one of the main causes of death in developing countries. Polluted waters are said to cause about 8% of all illnesses in the Third World. 35,000 children die every day of water pollution. Every year, 15 million people die from polluted water (Caba Martin, 1992, p. 34).

Forty percent of Africans are in danger of contracting water-related affections, with the main causes being the presence of excrements and toxic chemicals in their water supplies. Among the latter, the most often reported to cause endemic diseases affecting millions of people in the Third World are arsenic and high concentrations of fluor as well as of oligo-elements. Recent cases include for instance the outburst of bone fluorosis in India and repeated intoxications by arsenic in Latin America. Those under five years of age are the most affected (Caba Martin, 1992, p. 34).

In a world inhabited by some five and a half billion people, more than one third do not have safe drinking water and a quarter have no form of sanitation. Some 50,000 deaths occur every day from waterborne diseases. To put it in perspective, that's a third of all deaths occurring in the world. The remainder die from hunger, old age, cancer and other illnesses. 4.6 million children under the age of five die each year from

waterborne agents. "All of which is a very sobering thought for those engaged in the potable water industry...", writes the Secretary General of the International Water Supply Organisation (Bays, 1991, p. 11).

The spreading cholera epidemic is but the tip of the iceberg of a progressive degradation of health conditions in urban areas. The most common water-related disease is dehydration. The most often recurring water-related infections worldwide are:

- Bilharziosis

Caused by the parasite of a water snail, bilharziosis is rampant in 27 countries. 600 million people are exposed to it; 200 million are effectively infected. Bilharziosis, which cause damages to the liver and the urinary tract, is the first cause of death of Egyptian men between 22 and 44 (Caba Martin, 1992, p. 34).

- Onchocercosis

Also called 'river blindness', its vector is an insect carried by the larvae of a worm. In some regions it affects 20% of the adult population. According to the World Health Organization, the number affected worldwide in 1990 was 18 million persons.

- Dracunculosis

This disease is also known as the 'disease of the Guinea worm'. Between 5 and 10 million people are infected worldwide (WHO, 1990). It is exclusively transmitted by drinking water and its control is (or should be) therefore relatively easy.

- Cholera

In Latin America, this old epidemic, which had virtually disappeared more than a century ago, has now come back and slowly expanded throughout the continent. At the end of 1991 half a million cases had been registered throughout the continent, with 17.000 casualties, half of them in Peru. Worldwide 40.000 persons were affected in 1990 (WHO, 1990).

The UN, which declared the 1980s the 'decade of drinking water', tends to reinterpret the degradation of the health situation as a lack of the sanitary package, and makes numbers say with an apparent matter-of-factness that,

1.2 billion people lack safe drinking water and
1.75 billion lack treatment plants worldwide,
while in Europe alone, 100 million lack drinking water and
250 million lack treatment plants... (Caba Martin, 1992, p. 34)

If all these 'lacks' were to be met with the conventional sanitary package that has already caused the Dutch soil to die (Achterhuis et al, 1992), ecological disruption would jeopardize all sanitary improvements.

The times when hygienic advantages could be bought at the cost of ecological degradation are long over. Ecological disruptions are today part of the etiology of epidemics, be they old diseases coming back or specifically modern, degenerative affections.

Lima, with 8 million inhabitants partly living on soil impregnated by sludge, is only one example. It has not one single treatment plant (Lange, 1992), and thus, according to experts, lacks the package. However, a technology transfer of the 'lacking elements' would miss the point. People in Lima of course know that polluted water can lead to disease. But they are impotent to change these conditions: mineral water costs about one dollar a bottle and the price of kerosene to boil the water bought from the tank truck and kept in a drum is simply out of reach.

6. A LOCAL PERSPECTIVE ON A GENERAL PREDICAMENT: WATER IN THE VALLEY OF MEXICO

Mexico City has an official population of 12 million inhabitants although the whole conurbation includes almost 20 million. While slightly surpassed in population only by Tokyo-Yokohama (which by the turn of the century it will surpass), it is by area the second biggest conurbation in the world, just after Los Angeles which has of course a much lower population density. The Mexico City urban stain completely

covers and extends beyond the 1500 km² Federal District in the Southern part of the Valley of Mexico, including portions of the States of Mexico and Hidalgo.

Some 20% of the city dwellers have no access to water, be it because their wells are dry or polluted or because they are not connected to the city's tap water network. For obvious reasons, the same number has no sanitation services, and very few have dry alternatives. Because of wide-spread open-air defecation, Mexico City is a place where one can catch an intestinal disease through his or her respiratory tract.

Within the municipality of Mexico, 86% of the soil is covered by constructions and the asphalt of roads and squares, leaving less than 15% free for the reabsorption of rain water into the subterranean water tables. For the whole of the so called 'Mexico Valley', the proportion of free soil amounts to less than 40%. Though the mountainous basin in which Mexico lies is commonly referred to as the Valle de Mexico, it is not a true valley, because it has no natural outlet (Sahab, 1988; Gonzalez Tascon, 1987).

In all this false valley, water supply and water disposal are said to be 'very critical', because the current demand for water exceeds supplies, requiring the importation of large amounts of water from other river basins. Three geographical areas are of particular importance with regard to water supply use and disposal within the Valley of Mexico:

- The Upper Lerma River Basin

8,640 km², one of the 10 sub-basins of the Lerma River, this exterior basin was the first to be heavily tapped by the capital's utilities. A water-transfer project initiated in 1952 has 234 wells pumping 20 cubic meters per second (experts say: 20 'cumecs') of which 11.7 cumecs (58.5%) are exported to Mexico City via an inter-basin pipeline and open conduits.

- The Valley of Mexico

The Valley itself still provides most of its water to the metropolitan area through a series of well-fields to the North and South of the city. These

well-fields supply 43.5 cumecs or approximately 77% of the 56.5 cumecs used in the metropolitan area. Underground water tables are heavily overstrained by that pumping: of every 10 litres of groundwater pumped for the city's waterworks, only 6 are replenished by the seasonal rains.

- The Tula River Basin

The 12,969 km² Tula River Basin, located in the state of Hidalgo, is approximately 100 km north of Mexico City and is part of the Panuco River watershed with a discharge into the Gulf of Mexico near Tampico. The bulk of the 51.9 cumecs waste water discharge from Mexico City flows into this river's basin through a series of canals, tunnels and deep drains. Waste water discharge includes urban surface runoff (7.5 cumecs), non-urban surface runoff (8.3 cumecs) and urban industrial waste water (36.1 cumecs). The major part of this waste water is directed towards government-established irrigation projects.

The average water consumption is 320 lcd (litres per capita a day), including of course agricultural and industrial water uses. The average population growth rate from 1975 and 1985 was 3.2% yearly (Habitat, 1989 (1)). Further augmentations of the city's water supply will be very expensive.

It was within this context that the city introduced in 1985 its Efficient Water Use Program (Programa de Uso Eficiente del Agua, see: Rubi).

Around the turn of the century, a tunnel was bored through the mountains separating the basin of Mexico from the valley of the Mezquital in the Tula River Basin. Initially designed to carry away the rain waters that could no longer be absorbed by macadammed urban ground, the canal quickly also became a convenient outlet for some of the city sewers. In negotiations with the horticulturists of the Mezquital - who grow part of the vegetables sold in the city markets - sewage treatment plants were to transform sludge into innocuous - and even fertilizing - irrigation water. By now, however, the canal has become a huge sewer draining a mixture of untreated city excrement, heavy metals and detergents down to the Mezquital valley where this mixture irrigates gardens and fields.

However, in 1992, due to the incipient cholera epidemic, the Mexican government prohibited the sale of vegetables grown on fields irrigated with sewage water, threatening the very existence of peri-urban cultivators in the Mezquital valley and elsewhere.

South of Mexico City, Xochimilco is the last sanctuary of Aztec gardening on soil moistened by capillary water from lagoons and canals. The *chinampas*, Xochimilco's 'floating islands', are in reality much more than a tourist attraction. They are the last surviving remains of an intensive mode of cultivation that was specifically urban and would for that reason deserve the name urbiculture. The last *chinamperos* or 'urbiculturists' can trace their lineage back to Moctezuma's times, when the big lake of Texcoco - which had no effluent - was divided by a dike into a salty lagoon from which water evaporated and, at a slightly higher level, a sweet water lake that irrigated the chinampas.

Xochimilco is also a place known for its freshwater springs. However, most of the fresh water spouting from these springs has been requisitioned by the city authorities and channeled to the tap water distribution system. Like in the Mezquital, cultivators were given 'in exchange' poorly treated sewage water. Their existence is now under the threat of the new sanitation measures justified by the spread of the cholera epidemic.

Most of Mexico City is built on the ground of the former lake bed. Its soil is therefore constituted by the alluvions deposited through the millennia by rains and seasonal streams. Often called *jaboncillo*, it is a spongy mixture of clay and sand whose consistency and mechanical resistance depend on the presence of a great proportion of capillary water. Excessive pumping has lowered the water tables, causing the *jaboncillo* to dry and lose its resistance. As a result, many buildings have sunk several yards into the ground, while most have lost their plumb.

Overpumping has also had other, socio-anthropological, consequences. In a radius of one hundred miles around Mexico are to be found several indigenous communities of *nahuas*, *otomis* and *mazahuas* living their traditional village life. However, for many years they have

reported that their wells - because of the general lowering of the water tables as well as local pumping - have been drying out. Men increasingly expatriate themselves to urban areas in Mexico or the U.S. and their wives are engrossed into the ranks of the so called 'Marías', women of indigenous origin subsisting with their children on petty street trades (Lomnitz, 1973, 1984).

Most of Mexico City's sewers have been damaged by the frequent earthquakes and therefore leak sludge into the soil. Consequently, the city's superficial water tables have been deemed unfit as sources of drinking water, obliging the water utilities to tap ground water at increasing depths.

The still wide-spread domestic septic tanks - most of the time without convenient drain fields - are no longer emptied with regularity, and the once thriving small enterprises that pumped and processed sludge for a price are almost all out of business. The domestic treatment of used water is deemed inefficient, dangerous and a major cause of soil pollution by a city Council which is about to prohibit it.

For all these reasons and more, the authorities now feel that the limits of possible tolerance for the old network's failures have been reached.

The cries of the day are: "One solution to mass failures!", "... consistent with inevitable progress", "... a modern industrial response to an old predicament", in short: "Sewer up!". The new deep sewage under construction (Ortega Hernandez, 1989, p. 73) has sections so wide that the subway could fit in it. At the other end of the system, the same style of thought prevails: put super-pumps to lift water from lakes hundred miles away and thousands of feet below to the highland city! Just one of these pumping plants, which brings water to Mexico from the Lake of Valle de Bravo, costs every day as many megawatt hours as the night illumination of a city of one million.

The recipe is as expensive as it is unimaginative: pump water from wherever it is still reasonably fresh and in great supply. Dump sludge as far as possible from the noses of city dwellers. Megapumps and megasewers for a megalopolis and between them: megadistances! Are there no other ways to think about water, people and waste?

As a matter of introduction to our theme, I have presented you with a short 'sanitary résumé' of our city, Mexico. My aim is not to make you familiar with all the details of our predicaments, but to provide a concrete basis of comparison for the discussion of water- and sanitation-related issues and of their multidimensional consequences.

Though with different shades, the conclusion of our story must not be quite unfamiliar to you. The same recipe (huge pumps + huge sewers + huge distances between 'source' and drain field) is repeated throughout the world. From Bombay to Manila, Djakarta to Lagos and Dakar to Rio, governments, faced with the increase of water demands, polluted water tables and soils, and decaying sanitary conditions, tend to curb the failures of old systems by a flight into technological gigantism. Yet, in spite of skyrocketing costs and technological sophistication, Super Pump and Big Sewer do mainly three things:

- they blur natural watersheds;
- they dump sludge far from sources and delicate noses (but not from rural communities and everyone's food sources);
- they dilute poisons under the false assumption that "ultimate dilution will lessen pollution" (Warshall, 1980).

Basin-inconsistent water policies make the crucial issues of limits and scale seem irrelevant. Distant dumping makes us blind to the consequences of our daily acts, destroying the possibility of local controls, while there is asbestos in the air we breathe, diluted fluorine and chlorine in the water we drink and heavy metals in our bones.

7. CONCLUSIONS

Water is one of the scenarios in which the negative consequences of the technical transformation of the matrix of soil, water and air - superficially and in-depth - acquire the dimensions of a life and death drama.

On the other hand, modernity is characterized by a growing differentiation of the peculiar disciplines dealing with water. This

'specialization', with respect to the 'wholeness' of water, is not only inappropriate but extremely dangerous. The ubiquity of water in all living bodies makes of it a 'whole phenomenon' before which the divisions of sciences and techniques can only lead to its catastrophic atomization. Even inter-disciplinarity must be criticized, because it does not lead to a whole view but only to an addition of scientific specialties.

7.1. A CONCEPT OF WATER

I will allow the distinction between gratuitous water and scarce water to structure our study. Never shall I propose to make gratuitous water 'economic'. On the contrary, I shall examine the conditions under which a fair share of water can remain free, that is, free-flowing and gratuitous.

The understanding that the words economic and scarce are practically synonymous is only obscured by current economic prejudices. In contrast with the vulgarizers of economic 'pop science' (Fleck, 1979), professional economists generally acknowledge that synonymity from the first chapters of their treatises (Dumouchel, 1979).

We must understand that:

- free access to gratuitous water is a fundamentally different kind of right than 'a just share of scarce water';
- free or gratuitous water is local water.

Much of our water-related 'problems' are obviously man-made. They are the consequence of attitudes toward water that are both blind and reckless. The conflicts that arise from that blindness and that recklessness repeatedly oppose industry to people, cities to the countryside, the administration to the citizen. The root of these conflicts may lie in the demise of traditional water rights in the name of rights to water that negate people's fundamental right to conclude agreements about the water of the place they call home.

CHAPTER 2

FOR A CULTURAL HISTORY OF WATER

1. WATER AND THE MAKING OF PLACES

1.1. THE IMAGINATION OF WATER

To speak of water historically is to speak of the history of places. The imagination that shapes living places is not different from the imagination of water. Many cultures bespeak of a dwelling place as a matrix of soil and water, of air and water, of moisture and dryness, or of freshness and heat.

The French philosopher Gaston Bachelard took the correspondence between water and place very seriously. According to Bachelard, water, which is imagined differently in every different place, bears the seal of the way matter in general is imagined. This 'imagination of matter' is historical: different epochs have different ways of imagining matter. Yet this historical imagination is endowed with a true 'stuff-shaping' force: every historical period truly shapes matter by the way it imagines it. It would be a mistake to say that matter is mute in itself and only comes to cultural significance by receiving a form. We would be far from the truth assuming that an epoch's imagination only dresses matter in clothes - or forms - corresponding to its style. There is no mute, universal matter upon which every time and every culture would project its fantasies like changeable garments.

Bachelard ascribed such a genuineness to the imagination of matter that he allowed it to engender substance, that is, not only the form but the 'stuff' of things. Again and again he stressed the complementary relationship between the historicity of 'stuff' and the forms it takes in different times. For him, imagination has two aspects: a formal one and a material one. The form and the 'stuff' of our representations cannot be separated, for one cannot exist without the other (Duden, 1987, p. 18; van den Berg, 1974).

Thinking of Bachelard's sense of matter, Illich writes:

But the fact that we cannot separate our experience of passion from the element of fire and cannot imagine fire without passion in no way implies that the two are at all times perceived as versions of the same principle. Love, the hearth, rage, war and passion are kindled. They are set aflame by contact with a 'stuff' that is imagined as fire. (Illich, 1985, p. 6)

The same could be affirmed of the relation between freshness and water; we can hardly separate our experience of freshness from the element of water, and cannot imagine water without evoking its freshness. A place's unique style is a matrix of imagined freshness and heat, passion and peacefulness that cannot be unlinked from that place's elementary material powers, that is, from its inhabitants' imagination of matter in general, and particularly of water.

According to Bachelard, the liveness of our imagination of matter can be strengthened by the knowledge of the depth of one particular element. This element, for the first cities along the Jordan, the Nile or other culture-giving rivers, was water. Water gave their dwellers' imagination its 'fundamental color'.

Bachelard's own imagination of matter was also colored by his knowledge of water. He was born in a section of Champagne noted for its streams, its rivers and its valleys - in Vallage, so called because it has so many valleys. Thus, his preferred image for matter was flowing water. He never saw water as the ocean's surface, which evokes an infinite extension, but as the stream of rivers or the flow spurting from a deep underground spring, "... for, in my own reverie, it is not infinity that I find in water, but depth" (Bachelard, 1983).

Water surging from the depth was, for Bachelard, the carrier of remembrance. It first reminded him of Vallage - home - where matter is never abstract, but always embodied in a matrix of soil, water, air, and for Bachelard, stone and light:

But the region we call home is less expanse than matter; it is granite or soil, wind or dryness, water or light. It is in it that we

materialize our reveries, through it that our dream seizes upon its true substance. From it we solicit our fundamental color. Dreaming by the river, I dedicated my imagination to water, to clear, green water, the water that makes the meadow green. I cannot sit aside a stream without falling into a profound reverie, without picturing my youthful happiness...It does not have to be the stream at home, water from home. The same memory flows from all fountains." (Bachelard, 1983, p. 8)

Lest we reduce water to its sheer technical and scientific functionality - to H₂O - we must take our own culture's imagination of water seriously, because it contributed to shape the places where we live. Ivan Illich writes:

The time has come for historians to begin listening to 'the sonority of these dormant waters' (Bachelard), to become sensitive to the history of matter...Following dream water upstream, the historian will learn to distinguish the vast register of their voices. As his ear is attuned to the music of deep waters, he will hear a discordant sound that is foreign to waters, that reverberates through the plumbing of modern cities. He will recognize that the H₂O which gurgles through Dallas plumbing is not water, but a stuff which industrial society creates. He will realize that the twentieth century has transmogrified water into a fluid with which archetypal waters cannot be mixed. (Illich, 1985, p.7)

1.2. WHAT TO EXPECT FROM HISTORY?

History should not be an attempt to reconstruct the past out of the junkyards of time: such 'reconstructions' often say more about the prejudices of their makers than about the dead supposed to have inhabited them. True history implies an attempt to recover some feeling of past perceptions (Corbin, 1982). It is also an invitation to look at ourselves and at our perceptions in the mirror of the past (Illich, 1992). In this mirror, water that does not flow freely but runs in pipes, and is eventually 'produced' in treatment or recycling plants, is a strange kind of stuff.

1.2.1. REFLECTING ON SOIL AND WATER

The most modern of our contemporaries do not live any more in unique places but occupy locations in space. They have lost their homes, and some (post)modern philosophers consider that in a world living 'after virtue', coping with that loss is all that is left to righteous men. 'Ontheërnding' - de-homing - is, according to the Dutch philosopher Eric Bolle, the sign of the 'post-virtuous' man (Bolle, 1992).

Little impressed by post-modern lingo, a group of free intellectuals and philosophers gathered in Germany not long ago to examine the conditions of a philosophical reflection that would build on the soil - the local soil from which our forebears ate, and to which we will bequest our rests (Groeneveld and friends, 1991). The spread of modernity is the spread of a place-less and soil-less civilization. It is also the spread of a civilization that has lost the sense of free, flowing, sparkling water.

1.2.2. MODERNITY IN THE MIRROR OF THE WATERS OF THE PAST

What makes modern, 'western' water different from the waters of the past?

We say that we 'consume' water and make statistics about aggregated 'water consumption', using a word meaning 'to do away with completely, as by fire'. Literally, we 'burn' fresh water, giving it back as liquid ashes in need of treatments. As a writer who is also a philosopher said, these treatments never give it back its freshness. "Treated waters are never fresher than tears" (Muschg, 1992), and tears often burn.

Our perception of water as a scarce good, the practices that stem from this perception, the individual 'needs' and the systemic 'requirements' calling for ever more water, the engineering works reputed to meet these needs and match these requirements, all this speaks of an unprecedented break with the past.

Water has become scarce because every cubic yard forced to run into a pipe is the guarantee that at the end of the pipe, the want for more

water will grow endlessly. Pipes call for more pipes, in a never ending spiral. This is why water, no more limited then it ever was, has never been so scarce.

Can we understand times when water, in limited supply as it was, was not a scarce good, and hence not 'consumed' as an economic object? This is the challenge of studies on the history of water.

Scarcity, the characteristic of modern water, makes of it a very specific matter. We should bring home into a 'history of stuff' the intuition that Louis Dumont among others has illustrated in more ideological terms: there is a specificity of modernity that makes it not only different from past epochs but radically 'other' (Dumont, 1983). Mirrored in the waters of the past, modernity is 'strange' because its imagination of water is very uncommon.

People who still have a foothold in their traditions - and because they cannot be mobilized without restrictions are termed 'backward' by developers - can still perceive that strangeness of modernity. They perceive it, for instance, in the foolishness of modern water development projects that, in the words of a World Bank drop-out, only dam valleys to damn people.

The first thing a historian has to do before heading to the past is to open himself to a sense of estrangement toward his time's certainties (Illich, 1985, p. 18, 19). Let's have a closer look at the strangeness of 'modern water'.

1.2.3. H₂O VS WATER

Pushed through megayards of pipes, most of the water that modern man uses and 'consumes' is not less an industrial product than antibiotics, cement or gasoline. To distinguish it from what all cultures define in different ways as water, let's call it H₂O, as it is 'water' reduced to its chemical formula.

H₂O and water are very different substances. Every language has a word that bespeaks the quenching of thirst, purity, the cleansing of

bodies and souls, or the streams that carry away the dead's voices and sometimes whisper them back to poets (Illich, 1985). In English, this word is 'water'.

H₂O can be produced from the content of underground water tables, lakes, rivers or wells, but also out of the sludge of the next city upstream or by desalinating sea water. Not long ago, the authorities of Dallas, Texas issued a project intended to be "morally uplifting to the civic life". The project consisted of making a mid-city lake out of recycled toilet flush (Illich, 1985, p.1).

The longer the pipes, the more indifferent tap water becomes to its origin or its 'source'. A liquid that evokes no springs, no sparkling or dormant waters, that doesn't fall from the sky nor spout from the soil is, literally, source-less. It is source-less as modern cities are soil-less. Such a fluid, which doesn't run in cascades nor gush from the depth of the earth, hardly deserves the name water. Reduced to its scientific and technical function, it escapes the imagination of matter, which is impotent to give it a form.

Piped H₂O is indifferent to the matrix of soil, water and air that make a place unique. It does not evoke freshness, nor depth. For the network that distributes it, all places are reduced to space determinations. Water is no longer a determinant of here-ness, that is of this place's unique climate. Its voices deadened by miles of pipes, H₂O from the faucet is mostly dead water.

Yet the difference between living and dead water, which every traditional culture expressed in language and gestures, is blurred by the belief that since water and H₂O can match identical systemic requirements they can fulfill the same desires. The perception of what makes water different from H₂O is fading away at the pace of modernization. Today in the West, the airy or earthy qualities of water that falls in cascades or surges from a fresh forest are at best sale pitches for bottled spring water. The two 'i's by which chemists define H₂O - inodorous and insipid - are becoming the criteria to judge the quality, not only of H₂O in the lab, but of water at home. Since chemistry can cleanse the foulest moistures of any scent and taste,

such 'water' can be gained even from sewers: modern noses have become numb to the inodorous stench of piped water.

One of the goals of this study is to recover the sense and with it the fragrance and taste of water. The less industrialized or 'modernized' a culture, the more its sense of the liveliness of water is still alive. However, for economists and developers, the perception that H₂O cannot indefinitely substitute for water is a symptom of backwardness. It is dismissed together with all forms of resistance which are inspired by this perception. People's reluctance to see their wells tapped for the neighboring city, or to accept treated sludge in exchange for the river that irrigated their fields, are not seen for what they are: the last front of people's moral economy (Thompson, 1966) against official arrogance.

This study aims at supporting their resistance and giving them conceptual and technical weapons, as well as making their respective struggles mutually known among them.

1.2.4. THE TWO TASKS OF THE WATER HISTORIAN

The historian who wants to support that resistance by a work of clarification is faced with two contradictory tasks. No one has understood the difference and at the same time the necessary articulation between these tasks better than Barbara Duden. She is a 'body-historian': she studies the historicity of body perceptions such as Bachelard studied the historicity of water and the other material elements. Duden describes the double task of the historian of body perceptions who on the one hand must retrace the genesis of the modern, anatomic and hygienic body whose interior is made transparent by visualization techniques and, on the other, recover a feeling of that 'darkness under the skin' which characterized premodern body-perceptions. In the following passages, I have paraphrased Duden's work substituting the word 'water' for the word 'body' - for the historian of water must make a similar distinction between fore- and hindsight.

The study of the sociogenesis of modern water (H₂O) and the study of past worlds' specific perception of water can be

construed as two different tasks. Though both these aspects of the history of water are intimately related, such a distinction methodologically makes sense. Indeed, the conditions for the fundamental axioms of the modern conception of water - as H_2O - to exist only started hesitantly to take shape during the second half of the 18th century. For sure that in Descartes' France, or in England at Harvey's time, there were already indications that water could become the object of frantic piping that it became in the 19th century. But even for such an audacious researcher as Harvey [who invented the concept of circulation that became paradigmatic not only for blood, but also for water], these indications were sheer speculations... He or she who is interested in the genesis of H_2O - a chemical for which I 'know' that I have quantifiable needs, which is provided to me in pipes and evacuated in sewers - will study the history of a slowly unfolding certainty.

On the contrary, the historian who wants to deal with the waters of past epochs faces a fluid magma of images, *topoi* and themes that conserve themselves over centuries, seem to intermingle and appear again, surprisingly, under their old color. It is not easy for this historian to tune his or her instrument with an object which is wrongly taken for a-temporal and a-historical: water. (inspired by Duden, 1987, pp. 12, 13)

We will start with the first task suggested by Barbara Duden: The study of the sociogenesis of modern water - how water became H_2O . We will not concentrate on the labs and the offices where the scientific concept took shape, but rather on the changes of habits through which H_2O became an emblem for water that can be drunk, that washes and that carries away waste.

2. FIRST TASK: STUDY OF THE SOCIOGENESIS OF MODERN WATER

2.1. THE PREHISTORY OF A CONCEPT AND OF A PERCEPT

The internalization of H_2O into commonly perceived water has a prehistory in which Harvey's ideas, Lavoisier's experiments on the

conservation of matter and Dalton's atomic theory are steps toward the construction of a scientific concept. It is not the construction of that concept, but the genesis of the percept that interests us here. A scientific concept is limited to the field within which it is valid: the scientific concept of H₂O to chemistry, for instance. A percept is a complex construction of images or *topoi* joined by association. A prehistory of 'H₂O' as a percept would trace back the different notions around which the modern perception of water coalesced.

One of these notions is circulation. The idea that blood moves following a cycle after whose completion it is equal to itself is ascribed to William Harvey, 'the discoverer of blood circulation' (Harvey, 1628) though several studies have shown that this was not quite what he meant (van den Berg, 1959, p. 30 ff.). Yet the public perception of Harvey's concept established circulation as the paradigm of matter covering a cycle at the end of which it reappears, unchanged from its initial state. It was not long before this concept was applied to money, to ideas, to the transport of people, in fact to about everything that moved. In the end of the 18th century, it was applied to water, and with it the history of modern water proper - scarce and piped water - begins. The so-called 'sanitary revolution' is the practical outcome of the application to water of the concept of circulation.

We will document that history with examples from England and from the United States. In England, the promoters of large scale water circulation schemes were prone to expose their ideas before learned publics. They therefore project precious light into the history of the ideas underlying the sanitary revolution.

American promoters were in general practical inventors, industrialists and social reformers. American examples best illustrate how 'sanitation' did not become generally available and then mandatory before an industrial sanitary lobby was established.

2.2. THE 'SANITARIAN REVOLUTION' IN ENGLAND

One man did more than anyone else to promote sanitation - even coining the term - in England. His name was Edwin Chadwick. He

defined himself as a disciple of "the divine Harvey" and of Jeremy Bentham, the father of utilitarianism. That is to say that Harvey's concept of 'sanitation' is at the confluence of the idea of circulation and of the search for 'the greatest happiness for the greatest possible number' which is the essence of Benthamite utilitarianism.

Bentham was looking for the nation's hedonimeter, by which he meant the indicator of its greatest possible happiness. Chadwick believed he had found this indicator in Harvey's concept of circulation. Sanitation was for him water put into pipes for the greatest number's happiness: the state of waterworks and sewers was a city's hedonimeter, or 'happymeter'.

According to his biographer, Benjamin Ward Richardson, Chadwick was a man "...who, born with the century and living through it till its near end, was one of the most industrious and observing students of 'the very age and body of the time, his form and pressure...'" (Richardson, 1965, pp. viii).

Richardson knew Chadwick since "the early days of the Epidemiological Society, about the year 1853..." (ibid. p. xv) (Corbin, 1978). Neologisms - most of them coined by Chadwick - slip into his account of his friend's life:

In the first days of our friendship, sanitarians were struggling to make their labours known, and as the great work on *The Sanitary Condition of the Labouring Classes*, written by my friend not many years before, was the standard work in sanitary science, we younger men looked towards him with much admiration... (ibid. p. xv, xvi)

Unlike Latrobe, the American pioneer, Chadwick did not himself implement the works he was proposing. These were carried out in part against their spiritual father's advice; Chadwick was an advocate of the separation of storm water and waste water, but the London sewer whose construction he had suggested mixed them.

Chadwick was born in Longsight, near Manchester, on 24 January 1800. He met Bentham when the latter was 82 years old.

Bentham recognized in Edwin Chadwick a new disciple, who might well be trusted to deal with his own cherished idea of fifty years, that the whole worthy work of the legislator is to enable people to live happily; and Chadwick responded in principle, if not in detail, to a rule of right so congenial to his own sanitary conception. (Ibid. p. xxviii)

Through Chadwick, Benthamite utilitarianism was thus allowed to engender the sanitary revolution. Later in life, Chadwick became president of the Section of Economics and Statistics at Cambridge, where he taught sanitary economics (sic, *ibid.* p. xix). In *The Health of Nations*, a work on Chadwick written by Richardson when the former was 87 years old, we read the following explanation of the sanitary revolution:

[Sanitarians] introduced a new order of service into the public service. They taught leading men who were not practical - if we like to compliment them by saying so - to discover what principles of improvements were really wanted; and they called upon smaller men to supply the details. In time both were influenced. The leading men found, in the pursuits suggested, wide scope for their powers; while the small men, seeing a demand for services which were remunerative as well as useful, fell into the pursuit in unexpected numbers.

So Sanitation, the once despised, as a political and economical department, grew and flourished, until it became, as we see it in these days, a science, a hobby (sic!), and a trade. (*Ibid.* p. 82)

Embodied in sanitation, utilitarianism became the panacea for all social evils, since it eliminated miasms, cured idleness, opened new pursuits to great and small men and made the happiness of all. In a concoction of his own, Benjamin Richardson summed up his master's ideas in a sanitarian utopia that he called *Hygiea* (Richardson, 1876). It was the object of an address before the Health Department of the Social Sciences Congress in October 1875. Richardson said:

From this vantage-ground we gather the fact, that onward with the simple progress of true civilization the value of life (sic) has

increased. Ere yet the words 'Sanitary Science' had been written; ere yet the heralds of that science (some of whom, in the persons of our illustrious colleagues, Edwin Chadwick and William Farr, are with us in this place at this moment), ere yet these heralds had summoned the world to answer for its profligacy of life, the health and strength of mankind was undergoing improvements (ibid. pp. 11, 12).

In Richardson's utopia, the greatest happiness became the least mortality: "I have projected a city that shall show the lowest mortality..." (ibid. pp.17,18).

2.3. THE ADVENT OF INDOOR PLUMBING IN THE UNITED STATES

For this section I am particularly indebted to Susan Strasser. The fifth chapter of her book *Never Done. History of American Housework* (New York: Pantheon, 1982) is titled "Fetch a Pail of Water", and fits so well into this historical overview, that I have taken the liberty to paraphrase and quote from it extensively in the remainder of this section. My deep gratitude and admiration are offered to Dr Strasser for the contribution made to our understanding of water by her book, which I recommend highly.

Indoor plumbing accomplished basic chores that burdened nearly every household task: lugging fresh water into the house and carrying dirty water and liquid refuse out of it. As with gas and electricity, public services came to substitute for private labor. The rich got the service before the poor, the city dweller before the farmer, but at the end consumption replaced everywhere productive labor.

Nevertheless, poor women continued to haul water from urban street hydrants as everyone had hauled it for centuries from streams and creeks. In spite of the 'sanitary revolution' of the 19th Century, they did it well into the twentieth. Before becoming everyone's obligatory package, modern sanitation was an idea, a model. For instance, the bathroom in George Vanderbilt's Fifth Avenue house built in 1885 anticipated the bathroom design that was to become standard during the twentieth century.

2.3.1. CONSERVATION

Before indoor plumbing, most women hauled every drop of water they used for cooking, dishwashing, bathing themselves and their families, laundry, and house cleaning. After using it, they hauled it back outside the house, not necessarily going as far as they had come from the well, the spring, the creek or the urban hydrant or pump. Conservation was the order of the day: Catharine Beecher, a reformer of the 'Progressive Era', advised women to use the entire series of water over and over.

2.3.2. ...AND ITS DEMISE

Water conservation was a casualty of indoor plumbing; it began to subside as soon as running water became available in great quantities. In matter of sanitation, Philadelphia set a precedent that was to be followed by every American city. In 1823, the city completed waterworks begun at the end of the preceding century. As in the original project by Latrobe, these waterworks were financed by private subscribers. Water consumption per subscriber doubled between 1823 and 1837 and again by 1850. Not only did absolute consumption grow; habits were changing, allowing much more waste:

Women without faucets in their houses reused their dishwater. Indoor water allowed them to wash more dishes at once, fill the dish pans deeper, add more hot water as the dishwater cooled, and even let water go down the drain unused. As women learned to use more water, they also began to waste it (Strasser, 1982).

Frequent indoor baths became possible. At best a Saturday-night luxury of well-to-do families - with recycled bath water for most family members - throughout the 19th Century, immersion baths became available with running water in quantities sufficient to fill adult-sized tubs without breaking backs (Strasser, 1982).

2.3.3. A MATTER OF PUBLIC POLICY

People who wanted to take tub baths in their homes could not simply go out and buy running water. Unlike prepared food or new utensils,

indoor plumbing was a matter of public policy as well as private production and consumption: even the urban elite needed large waterworks systems.

Nevertheless, these municipal systems owed their existence more to pressing public health concerns than to expressed consumers' needs (Bradshaw, 1975), and this pattern will repeat itself in all American and European cities. The 'sanitarian revolution' was much more the deed of crusaders for hygiene and longevity (Richardson, 1876) than an answer to public demands.

2.3.4. LATROBE, THE PIONEER

Philadelphia pioneered public waterworks in the United States and in the world. The idea to bring piped water to every home was formulated by social reformers after a massive yellow fever epidemic raged throughout the 1790s.

Benjamin Latrobe, who was to become the designer of Philadelphia's and later several other cities' waterworks, is usually considered the first professional architect in the United States. His biographer insists that he brought to the task a set of skills far beyond architecture, for designing the waterworks presented new technological and organizational problems (Fitch 1966, quoted in Stasser, 1982). Latrobe, for whose work there were no precedents or models, invented a concept for a new urban industrial society. This concept's basis was to withdraw water from the Schuylkill River by means of a steam pump and to bring it through wooden pipes to the subscribers' homes and to street hydrants. It was Latrobe who proposed the private subscription plan. He wrongly believed that construction and operation costs could be met by charges to businesses and households directly connected to the system. In fact, the project had little success. In 1811, ten years after the system had been opened, only 2,127 Philadelphians had subscribed. Most of the city's 54,000 residents continued to draw water from private wells or take it from the system's street hydrants without paying.

The first modern urban waterworks was thus running heavy deficits, and Latrobe would have failed were it not for the sudden support of the

city's bourgeois elite for whom the project rang a bell in tune with their hygienic prejudices (Corbin, 1982). They ultimately covered Latrobe's deficit and even financed improved works - with a dam across the Schuylkill, water-powered pumps, hilltop reservoirs, a gravity-fed system, surplus capacity for growth, and grounds laid out as the first large urban park in America - fostering eventual financial success and more widespread use of public water by 1837.

A new concept of public water had thus been invented. It rapidly became "...the system that was to make possible the expansion of industrial cities" (Strasser, 1982).

First big cities like New York, then medium-sized and small cities, followed the lead of Philadelphia. By the time of the Civil War, 136 cities - probably all towns with populations greater than 10,000 - had some kind of public waterworks. Prairie towns simply dug town wells near rivers and hired tank wagons to haul the water around town, filling private barrels; eventually, they dug hilltop reservoirs or mounted supply tanks in high places to send water through pipes by gravity. By the end of the century, another 3,060 towns had established water systems.

2.3.5. PIPED FRESHWATER GENERATES UNPIPED WASTE WATERS

A structural feature of that epoch can still be observed in many countries today - the establishment of a tap water network before and independently of the establishment of a sewerage. Boston reformer Edward Atkinson already complained about that habit. Progress in sewage disposal and drainage, he wrote, "...has not kept pace with this more abundant supply of water" (Atkinson, 1892, quoted in Strasser, 1982).

Had he said instead "never keeps pace with the supply of water" he would have formulated a 'law' that still verifies itself today. Indoor water - because it calls for indoor sanitation - almost inevitably generates 'wild' waste water. But cities are not as quick to make strides in drainage and sewage disposal as they are in their water supply efforts. For instance, in 1855, more than a half-century after the Latrobe

waterworks inaugurated public water supply, Chicago began to design "the first comprehensive sewerage project of the country", but did not install the first sewer until nine years later. In 1866, only one-eighth of the city had sewers. Although the tunnel system emptied thirty feet below lake level, water contamination plagued it from the start.

Usually administered separately from water systems, sewage disposal lagged behind water provision throughout the century in towns of all sizes, until the efforts of public health reformers inaugurated a new era of sanitation. This was a new deal for managers and industrialists.

2.3.6. THE SANITARIAN CRUSADE

The end of the 19th century has been termed 'the Progressive Era'. It was a period of reforms passed under the pressure of 'urgent public health concerns' that generated a demand for public waterworks. The sewer became a recognized municipal concern, worthy of significant monetary appropriations; about one-third of Boston's total city budget in the last third of the century, for example, went to sanitation projects.

Private entrepreneurs capitalized on administrative failures and public fears with a variety of 'services' and planning tricks. For instance, speculators and subdividers of Boston's suburbs extended the provision of sanitary services to the middle classes, grading streets so that the city would do the initial sewer work before the subdividers erected the houses: private 'services' offered at the municipality's costs.

But most people still did not have access to the new "invisible network" (Waring, 1911). Women carried liquid refuse outside - dirty dishwater, cooking slops, and, of course, the contents of chamber pots, "the most disagreeable item in domestic labor", according to Catharine Beecher (Strasser, 1982, p. 95). At the beginning of the Civil War toilets and bathtubs were still luxury items; city water departments charged extra for them, above the normal water rate. Most people still used outdoor privies, said to cause "terrible physical irregularity", since people, especially women, "deferred their visit to the privy until compelled by unbearable physical discomfort, and allowed themselves to be so constipated that days and sometimes weeks would pass between stools" (Strasser, *ibid.*).

Robert and Helen Merrell Lynd, the sociologists whose seminal study of "Middletown" (Muncie, Indiana) set the standard for community studies, maintain that in 1890 only about one-eighth to one-sixth of Muncie's families "had even the crudest running water - a hydrant in the yard or a faucet at the iron sink For the most part, Middletown pumped its water to the back door or kitchen from a well or cistern. By 1890 there were not over two dozen complete bathrooms in the entire city" (Lynd, 1929).

Plumbing was only slightly more common in larger cities. The United States Commissioner of Labor's 1893 report found that 53 percent of New York's families, 70% of Philadelphia's, 73% of Chicago's, and 88% of Baltimore's had access only to an outside privy.

The major 'achievement' of the Progressive Era was not plumbing for the wealthy (who already had it) nor the poor (who had none until long after 1900) but in the changing of the middle-class concept of minimal equipment as plumbing became affordable. It constituted the establishment of a sanitary standard, as well as the concept of a normal and convenient life, so to speak a model of "domestic normalcy, conveniency and efficiency" (Strasser, 1982).

By the beginning of the 20th century, indoor water closets and kitchens with sinks, already a "minimal standard for a decent, normal life" to the middle-class social workers who lobbied for them, were still luxuries to urban industrial workers and to most rural people. Social workers trooped into the homes of the working class and the dependent poor to study their 'living conditions' and 'standards of living', hoping to discover a way to extirpate the vermin and the overcrowding that most of them understood as the seamy side of American capitalism. In their professional meetings, they shared their findings of "how the other half live", in the words of that epoch's most influential urban reformer, Jacob Riis (Strasser, 1982, p. 100).

Only by 1919 did middle-class expectations extend even to the dependent poor. Plumbing fixtures, once a matter of expensive craft, had become the staple of a new industrial giant and could reach further and further down the income scale. By 1925, only 7% of the small earners studied by the Chicago Department of Public Welfare still had

to go outside to use the toilet. The 'sanitary revolution' had taken place. Like food and energy, water had become a purchased commodity, controlled by municipal decisions and those of the manufacturers who produced plumbing parts on a mass scale.

The completion of the 'sanitary revolution' in the United States can be summarized in three main epochs or phases:

- A first epoch in which the systemic logics of plumbing (like the railroad's, see Schivelbusch, 1980) is discovered.
- A second epoch in which handicrafts provide the first commercial fixtures and in which wet sanitation becomes a major health hazard in urban areas. The pressure of epidemics inspires sewer projects.
- A third phase during which the industrialization of sanitary fixtures and progressive reforms make wet sanitation both available and mandatory.

3. SECOND TASK: DEALING WITH THE WATERS OF THE PAST

3.1. WATER AND ITS CULTURAL MATRIX, CULTURE AND ITS 'WATER MATRIX'

3.1.1. WATER AND THE WAYS OF CULTURES

Water traces the ways of culture; culture, at least urban culture, follows water. Through coming to terms with water - tanking, conserving, distributing, but also fighting it - people learned how to organize social space. Water rights are at the origin of civilization. Rivers and wells were the great educators of the first law makers.

From the dependence on water flourished an incipient independence toward nature, seasons, destiny and hazard. Through water, man found his own time, and his own measure.

Water required a strict order, but it did not allow a central power without the responsible involvement of all (Wittfogel, 1981; Palerm, 1990). He who wanted protection from water had to protect water for

all. The equality, for which water has a physical inclination, is somehow akin to the equity that it favored socially. In the 5th century before Christ, the Greek invented a social order theoretically based on an equal rule for all. They called it *isonomía*, submission to the same rule, which - despite all modern nostalgic coopting of 'Greek democracy' - they preferred to that of *démokratía*. Since they favored it, water rights were the early embryo of democracy. For as nobody can dominate water without at the same time serving it, its domestication was a *communitary achievement* (Muschg, 1992, p.28). The 'ways of water' were, in the words of writer Adolf Muschg, the first model of political equality.

COMMUNITIES AND THE 'WAYS OF WATER'

The existence of 'a community' should never be taken for granted. A community is not a timeless subject nor an abstract 'body social'. It is always community in the making or it is not. If it does not make and remake itself, it perishes. The body around which policy makers and water-experts wrap the cloth of 'supplied services' and 'met needs' is too often a dying body.

Throughout history, water has been the great maker of communities. Again and again, people of several origins sharing the same wells or cohabitating along the same river came to terms (Sahlins, 1972), and by that act laid the basis of a community. By settling the boundaries of the mutual water rights of the ones living up the river and the ones drinking its waters downstream, the ones washing their clothes on the right shore and the ones bathing on the left, those who used the common well as a horse pond and those who irrigated their plots from it, custom made the bed of politics and law.

Water is the substance of original community ties; the more limited it is, the tighter the ties. It is the true blood of the Sahel's Peuhl tribes, which gather once a year around salty ponds and endlessly dance, sing and chatter, until their flocks are satiated, their youth married and their old agreements confirmed. The 'water rights' of people living along the Nile or between the Tigris and the Euphrat are perhaps the oldest testimonies of political thought.

Water faced people with life and death questions of equity, distributive justice, and last but not least of inalienable rights of access to springs, wells, and lake and river shores. In the order of priorities, rights of access were 'upstream' in relation to others. Questions of justice and distribution made sense only as long as water was personified in the concrete places where it spurted from the soil or the mountain canyon, and - before all distributive justice - custom and common law protected the weakest's liberty of access to these spots. The oldest formulations of the commons concerned access to wells and springs. By a strange symmetry, the last ones deal with the right of access to shores (Hardin, 1977).

The ancient Greek language allowed many distinctions of scale to be made, each associated with a typical substance whose smell or taste defined the intimate belonging to a community. For instance, the inhabitants of a house or *oikos* often called themselves *homokapoi* - from *homos*, the same, and *kapnos*, smoke - because squatting around the same hearth, they breathed the same smoke (Vernant, 1963, p.27). Every house was recognizable by its smelly aura, the unique mixture of fragrances and stench that made it different from the neighbor's, so those who shared the same smoke were also those whose clothes were impregnated by the same scents (Corbin, 1982). Between the *oikos*, the domestic community, and the *politeia*, the body of all citizens, there was the intermediary domain of those who shared the same water. These '*homohydrot*' - from *homos*, same or common, and *hydōr*, water - met at the quarter's wells, fountains and public washing-places. Balancing the 'men's club' of Greek democracy (Loraux, 1986), these places were the centers of a feminine counterpower which awoke awe in men (Illich, 1982). In this domain of shared water, householders had to come to terms under the eyes of women who sanctioned transgressions and the breach of agreements; Aristophane's comedies are full of their vengeful jokes.

Under other horizons, water had led to imposing works and formal laws recorded in clay tablets or papyrus scrolls. Not so in Atica, where there were no big streams but many springs. Yet there like everywhere, the flows of water cut across the frontiers of kinship and gender. The ones who shared the same waters were not kinsmen but neighbors. Many Greek myths express the difference between kinship and neigh-

borhood, such as the myth of Hestia and Hermes. Hestia and Hermes are not wife and man, mother and son nor sister and brother. They are neighbors and friends and, as such, the gods of friendly cohabitation (Vernant, 1963). One expresses the stability of the hearth firmly rooted in the soil, the other has the fluidity of water - or of the liquid metal to which he gave his Roman name: *hydrargyrum*, *argentum vivum* or mercury.

The archetypal relation to land is expressed by the verb 'to possess', literally to squat on 'what is mine' like nothing else. Hestia, the squatting goddess, personifies the possession of land. Water breaks through the boundaries of possession as it laughs at clan barriers. It cannot be possessed, but only given, shared and distributed before it evaporates. Hermes is the god of the gift to strangers, the gift of bread, salt and water that makes friends. Land is 'possessed', water is shared; there is no living dwelling without that essential tension.

The first urban communities were formed by strangers who came to terms (Mellaart, 1974). It is because they had come to terms that the so different tribes that lived on the Tiber's shores founded the urbs and became Romans. Their first God was Quirinus, the god of commonality, which is water's characteristic (Dumézil, 1966). They called themselves the *quirites*, and, in case of danger, cried "*quirito!*" much as today's Mexicans call "*jaguas!*" ("waters!").

Equalitarian by its nature, order inspired by water is never amorphous. Water, that has no fixed shape, has a special affinity to plastic forms. Its resistance determines the shape of ships and of fish (Thompson, 1971). A gush of water into a glass can generate flowers of water. The contemplation of water sprouting violently from the ground suggests liquid fireworks. But more than specific forms, water has given us the first geometrical archetype: the plane. Complementary to the plumb line, the surface of dormant water inspired perhaps the first 'poems of the right angle'.

Magic has sometimes been defined as the balance of sacrifices: for all that man took from nature, he gave her something back (Sahlins, 1972). Magical practices had precisely the quality that we most deny them: rationality, the rationality of 'awe-full' reason.

From magic to technology: in industrial bookkeeping, the countergift to nature appears as a loss of time, money and energy. The blow up of the oldest desire into a planetary supply system recalls Faust's dream. Old Faust, in order 'to stand on free ground with free people', let the sea be dammed. For this colonization goal he used a war-like technology embodied in the spirits Habebald (Havesoon), Haltefest (Holdfast) and Eilebeute (Speedpray). He refused to see that they came from the devil.

The signs are clear: when water can only be dominated, it will no longer let itself be dominated. Warmed by the exhaustion gases of our industry, the atmosphere melts the polar caps. Dikes, built to protect exposed lands against the elements, are of no use. Water has become the image of a disturbed elementary equilibrium.

Water was the archetypical purifier. If undisturbed, it purified itself. To any primitive society, the lost purity of water would be an apocalyptic sign. We have muddled our own spring.

The Greeks, for whom water was an element, denied qualities to pure, elementary water. Real water, water that cleansed bodies and quenched thirst, was always a balanced compound of water, earth and air. It spouted from a matrix of soil, moisture and wind that constituted a local climate. Good places had good water. Deleterious airs and putrid soils brought about foul waters. The one did not go without the others.

Ancient Mexicans represented a dwelling place by a jar turned upside down from which water flowed. The jar symbolized a mound or a hill which, they rightly thought, was where water was kept during the dry season. People thus settled at its base, where the springs were. Maybe we no longer believe, as they did, that water irrigates the soil - like blood the flesh - through a network of arteries, nor that through these arteries water from the sea is sucked by the mountains and hills of the highlands. What they attributed to the soil and the power of mountains, we ascribe rather to the atmosphere and the power of solar heat. By juxtaposing the pictograms for water (*atl*, or in compound words, *a-*) and mound (*tepetl*), the old Mexican formed the sign for a dwelling place and called it *in atl, in tepetl* (this water, this mound), or simply

atepetl. It was the expression which, according to the chronicles, Montezuma used when upon their first meeting near Ixtapalapa he took Cortez, the future conquistador, by the hand and told him: "Come with me and see your *atl* and your *tepetl*", meaning by that the resplendent city of Mexico-Tenochtitlan (León Portilla, 1961, 1964). In today's Mexico, the toponymic suffix *-tepec* reminds us that, to be a dwelling place, any hamlet, village or town needs its jar of living water.

In modern Japan, the word *fu-do* designates the most intimate of spatial experience, that for which the Japanese prepares himself by taking a purifying bath and putting on his kimono. Yet the word *fu-do* is but the juxtaposition of the ideograms for air (*fu*) and soil (*do*). The *fu-do* is not just the house, the domestic space in the restrictive occidental sense. And yet no other expression refers more adequately to 'the region that we call home'. There is a *fu-do* of the house, but also of the town quarter, of the city and of Nippon at large. The *fu-do* is the introvert side of spatial experience, in contraposition to the open spaces where one meets strangers. This intimate experience is named after the soil-air matrix that gives every peculiar place its specific climate (Berque, 1979; Watsuji, 1961).

Before 1603, when the Edo period began, the signs for water and soil (*sui-do*) were used to mean this hardly describable core of vernacular experiences, and the same concept acquired a philosophical predominance during the following centuries (Tamanoy et al., 1984, p. 286). Today Japanese tease their fellow citizens from the island of Okinawa because they call this intimate core *fu-sui* - air-water.

Today in Iran, the juxtaposition of the roots for air and earth still connotes the climate.

It does not require much digging to discover that all traditions carefully avoid the treatment of elementary water as a solitary, as we do when we call water 'H₂O' and isolate it from its matrix by means of endless pipes. Water - the water of traditions, not the engineers' H₂O - is embedded in several matrices, here of soil and air (Berque, 1979) or of water and soil (Tamanoy et al., 1984), there of air and water, and perhaps elsewhere of wood and earth, moisture and wind, or light and dryness.

In contraposition to all traditions, the Western civilization has disembedded water from its place-bound climatic matrix. This, I contend, is the deep root of our water crisis. Since the West has broken with its own traditions, the recovery of the genuine essence of the perception of water - of its elementarity - becomes a primordial matter of ecology.

4. REVIVING THE PHILOSOPHY OF WATER

The cornerstone of an institutional inversion of water practices is the revival of a philosophy of water.

Something that had been with the Western tradition until the beginning of the last century is no longer there or survives only piecemeal in local traditions. It has become a sign of backwardness - the stigma of a lack of social mobility. Perhaps also an inspiration for resistance against encroachments: the subject matter is subversive. Speaking in these terms of the philosophy of water would reconstitute to philosophy its subverting force toward powers that be.

Before examining under which conditions a new, contemporary, non-nostalgic philosophy of water could flourish again, let us see how it was lost.

4.1. THE ANCIENT MYTHOPOETICAL ELEMENTARITY OF WATER

Is it still necessary to insist here on the elementarity of water in all premodern traditions? Water has always been an inexhaustible reservoir of cultural symbols. Water spouts from the ground as springs. It flows as rivers. It is the eternal rest and endless motion of the sea. It opens the landscape to the far horizon of the ocean. It is ice and steam. As sucked by the sun, it climbs to the sky. Attracted by the earth, it falls as rain, snow and hail. As clouds, it flies endlessly. It makes the earth fructify. It washes bodies and things, soul and spirit. It is the original desire. As spring or stream, it is the core of the *locus amoenus*: the place of joy and beauty. It contains death and bears all life (Böhme, 1988).

Language, dream, and the imagination are not autonomous human means of production in which mute matter comes to cultural significance through a 'sense-giving operation'. The opposite is true: the ways of functioning of language, dream and imagination are best understood in analogy to water itself. Goethe had understood it when he wrote: "the human soul is like water". And Heraclit: "you never bath twice in the same river" (Böhme, *ibid.*). Everyone should listen to his or her own tradition and pay attention to the ways it bespeaks water, because the bits of wisdom that can be found there are like beads of a broken necklace.

4.2. THE ELEMENTARITY OF WATER IN NATURAL PHILOSOPHY

We must give a thought to the respectable tradition of the philosophy of nature. Between what we now call science and what we call philosophy, the philosophy of nature must be considered both an original cognitive formation and one of the oldest traditions of knowledge.

The philosophy of nature first flourished in Greece in pre-Socratic times. It reached a peak in the Renaissance and later enjoyed a revival in the Romantic period, finally falling into disgrace in the 19th century as a consequence of the victory of the natural sciences.

Wolfgang Detel argues that European philosophy started some 2,500 ago, and that it started ... in water. "Water is the beginning and the foundation of all things", wrote Thales of Milet.

As it was linked to water and the other elements, philosophy was geared to common sense. Both for philosophy and common sense, nature reveals itself through the senses. This is still clear in Goethe's philosophy of light, where he attacks Newton for observing light in a dark room, turning his back to its source (Cassirer, 1921).

The philosophy which looked for the elementary powers of matter is what historians of ideas call 'natural philosophy'. Natural philosophy took water in the multiplicity of its symbolic meanings and their ramifications. It was nourished by poetry and art.

4.3. THE DEMISE OF THE PHILOSOPHY OF WATER

All this has become idle land since the tradition of the philosophy of nature was interrupted in the 19th century. As a consequence, philosophy started to justify itself as a theory of the sciences. In view of the apparent irresistibility of scientific and technical developments in the 19th century, this was an attempt to save philosophy by putting it in tune with the supposed 'avant-garde' of knowledge. At the same time it was an acceptance of the growing marginalization that philosophy since then shares with the arts.

In the hierarchy of social meanings, the demise of natural philosophy allowed those elites who had at their disposal economic or military power or scientific knowledge that could be used technically to come to the foreground. The knowledge about water that the arts and natural philosophy shared with premodern traditions suffered a deep loss of validity. A structural shift in the position of man in nature followed. Descartes' philosophical creed that man is master and possessor of nature could become the practical imperative of a technological society. This consecrated the end of an attitude in which all use of water was embedded and found its limits in religious, mythical or philosophical concepts. From now on, feasibility became the only token of knowledge.

The 'sanitary revolution' of the mid-19th century is but the reflection of these changes. In spite of all admonitions, the solution pioneered in England by Chadwick came to be applied worldwide.

4.4. THE URGE FOR A PHILOSOPHICAL REORIENTATION

In the whole 'developed' and 'developing' world, most official policies concerning water must be qualified as absolutely catastrophic because of their incapacity to integrate man as a water-bound living being into concrete policies and technological strategies.

At the same time, in all the Western and westernizing world, traditions with all their symbolic riches have been reduced to unscientific superstitions or useless fairy tales. In the West the philosophy of water, which in its origins could not be dissociated from philosophy itself and

which survived until the 19th century in natural philosophy, has lost its validity.

I believe that there exists a strong link between both trends: politics are catastrophic because of a general philosophical dis-orientation. Without a concept of water that orients me within my watersheds, I cannot come to terms with water in a way which would not be inherently destructive.

4.4.1. PHILOSOPHICAL PROPOSALS

Inspired by Barbara Duden's distinction between two historical tasks, we see two lines of attack:

- Have an ear for the sonority of the waters in 'the place that you call home'. Which traditional concepts of water still exist, which are hampered by water development, which have been wiped out by school and market habits?

- A new comprehension of the relations between science and common perceptions, and within those relations philosophy, is required.

Let us examine both points closer:

I. Remembering the mythopoetic history of water can teach us that man cannot abstract himself from the natural and cultural matrices in which water is contained, because these matrices are his home. Within these matrices, domestic culture, the gestures of daily ablutions and respect for the sparkling dignity of water shaped and limited everyone's needs.

On the other hand, the gesture of turning on a faucet shapes very different needs, for a stuff which comes through pipes in apparently unlimited supplies is also a different stuff.

II. Modern man stands before water as a subject to an object, forgetting that he is himself water. As a consequence of this separation, water can be unlimitedly disembedded from its local matrices and objectified, estranged into a stuff that can be piped over

any distance. This is how water is transformed into a technically available and disposable 'stuff'.

What could be the function of 'remembering water' - the water of 'home', of our youth, of our threatened culture - in the face of the technical and scientific knowledge that dominates our time?

It could be twofold:

- To stimulate an awareness of the image of man which modern water techniques project. Because of the practical prohibition of any reflection on that image - e.g. the image of the body as a volcano of ever gushing dirt that have to be cleaned in solitude under daily niagaras, or the bourgeois persecution of odors - there is no vision and no *political reflection on the aggressiveness and megalomania inherent in such apparently down-to earth technical activities as well-drilling or even plumbing.* The impossibility to see ourselves in the mirror of that destructiveness is only the most absurd chapter of the history of the trivialization of absurdity.

- On the other hand, the remembered riches of past 'cultures of water' could reveal to some of us the ultimate misery of our own representations.

CHAPTER 3

BEYOND WATER DEVELOPMENT

1. FALLACIES ABOUT WATER

Water development is based upon assumptions that must be questioned, like the following:

- water can be supplied everywhere in any amounts needed provided the adequate means are affordable;
- diverting water from one basin to another is mainly a pricing problem: water is not embedded in any specific 'matrix', it has no place;
- water management can ignore watersheds and be national, transnational, even planetary: decisions about water are not bound to a scale of action;
- sources can be monopolized: water is not a commons but an economic good and everybody's right to water is merely a question of servicing; rights to water are distributive, there are no participatory rights;
- water is a scarce good in abundant supply.

1.1. THE RECOGNIZED PITFALLS OF WATER DEVELOPMENT

That these concepts 'do not work' can be read between the lines in the texts of many experts in water development.

Most reports on recent water development and sanitary engineering are full of apocalyptic warnings of this type: "Despite modern technology and the feats of modern engineering, a secure water future (sic) for much of the world remains elusive." "Water supplies are dwindling worldwide." "Most Third World countries will never be able to develop

their water sources as extensively as the industrial countries have done." "Water planners in many countries of the world - in humid climates as well as in dry ones, in affluent societies as well as in poor ones - are projecting that within two decades water supplies will fall short of needs." "The time of scarce and costly water has come." (Postel, 1986)

Before we ask ourselves which concepts would fit the present situation better than the package of recipes offered by professional 'water-men', let us ask ourselves what is principally wrong with them.

In the past four decades, water policies have almost exclusively concentrated on water development. Water development consists mainly in the building of dams, reservoirs and diversion canals under the assumption that water can be supplied wherever in whatever amounts desired. This assumption is not only false, it is inherently destructive. In Sandra Postel's words: "Today's water institutions - the policies and laws, government agencies, and planning and engineering practices that shape patterns of water use - are steeped in a supply-side management philosophy that is no longer appropriate. ..." (Postel, 1986).

Has it ever been?

1.2. THE EXPANSION OF WATER-DEVELOPMENT AND THE SCARCITY OF WATER

The main fallacy underlying water development reads: "Water can be brought everywhere in whatever amounts according to needs". In a limited world where only diagnosed needs (Bradshaw, 1975) aren't finite, this is a semantic monstrosity in which no sound expert can still believe. However, because it is still viewed as a key to economic development and because development still remains largely unquestioned (Esteva, 1992), water development in much of the world continues to expand, practically unchecked. Cities and farmlands go on sprawling across virtual deserts, and water being brought to them in unlimited amounts (Postel, 1986, p. 40). Herewith, the inherent limitedness of water and its embeddedness in concrete natural and cultural matrices is negated at unimaginable costs. Apart from its

evident ecological destructiveness, this negation makes of water an object of envy (Foster, 1962), and eventually a motive of war.

What selective professional shortsightedness focuses on as a technical means to bring everywhere any amount of water ends in reality in the destruction of the basis of peoples' autonomy by uprooting them from the sphere of common action in which they 'came to terms'. The systematic diversion of one basin's water to another makes of everyone everyone's competitor for scarce water.

Water has long been limited without being scarce while the rule is today that it is both overabundant - and hence wasted - and scarce. This apparent paradox deserves an explanation which in turn requires a dimensional analysis:

- The traditional limitedness of water must be distinguished from scarcity. To a large extent - like every economist will admit - scarcity stems from the illusion of unlimitedness in a limited world. In worlds that acknowledged limits, water was in small supply, often rare, but it was seldom scarce, which means that it was seldom an economic good (Thual, 1992).

- The ecological limitedness of water was scale variant, which means that it was differently experienced in several dimensional realms:

1. the domestic domain of shared intimacy;

2. the quarter, whose traditional center, the well fountain or washing place, has recently been emptied of its functions and meanings;

3. the 'region', whose subtle landmarks or 'watersheds' are hardly acknowledged any more.

- Finally, water is also limited in a cosmical sense. The anthropogenic water cycle cannot comprehend more than a relatively small part of the natural cycle.

The points in which the two cycles interact are of such crucial importance that they deserve a special name. Following a well

established linguistic habit we will call points of withdrawal (or 'sources') the spots where water is withdrawn from the natural cycle and diverted to the anthropogenic one, and points of discharge the places where used water is returned to the first cycle (Postel, 1986).

However, it would be an error to consider the points of withdrawal and of discharge as part of a 'global circle' comprehending all localities. In fact, these points are always localized spots, at the scale either of the domestic domain, the quarter or the regional 'basin'. One of the first tasks of a scaled water policy shall be to carry out a survey of the sources and discharges of every 'circle of cohabitation' or dwelling domain.

1.3. TRADITIONAL RESPONSES TO THE LIMITEDNESS OF WATER

'Global thinking', which proceeds by organigrams linking semantic emblems with arrows, has attached the prefix 'scarce' to water. Since 'global thinking' never questions the content of its semantic emblems or 'shells' but only concentrates on the functional arrows between them, scarcity has come to be seen as a natural property of water. The most progressive 'global thinkers' now affirm that after centuries of the illusion to the contrary the 'natural' scarcity of water has finally come to be recognized, and they request governments to found their water policies on that 'discovery'.

It is my contention that time has also come to put this conceptual gambling in its place. The intellectual smog that it has already been generated can only inspire remedies worse than the ailments which they pretend to heal. Water is not scarce by nature but rather multidimensionally limited, which is not at all the same thing. Scarcity itself is not a natural given but a relation and a perception, in which Paul Dumouchel rightly sees an avatar of mimetism and a kin of envy (Dumouchel, 1979). Systematically stirred up by the ideology of the self-regulated market (Polanyi, 1957), the perception that the world is a scarce place has secularized Calvinist and Puritan self-mortification; as the dominant social relation, scarcity is indistinguishable from the economic nexus itself. In facts and in representations - in economics as in the economy - scarcity is the foundation of all economic relations.

The result is that 'recognizing the natural scarcity of water' in reality means making of water a scarce good, ultimately reducing every water policy to the 'iron laws' of the economy. This is the diametric opposite of what all traditions have always attempted - and to a reasonable extent achieved - in respect to water: to maintain it, no matter how limited or even rare it was, outside of the socially dangerous contagion of invidious mimetism. So that it can be shared. So that access to its sources can be the object of concerted actions - and not the effect of blind 'laws'. So that the 'ways of water' can inspire the ways of communities: so that the submission to the common rule be consistent with the protection of the weakest's basis of subsistence.

2. THE CONCEPTUAL TOOL KIT

2.1. PAYING HONOR TO PRECEDENTS

Since the terrain of our debate has been delimited by landmarks set by predecessors, we cannot ignore them and must pay honor to their heritage. Two main practical concepts stand out in their bequest:

- the right to water
- sustainable water development.

We will successively match the first with traditional, community-shaping water rights and oppose the latter to the embeddedness of water in multidimensional matrices.

2.2. THE RIGHT TO WATER

In English, the word 'right' oscillates between two fields of meaning: in the first, 'right' means basically freedom to do, while in the second, it refers to the guarantee of the satisfaction of needs by whatever means are deemed necessary.

For instance, if we speak of a community's rights to dwell in a place, we speak of its rights of access to soil, water and wood as well as to the roads, but also of its capacity to shape its surroundings into a cultural space. Dwelling rights - also often called 'housing rights' - are

complex conventions including the liberty of access to commons like woods, pastures or water sources, endowments to public utilities like roads, and freedom to build. Since dwelling - or housing - rights are the most place-bound of rights, which means the most deeply rooted in a specific soil and a unique tradition, they are better carried by customary than by written laws. For this reason, the substitution of writs for oral customs inevitably involves a danger of uprooting people from their soil, their tradition and their sense of measure. The knowledge of how much is enough cannot be separated from a sense of the good which is local and culture-specific. Since this sense of 'enoughness' is embedded in oral customs, it can hardly be superseded by supra-local ordinances. In fact, booming demands for such a typical service as tap water are often a symptom of the demise of local customs and with them of the cultural perception that water is more than piped H₂O.

The first and the second meaning of the word 'right' define two heterogenous semantic fields. This can best be illustrated by a few examples. When I claim my right to dwell, I fundamentally affirm my right, as a historical man, member of a unique place-bound community, to give expression to my sense of the good by actively shaping my dwelling space. The same can be argued of my right to heal, which is not primarily a right to medical services, but literally my right to remain whole by exercising an active control over my environment. Such space-shaping and health-enhancing activities are best described by active and intransitive verbs: I dwell, which in most languages can also be said 'I live'; I heal, I care, or simply I go - since, as long as I live, I cannot 'be gone'. On the contrary, when what is being stressed are my rights to be housed, transported and hospitalized, or my children's right to be schooled, a completely different situation arises, best expressed by transitive and passive words, all vaguely synonymous of 'I am being taken care of' (Robert, 1980).

In the first field of meaning of the word 'right', a person stands in the middle of decisions as a *homo politicus*. In the second field, he or she allows proxies to speak on his or her behalf.

Until recently, English common law knew how to distinguish between these two heterogenous situations. In the first case, where it referred to the right to act, make decisions and defend one's community's

subsistence, it spoke of civil liberties. In the second case, when peoples' needs are defined by professionals and the corresponding services channeled by several brands of proxies, it used the technical term social rights. Such defined, the right to dwell was a fundamental civil liberty that included but was not exhausted by the freedom to build. Identically, the right to heal could be defined, before any claim to 'health services', as the civil liberty to actively cope with the aggressions of the environment as a person and a member of a community.

In the implicit hierarchy between civil liberties and social rights, the latter could be defined as claims to crutches. They were rights to heteronomous substitutes for what most could do by themselves.

However, the definition of ever more specific needs by ever new brands of professionals (Bradshaw, 1975; Groenmeyer, 1988; Illich, 1987) began to reshape the law. Services - once the mutual cares of community members - were redefined as institutional responses to professionally defined needs.

Since the provision of 'services' has superseded the production of goods as the growing sector of post-industrial economies, the hierarchy still postulated by English common law has crumbled, and the technical terms that expressed it are falling into oblivion. The word right has come into such prominence that it has blurred the once evident distinction between freedom to do and rights to be served. Correspondingly, lists of partial rights to standard arrays of services matching social and political standards have displaced basic rights to dwell - which as civil liberties cannot be reduced to social rights to institutionally distributed goods and services (Turner, 1976, p.28 ff., 116 ff., 138 ff.).

Current water policies illustrate that shift: the general insistence on the right to piped water is obscuring the historical fact that concerted rights of access to water sources have shaped communities. It is the purpose of this study to claim the priority of the freedom of access to water over the right to piped H₂O. In chapters 4 and 5 we will examine the conditions of a new articulation of action-enhancing civil liberties and social rights to services.

People have been too indulgent to encroachments upon their rights and freedoms of action when these encroachments were perpetrated in the name of their claims for 'more' or 'better' services. On the whole, this has brought about a situation in which medical care is a threat to health, schooling hampers learning, and housing services negate dwelling rights. The counter-productivity of substituting the provision of services for traditional activities that were bound by place and ruled by culture is dramatically expressed by the conflict between access to water and the right to piped H₂O. Rights to water should therefore never be disembedded from general dwelling rights.

2.3. 'SUSTAINABLE WATER DEVELOPMENT'

'Water development policies' are part of the package offered to the poor countries under the label 'development' and making them believe that they can reach the rich's levels of water wasting (Esteva, 1992). In other words, the building of dams, reservoirs and diversion canals was offered as the hinge of economic development. Backed by international loans, governments built and financed gigantic water projects (Postel, 1986) which in turn overtly encouraged modern agriculture at the expense of subsistence farming, and economic expansion on the ruins of all culture-bound forms of shared livelihood (Polanyi, 1977). No wonder then, that water development suffers from the same counter-productivity (Illich, 1976; Dupuy and Robert, 1975) as development at large. The image of the pipe pouring infinite amounts of water into the desert and making it flourish summarizes a fundamental fallacy of water development that can also be taken as a metaphor of the fallacies of economic development (Esteva, 1992; Sachs, 1992 (1)).

A catchword, sustainable development has 'caught' minds because it is ambiguous. It must be feared that its career is due to the fact that it can be understood in two diametrically different ways, namely:

- as the news that development can be sustained despite development-caused catastrophes;

- as the hope that man's livelihood can survive four decades of development and some liveliness of it be sustained.

The first understanding of 'sustainability' is a monstrosity that falls by its own weight and hardly deserves a comment. Shall planners go on projecting 'future water needs' without considering whether available supplies can sustainably meet them? Unless they want their failure to be exposed, they will not. But shall they go on simply because the amounts of water that can be withdrawn from common sources will allow it?

If the intuitions underlying the latter understanding are to be maintained alive and sustained - and we firmly believe they are - the first thing is to radically delink sustainability from development.

2.4. DELINKING SUSTAINABILITY FROM DEVELOPMENT

To sustain development in spite of its internal antinomies has become so obviously destructive a project that only cynics still stand for it.

On the other hand, to sustain some friendly liveliness in spite of past developments, to celebrate as blessings what is still with us - the fact, for instance, that water sometimes is still sparkling, that it is not always processed sludge and that it can still be free - can be the modest endeavor of those who by welcoming the limitedness of water acknowledge their own limits.

Sustainability implies the recognition of limits and scales, a sensitivity to subtle watersheds, the respect of the matrix of wind, water and soil which conforms the unique climate of "the region that we call home". Only then can the cultural avoidance of scarcity in limitedness have a chance to again flourish.

3. IS WATER AN ECONOMIC RESOURCE OR A FREE GIFT?

3.1. AN ITALIAN SHEPHERD'S TALE

Gianozzo Pucci lives with shepherds on the flanks of a Florentine hill, but still retains at Palazzo Pucci a room that he has transformed into an office from where he defends 'the civic uses of water'. He has written a story that sums up philosophically his experience. This story,

first read in Italian and then told to friends in Spanish and English, gave the writer of this report a good laugh. Having known it before starting would have made his own effort feel useless. What Pucci tells us in a few pages sums up the essence of what has to be said about water and people. Discovering it after weeks of delving into heaps of reports which are processed texts, texts elaborated by several persons and in several steps on a word-processor and behind which, at the end, no personal author stands, was a true relief. Pucci stands behind his words. It is because I want to stand somewhere near where he stands that I took the liberty to change some of his words when I had the impression that I could tell the story in better English than a literal translation would have done.

Pucci's story is titled *Acqua risorsa o gratuita meraviglia?* - Is water a resource or a gratuitous marvel?

Here is the story:

TRADITIONAL WATER RIGHTS AND *USI CIVICI*

I live in a small valley separated from Florence by a hill. There is not much water, but a forest has prevented the slopes of the hill from eroding. In the course of the centuries, the springs, the wells and the streamlets have woven the threads of the inhabitants' interests into traditions of solidarity of which the elders cultivate the memory. The well near my home's threshold, which is at least eight hundred years old, was notorious for giving water even in years of severe drought. All the neighbors used to come to quench their thirst and water their cattle, according to a tradition that culminated in the *usi civici*, which is the approximate Italian equivalent of the commons.

All springs along the way were directly accessible to the passer-by.

Some decades ago, new residents of the hill started not only to close vicinal roads that had been open since time

immemorial, but also to privatize the springs without even letting a small fountain faucet offer water to the nymph of springs and to the passer-bys' thirst. At the news of the misfortune, the nymph ceased to protect the springs. While in the deruralized residences, niagaras of piped water started to flush tubs and toilets, it became impossible to maintain the potability of the water still flowing on the slopes of the hill. The municipality acted no differently from the private owners: it collected all the remaining free waters, so that these now flow no any longer into the Arno but are evacuated through a canal.

As far as memories reach, the right of the passer-by to drink from springs which were naturally potable has always been recognized by all peoples, even the most barbarian. This right is founded on the supreme values of preindustrial societies, namely:

- the equal liberty of all humans, which requires that water be free, because the rich following their own thirst cannot drink more than the poor;
- the fundamental gratuitousness which is - since every one of us was born gratuitously - the principle upon which nature itself is founded.

The withdrawal of all the hill's water from free use was suffered by the old inhabitants of my village as an intolerable encroachment on their customs, a robbery, a new misery, an offense against their solidarity, a case of evil eye. But not one single public functionary cared to learn what was happening.

NEITHER PRIVATE NOR PUBLIC: COMMON

Today, however, years later, a new law project seems to care. Its name, if it is ever passed, will be the Galli law. Following the Galli law project, water shall be declared 'public'. Thinking of my neighbors, you will perhaps utter a relieved "finally!". But don't feel relieved too soon; rather give yourself time for a second thought. In a time in which the public domain has

surrendered to privatization, what can the sentence "water is public" mean? Which sense can it have for the wise old men of my village? Will they feel that the curse has been exorcised, or will it exacerbate the evil eye?

Perhaps three things could help answer these questions:

- a brief analysis of the relationship between the public and the private during the last centuries;
- a definition of the concepts of 'resource' and 'pollution' in advanced industrial societies;
- a clarification of the juridical, physical and social nature of water.

THE GENOCIDE OF GRATUITOUSNESS

'Public' and 'private' are the two halves resulting from the partition of the old right of communitary possession over the natural elements deemed necessary for subsistence. Traditional common law warranted the poorest's and the weakest's access to these elements, and by doing this, protected the commons, which in essence is everybody's freedom of access to these elements. Traditionally, caring for the weakest's freedom of access to the commons has also taken care of the environment, so to speak gratuitously. Which is why I think that the environmentalist discourse has no chance today if it does not start there again:

- by first linking the care for nature with the poor's freedom of access to the sources of subsistence,
- by so rediscovering the commons and designing politics for their recovery.

When the commons are polarized into the two halves of the private and the public, actions inspired by one or the other pole are equally destructive of communitary rights, and since there

is no close eye over its localities, of nature itself. There are periods during which the public domain seems to triumph and everything is nationalized at enormous costs for the community. Then come times in which, in reaction, all the solutions are said to lie in the private sphere, as has happened during the last years. But concerning water that flows freely through the territory, both modalities tend to cause heavy damage to the relation between people and the natural elements. The private (ab)use of water brings about the enclosure of springs, the pollution and erosion of mountain slopes, and the indiscriminate boring of wells at increasing depth. The public witnesses this degradation with indifference, reluctant as it is to resort to the instruments at hand for defending the original values and rights of the weakest, which also naturally corresponded to the values of the environment and the deepest roots of solidarity.

Public abuses against local populations have had equally disastrous effects. To affirm that water is public amounts in fact to giving power over our water to somebody from the capital, which means someone from far away, more prone to make agreements with the powers that be than to consider the humblest inhabitants of the land, often illiterates and in any case without weight in the state's books because they do not represent any interesting basis of fiscal collection. The war waged against the indigenous and peasant worlds of Europe had and still has the characteristics of a cultural and biological genocide that wipes out whole ethnic groups, but also an immense variety of plants, animals and local typologies of natural elements (when a spring or a forest gets polluted, it is for the ones living near equivalent to the disappearance of bread or fruits).

There is a fundamental connivance between the public domain and the private sphere: though they may oppose themselves on the question of 'who is the boss', they agree on taking the land away from people of humble condition. It looks as if an association of professional lawyers were at work, worldwide, to systematically eliminate the legal heritages of Christianity - and

of Islam, the Veda and the other great traditions that founded the law on the poor's rights. It is like a conspiracy against the meek, who are considered 'backward', as the peasants of the past who presented themselves with their hat in their hands, because their sovereignty could afford the highest form of seigniorship and of wisdom, which is humility. "Blessed the meek because they will possess the earth" was the recognition of a personal and social rule, whose validity extended from the present into the future. Eliminating the gratuitousness of naturally potable water constitutes a new chapter of the elimination of the essential conditions for meekness to be a virtue.

FROM WATER AS A COMMONS TO WATER AS A RESOURCE: THE ADVENT OF INDUSTRIAL POLLUTION

When people experience water as a commons, they consider it as an element which has its own limits. Very necessary for subsistence, it is - though limited - never perceived as scarce in a strict economic sense.

The abolition of water as a commons inaugurates a new ecological order. Not only does it transfer all control to bureaucratic structures and abstract mental processes, but it also seals a radical change in the attitude toward nature. Water loses its nature - its taste, its freshness and its sparkling vivacity. In this loss, the sinuous sacred vitality of a miraculous gift is transmogrified into the functionality of a resource. Water, which was a free gift, becomes H_2O , a primary material resource at the service of the dream of transforming the whole of nature into a reservoir of consumer goods. This reservoir of H_2O is all that interests experts, public servants and private industrialists. The image of that 'global reservoir' - the 'global drop' - allows them to redefine local communities as essentially needy because unable to pipe water or dam river courses.

The transformation of community water into a resource for productive activities is the most radical form of environmental degradation, and the material origin of pollution and of the

diffusion of the scarcity of naturally potable water which is the true hydric misery of contemporary man. It is therefore highly desirable that any 'Secretariat for Water Resources' be transformed into 'Councils of the Common Use of Water', in the hope that such a change of language will translate into a new trust in communitary abilities to care for the environment by concretely respecting its local watersheds and limits.

The technological choices in matter of canalization and forms of depuration should also be made on the basis of the communities' capacity to shape their needs according to the 'style' - in quantities and qualities - of traditionally available water. Self-limitation should be encouraged by reduction of fiscal charges as well as of bureaucratic encroachments upon local autonomy. To design policies favoring culturally rooted forms of self-limitation is a primordial moral duty of politicians and public administrators today.

THE PROTECTION OF WATER'S PHYSICAL AND JURIDICAL NATURE AS PUBLIC DUTY TOWARD THE HUMBLE AND THE ENVIRONMENT

In nature, water's qualitative and quantitative characteristics are always bound to a concrete place: it is the quantity and quality existing in that place as in no other that must fix the rights of the inhabitants. To put it the other way around can only initiate the never closing circle of scarcity. The right to water of a member of a Tuareg tribe in the Sahara desert cannot be formulated in the same terms as for a forester living in the Upper Adige Valley or a hunter in a log house near the Niagara Falls. The diverse inhabitants of the earth have different rights according to their place of residence. From the viewpoint of potability, even where official parameters have been fixed, these are only valid in the perspective of the natural right for the users of officially piped water which can be supposed to belong to diverse environmental basins and have different cultural origins. The true water rights of those whose traditions give access to the sources must consider physiological adaptation. For them, waters that current

legislation would deem undrinkable can be potable and meet their needs better than water treated according to technocratic and administrative norms.

Water has therefore the juridical nature of a civic right, or, to use the terminology of old common law, a civic liberty of access. Civic rights of that kind do not pertain to the state nor to private parties. On the contrary, they are part of the fundamental possession rights of any community of residents living in the same basin. Rights to water are therefore the specific rights of 'water-sharers' here. The more their water is respected, the more inclined community residents will be to limit their needs according to the local water qualities and quantities. Because they intimately know its limits, they will not perceive it as scarce, but they will find the cultural solutions for its more rational use.

The conditions of the civic good - that is, what a community considers to be good - are consubstantial, or if you allow the neologism, connatural, with the physical laws of water: water is the sole substance which in its cycle continuously passes through the liquid, the solid and the gaseous states. In every basin there is an expression of the fact that, on the whole, water is always in finite quantity; the only thing that man can make vary locally is the intensity or 'speed' of its self-depuration. The natural cycle of waters is not only beautiful and remarkable in its continuous movement (clouds, mist, dew, frost, rain, hail, snow, ice caps, glaciers, springs, streamlets, rivers, lakes, seas and the continuous and immense evaporation that in every instant rises from the soil) but has a function: to depurate, to clean the water and all that it crosses. But if pollution reaches a certain limit, self-depuration relinquishes.

WATER POLITICS

In the light of these considerations, it is possible to recognize some guidelines for policies of correct use of water:

- increase the capacity and intensity of natural self-depuration;
- protect the gratuitousness of the legitimate and traditional uses of water extending it to uses of small economic weight but great cultural and energetic significance;
- reconfirm the possession rights of communities of residents and riparians over water sources and ask the state and local powers to be the shield and the guarantee together of these rights;
- tax in a conspicuous manner and with progressive tariffs all heavy water consumers, be they private or public, so that squandering become very expensive for the squanderer;
- reconstruct in every basin the matrix of natural self-depuration, avoiding the separation of the management of water which is paid for (because it runs in canals, sewers, etc) from the other elements essential to the cycle: forests, mountain slopes, watersheds, hydrographic nets, etc;
- fix for every basin a maximum ceiling, that is, ration water according to the local capacity of self-depuration and the correct use of the mountain slopes and wells;
- promote the forms of depuration technologies that involve people and make them responsible, improving their hydric culture;
- and last but not least, let great amounts of clean water run unpiped over the territory.

From now on, Pucci's story will be with us.



CHAPTER 4

RESCALING WATER POLICIES

1. RETURNING TO THE SOURCES OF COMMONALITY

1.1. THE HOUSEHOLD OF WATER

Before suggesting any guidelines for action, the question of the relationship between water and community must be raised. It would be difficult to do so more radically than Giannozzo Pucci does. The core - and the chore - of any sound household of water is to recover the sources of common existence in a place: that which is to be done together so that we can live here.

1.2. SOUND HOUSEHOLDERS OR PROFESSIONAL WATER MANAGERS?

One of the less directly conspicuous and yet deepest manners in which professionalism infringes upon community life is to have communities get 'rid' of water-related conflicts by supplying them piped water at will. People of outside origin who do not concretely share water within a community, nor stipulate the forms of access of its members to it and rule its distribution, are in danger of forgoing the ability to define a practical commonality. Since water sets the standards for conflict-solving, people lose, with the control of their sources, the ability to define their own rules which is the essence of autonomy (Sousa Santos, 1974). Furthermore, the disappearance of the feminine 'counterpower' at water points only increases sexist patriarchalism. Blindness to that loss is only one example of how narrow the sociological view of professionals is, how deprived of political imagination their plans are, and how dangerous it is to entrust them with issues as important as questions of water. The widening gap between common sense and the conventional technological package of water and sanitation development is often part of the etiology of what Majid Rahnema calls an acquired cultural immunodeficiency syndrome (Rahnema, 1992). By its pretension to meet needs that it

has previously defined according to its supply capacities, professionalism dries the wells of popular autonomy and of a community's sense of enoughness.

1.3. THE RIGHT TO SAY NO

Given the clash between the community 'household' of water and its professional management, the right to say 'no' should be written into the law. It was long the implicit prerequisite for any allowance of services to be legitimate. The spread of prescriptive legislation, mandatory participation and compulsive consumption make an explicit recognition of the right to say 'no' into an ethical imperative.

Fortunately, the lines of a reasoned resistance to encroachments upon communities' fundamental liberties and rights are beginning to be readable in an otherwise arid political landscape. The words "No, thank you!" are gradually becoming the shibboleth of the new resisters. From the Mexican Sierra Madre to the Andes and to the Narmada River Valley in India, courageous village communities are shouting "no!" to roads (and herewith traffic), electricity (and with it technocratic control) and waterworks (together with apocalyptic ecological and human settlement destruction and bureaucratic abuses). I obviously do not say that their radical example should be followed by everybody. We only want to insist on that simple truth, which is also the first golden rule of all water policy:

No new waterworks - or transportation, energy or other "developments" for that matter - should ever be proposed if the affected community's right to say no to them has not been clearly recognized and if the non-realization of the project is not publicly debated as a concrete option.

As to the second golden rule of water policy, it should not be mistaken for a pronouncement against indoor plumbing. The time of street hydrants or the tap at the kitchen door and the common privy in the courtyard has been over since the 1930s in Europe and North America, and it is doubtful that proposals to maintain it where it is still in force would meet the communities' approval in poor countries. But it shall

never be forgotten that the 'indoor-plumbing revolution' has only been implemented at a cost: it has deprived communities of their liberty of access to original water-points and with that of the most elementary ecological control over their living space.

1.4. RECOVERING THE 'DEEP STRUCTURE OF THE LAW'

By substituting a distant administration for a community's own resolution of possible waterborne conflicts, the 'sanitary revolution' has set the standard for the loss of the deep structure of the law that characterizes modern, prescriptive legislations (Illich, 1987; Souza Santos, 1974). Hence the second golden rule of water policy:

Water-related projects must aim to recover the 'deep structure of the law', that is the level of social interaction in which people, by 'coming to terms' on central concrete issues, create the very bonds that hold communities together. Among such central issues, water is primary.

Because a recovery of water's ways can only occur 'in scale', before we suggest more precise lines of action it is important to first define scales of cohabitation.

2. SCALES OF COHABITATION

Three dimensional levels, or better said three concentric circles of cohabitation or dwelling domains, shall be recognized. Though they do not correspond with administrative divisions, administrators should not ignore them. They have little to do with powers that be or management from above, but much with that community 'interiority' of the spatial experience that the Japanese at any scale call *fu-do* (Berque, 1979).

2.1. THE DOMESTIC DOMAIN

The first circle is that of the house (Bachelard, 1957) or its modern substitutes, the flat or the 'vicinity' with collective courtyard. Though it is no longer the domain of 'the ones who share the same smoke' - urban gas and electricity have put out the hearths and often the ovens - it remains a sphere of shared staircase smells, daily met faces and

heard voices and, in badly insulated apartments, of shared bedroom secrets. Sociologists have shown that it is in the most anonymous settings that these subtle features of intimate belonging are reinforced and raised to the rank of distinctive signs (Metton and Bertrand, 1974).

2.2. THE CIRCLE OF COMMUNITY WATER

The second circle is that of the shared water: a circle of which the well, the washing-place, the public fountain or even the street hydrant was previously the center. It is the circle that has most conspicuously been wiped out by indoor plumbing, confining the woman within domestic precincts and redefining her, by that, as 'the housewife' (Illich, 1982 (1)).

2.3. THE DOMAIN DELIMITED BY WATERSHEDS

The third circle we will call the basin. A subtle watershed runs through geography, separating one basin from the other, eventually making its inhabitants into co-dwellers of this valley. The perception of changes of cultural mood between 'here' and 'over there' is no less subtle than the identification of geographic watersheds in a shallow landscape.

It was in order to open his students' minds to these often imperceptible and yet important distinctive lines that Patrick Geddes, the author of *Cities in Evolution*, devised the concept of the 'cut over the valley' (Geddes, 1915). The entity he so defined corresponds to what we call a basin in a sense which is not strictly hydraulic. However, when water was allowed to stress such distinctions so that communities were bonded by watersheds, they had a human scale, and common agreements had a concrete substance.

2.4. THE DEMISE AND THE RECOVERY OF SCALE

The blurring of water domain distinctions shows the ambiguity of the revolution of domestic habits that, starting in the mid-19th century but not fully effective until the 1920-30s, brought water indoors. Since then, the reckless gigantism of water development in Europe and North America has wiped out the second and third circles of cohabitation, letting the individual householder and his feminine shadow-worker

(Illich, 1982(1), 1985) become completely dependent on the services conceded to them.

However, the credibility of this revolution in its turn has come to an end. 'English hygiene' is out. Even in the North, water and sanitation 'problems' can no longer be 'solved' along its lines. In the South it has served less than half of the urban populations, poisoning the waters and impoverishing the soils of all. Beyond a doubt, other ways must be sought. Time has come again to let water's ways shape communities.

3. EXPLORING THE INSTITUTIONAL LANDSCAPE

Rather than typify water-related institutions, agencies and organizations, we will attempt to locate them among the watersheds that we have identified. Where do the World Bank, the government of the country where we live, this or that non-governmental organization or our specific municipality stand in relation, for instance, to Pucci's statement?

Or better, starting the other way around: what about my household? How can I contribute to a recovery of our commons by putting my home in order? Wouldn't starting first where I stand, and only then expanding actions up to the common horizon of our community, be the right order of priorities?

3.1. THE DOMESTIC SCALE

Recaling water management must necessarily begin at the domestic level. That which starts in my household is of interest for the community's household: for instance, saving water at home can curb municipal costs.

In that respect, the proposals of Cesar Afiorve and Pierre Lehmann, the Tucson 'Casa del Agua', and the installation of domestic water meters by the dwellers of a Peruvian squatter settlement are particularly illustrative of the ways in which retooling my household can avoid the squandering of water both at home and at the municipal level.

3.1.1. PROJECTS

RETOOLING THE DOMESTIC DOMAIN

I. A GRASSROOTS 'ALTERNATIVE SANITARIAN' WHO GENERATES LOCAL EMPLOYMENT

Cesar Añorve, a Mexican architect, has read Ernst Schumacher, Ivan Illich and John Turner. The right scale (Schumacher), conviviality (Illich), people's empowerment and autonomy (Illich, Turner, Ortiz) are the qualities and values that according to him should characterize the tools of the domestic domain, including sanitation appliances. In houses connected to the industrial networks of tap and waste water, this is unfortunately not the case. The illusion that water is available at the faucet in unlimited amounts, Añorve insists, has buried traditional conservation habits. The daily gesture of 'flushing and forgetting' blurs one of our most fundamental links to the soil - the soil to which we bequest our excrements, which are soil themselves (Groeneveld and friends, 1991). If one further reflects upon the fact that in industrial society the tap-turning hand ignores what the flushing hand does - e.g.: drinking water and waste water are controlled by separate institutions, working without a common concept (Coing and Henry, 1989; Strasser, 1982; Tarr, 1984; Waring, 1911) -, he will understand how inappropriate conventional sanitation technology can be in poor as well as in rich countries.

Starting from the realization that in the long run a poor country like Mexico cannot afford the price of such a careless technology, Añorve has begun to think of alternatives to conventional - industrial - sanitation tools. He has modestly started by designing and proposing an ecological dry toilet that is technically flawless and socio-culturally accepted. In his workshop are also found plans and models of an aerobic slow sand filter (Hopping Stoner, 1977) for grey water whose domestic installation could cut a home's water consumption by half by recycling grey waters to the garden and/or to the flush toilet (Hopping Stoner, 1977; World Bank, 1991).

Añorve calls this filter a producer of negaliters - a device that makes the tapping of ever more distant sources unnecessary because it curbs

the need for more liters of water. He is also exploring the possibility of letting the soil 'treat' waste waters and is working on the first pilot project of a root zone plant (Kickuth, 1984) in Mexico. But Añorve insists that we only report on the aspects of his activities that he considers 'ripe' enough to withstand the test of public acceptance. Among these, the ecological dry toilet has been co-opted by the public to a point that exceeds Añorve's and his group's logistic capacity.

Far from fighting 'competitors' Añorve has actively encouraged imitations, even organizing courses for would-be ecological dry toilet builders (*letrinos*). After 10 years of an effort that has more the features of a social animation in some kind of community artistic pursuit than of a commercial enterprise, it can be said that Añorve's ecological dry toilet has acquired the substance of a cultural, social, and - small scale - political reality. It has certainly enriched the technological options of the communities with which he has worked as well as the neighbors who have copied his projects.

The economic implications of this form of commitment would deserve more than a brief commentary: An average of 120-150 new ecological dry toilets a month are built in the state of Morelos by Añorve's team and imitators. Since the building of every dry toilet requires 5-7 full working days, Añorve's action generates about 700 days of employment a month, which quantitatively corresponds to the creation of 35 constant full time masonry jobs (mid-1993 numbers). This number does not include the building of the hygienic seats in Añorve's workshop nor the activities of 'grassroots consultants' and 'teachers'.

In the long run, Añorve hopes to be able to propose a concept of water management better fit to the realities of his native town, Cuemavaca, than imported practices from England or elsewhere such as conventional sanitation techniques. Having been born in a shantytown located in one the seven - presently severely polluted - *barrancas* or canyons among which Cuemavaca is built, Añorve is particularly interested in the regeneration of those canyons.

In short: Añorve's projects start at the domestic level, but their implications reach beyond the scale of the household and even that of the quarter or district, up to the 'hydric horizon' of his community (for more information, see Añorve 1994).

An association called the *Coalición para la Innovación Tecnológica Alternativa (CITA)* has recently been founded in order to promote Añorve's and others' socio-technical innovations in the Cuernavaca region. Among other purposes, CITA intends to raise funds for a demonstration project to show to the broader public how every household can be re-tooled so as to significantly curb its water consumption even without changes of habits (see below, *Casa del Agua*).

II. A PROPONENT OF THE 'ALL-DRY ALTERNATIVE'

Pierre Lehmann is a Swiss alternative technologist who lives near the sea of Geneva. In the last 20 years, Lehmann has taken some radical steps toward unplugging himself and his household from ever more costly and ecologically destructive municipal services like the tap water network, the sewer and the garbage collection system. He collects water from his roof and keeps it in a cistern. He has invented a fast composting toilet that uses grape bagasse as a biological accelerator and can be installed in any type of house or flat. He has designed and built fast compost bins of all sizes that use the same natural and - in his region - overabundant additive, are completely odorless and function on a continuous scheme (kitchen waste is added through the top lid and 'ashes' collected at the bottom without ever having to empty the composting bin).

In order to gain acceptance for these new domestic tools, a civil association, the *Société d'Etude de l'Environnement, SEDE*, was founded. First, Lehmann's friends and a small grant allowed him to conduct long term projects with 'pilot households' ready to take on the small disadvantages of a still experimental technology. Then, after the 'childhood illnesses' had been overcome, Lehmann's solutions were offered to the public at large (Lehmann, 1983).

Not unlike Añorve, Lehmann is an engineer whose goal is a radical retooling of the household to make it more convivial and ecological. He has given a practical answer to radical critiques of current urban waste disposal practices like the one formulated by Jane Jacobs in 1969:

...to carry [human] wastes away by flowing water is extraordinarily primitive. It is amazing that we continue to use such old-fashioned makeshifts. Excrements in sewage complicate the handling of all city waste waters, including even the runoff from rainstorms, and exacerbate all the problems of public health connected with water pollution." (Jacobs, 1969)

Both Añorve's and Lehmann's projects are emanations of the civil society. As such, they show the much that simple citizen initiative can obtain with little means. Both use local market practices as only one of the expressions of that civil society.

However, for their ecological consequences and the forms of community commitment that they foster, both Añorve's and Lehmann's initiatives belong to the noble sphere of action for which Patrick Geddes coined the word civics (Geddes, 1915).

III. RETOOLING THE HOUSEHOLD: A DEMONSTRATION PROJECT

The Casa del Agua in Tucson is a public demonstration project about easy to implement water conservation practices, both at the domestic and the municipal scales.

The main suggestion for households are:

- use up-to-date water-conserving fixtures;
- use water meters to check daily consumption;
- recycle grey water to the garden or to the flush toilet;
- prefer dry landscaping (xeriscape) to the conventional grass lawns;
- build a cistem and collect rainwater.

The following suggestions are given to municipalities:

- prefer xeriscape;

- concede fiscal advantages to citizens who

- . practice xeriscaping;

- . have built a cistern to store rainwater for the garden;

- . have installed special grey water plumbing systems with slow sand filters to recycle the water from the family's sinks, tubs, showers and washing machines into the flush toilets or the garden cistern.

A typical household equipped with the water saving fixtures exhibited at the Casa del Agua consumes just one third of the amount of water used in a conventionally outfitted single-family household of the same size. Either the government or water companies could finance the installation costs of these fixtures and/or deduce the amount from monthly bills over a period of time.

If cities succeed in cutting back consumption by such means, they will be able to delay huge investments to expand their systems, since laying new pipes and building dams and treatment plants costs hundreds of millions of dollars.

As César Añorve would put it, a house equipped like the Casa del Agua would produce negaliters, meaning by that a 'negative demand' of so many liters per capita per day, reducing by that amount the need for more waterworks.

IV. METERING DOMESTIC WATER: A SIMPLE MEANS TO DETECT LEAKS AND CURB SQUANDERING

In Manzanilla and in the *pueblo joven* (Mangin, 1970; Turner, 1967) José Galvez near Lima, water meters have been installed in every house or flat. In both towns, the corresponding decision has been taken by the citizen's council, which also covered the costs (the equivalent of about US \$25 per household).

As a first return of this investment, all leaks could be detected and repaired. Second, squandering was discouraged. Third, sufficient pressure was reestablished in the pipes to service the houses located

in the highest parts of the community as well as the flats on the 3rd and 4th floors of the apartment houses. Fourth, this initiative, taken without any external intervention, reinforced community links among dwellers.

What has still been little explored is the possibility for municipalities to foster similar re-scaling of water management by means of concrete incentives like tax reductions, loans, etc..

3.2. MUNICIPALITIES, COMMUNES AND *BARRIOS* : WATER DECISIONS AT THE SCALE OF THE QUARTER, THE DISTRICT OR THE SMALL TOWN

One of the first things to ask concerning municipalities and communes is: what is a commune, what is a municipality?

Two principles must be taken into account:

- the commune does not necessarily correspond with the municipality, and
- several traditions are often intertwining.

3.2.1. HISTORICAL COMMUNE VS MODERN ADMINISTRATIVE DIVISIONS

For instance, in the Hispanic world the commune can hardly be understood without reference to the Spanish *cabildo* (Coing, Henry 1989). In Mexico, the commune inherited from colonial times still exists, a heritage often mingled with old-Mexican traditions. It does not coincide exactly with the *municipio*, which is a modern administrative division. Though the name *comuna* is rarely used, the institution survives in the adjective *comunal* that qualifies the common land that cannot be sold nor durably alienated but only used, and the name *comuneros*, designating the ones who by birth have a right of access to and/or of possession of *tierra comunal*, is still in use as well. Not all the inhabitants of a *municipio* are *comuneros*. In Mexico communal rights were granted by royal charts whose legal validity is still recognized today. For instance, the commune of Chamilpa in the State

of Morelos recently sued an alleged land invader for a violation of a chart granted to the commune in 1539 by the *virrey* Mendoza. Such royal or viceregal charts were often attempts to confirm existing boundaries among indigenous communities, explaining why the communes sometimes approximately coincide with the lineaments of traditional indigenous *cofradías* (brotherhoods or confraternities).

3.2.2. COMMUNAL WATER MANAGEMENT: HISTORICAL EXAMPLES AND PROJECTS

HISTORICAL PRECEDENTS

I. 'WATER-BROTHERHOODS' IN TEHUACÁN

In the valley of Tehuacán, where Richard McNeish discovered the oldest specimens of cultivated maize ever found (McNeish, 1972), the commune - or better said the *cofradía* - rules one of the most sophisticated indigenous irrigation systems of the New World. Since time immemorial deep trenches run on the slopes of the valley. Water - not groundwater in the proper sense but water retained in the soil by capillarity - seeps from the sides to the bottom of the trenches. In many places these trenches are in fact tunnels cutting through hills in which water also drops from the roof.

The water thus collected is distributed by canals to the fields of the *cofrades*. The maintenance of the trenches and tunnels requires constant labor which is completed by community members working in tours following the widespread custom of the *faenas* or *tequios* (collective work, mutual aid, see González, 1990, p. 65). No central authority is required to manage this complex waterworks network.

Angel Palerm, who studied the Tehuacán water-brotherhoods offered them as a counter-example to the father of the theory of the 'oriental despotism', Karl Wittfogel. Wittfogel's theory states that the oriental despot - e.g. the Chinese Emperor - organized huge waterworks in order to bring irrigation water to the peasants, allowing them to increase their crops and the despot to tax them higher. These 'taxes' - most of the time in the form of rice - fed an army, that in turn increased the despot's riches by plundering weaker neighbors.

Wittfogel elaborated thus a model that links a central organization or 'state' with the building and survey of waterworks allowing the generation of surpluses, collected to feed a huge army dedicated to exterior conquests. Wittfogel often qualified the tax collection as 'internal plundering' and the military plundering as 'external collection'. Several Mexican anthropologists successively attempted to apply this model to ancient Prehispanic civilizations which, as for instance the Teotihuacán culture, have left traces of sophisticated waterworks. Invited to visit the works of the last heirs of prehispanic hydraulic arts in Tehuacán, Wittfogel had to admit the possibility that complex waterworks requiring a deep knowledge of local natural conditions, genuine engineering talents and a high sense of social organization can be the feat of communities whose highest values are practical equity and the protection of the weakest's rights of access (Wittfogel, 1981; Palerm, 1990).

In every culture in which the voices of customary practical reason (Sahlins, 1977) have not been entirely railroaded by the loudspeakers of development, similar examples can be found. They are not only a precious patrimony, but the possible seeds of renewed traditions.

II. MEXICO'S 'FLOATING GARDENS'

When the Spanish trooper Hernán Cortés met for the first time Moteuhcoma Xocoyotl (Montezuma the Last), *tlatoani* (people's tongue) of Mexico-Tenochtitlán, the latter took the Spaniard by the hand, saying: "Come, I'll show you 'your water and your hill'", and led him through the busy 'streets' of ancient Mexico up to his father's palace, where he housed him and his five hundred soldiers.

The nahuatl (Aztec language) word for city or town is *atltepetl*, from the words *atl* - water, and *tepetl* - hill. Cortés was the conquistador, 'Montezuma' was the last Aztec 'emperor'; by saying "your water, your hill", he meant 'the city that my hospitality will make yours' and, in this city, the sacred *calpulli* (quarter) where the Spaniards were to be lodged.

In fact, the 'royal highway' leading from the historical point of encounter of two worlds to the Aztec capital on islands in the middle of a vast

lake was a wooden bridge thrown over floating launches. On both sides, the amazed Spaniards observed the diligent business of the Aztec farmers practicing one of the world's most intensive forms of cultivation in a complicated web of *milpas* (corn fields), small gardens cut by canals, orchards full of unknown vegetables (amaranth, chile, tomatoes, all types of *quelites*) and planted with exotic fruit trees (zapotes, avocados, *pochotes*, *tejocotes*) on small islands protected from the wind by hedges of *ahuejotes* (indigenous willows, *salix lasialepsis*) or less often of *ahuehuetes* (huge autochthonous 'cypresses', *taxodium mexicanum*). This was the first contact of Europeans with Mexico's *chinampas* ('floating gardens').

To establish a chinampa in the shallow waters of the lake the Aztecs loaded huge baskets with stones and let them sink on the spot where a new garden was to grow. They then filled the basket with slime, nightsoil and all types of domestic and urban refuse until it was full, and refilled it as it settled. When they felt that it had become firm ground, they heaped up an arm width's thick of humus taken from the bottom of the canals and packed it down. On the edges they planted trees whose roots could live in water and helped fix the new chinampa deep into the lake's soil. The new 'floating garden' was ready (Sahab, 1988).

The chinampas emerged from the canals like the surrounding mountains from the lake, literally repeating on a smaller scale the landscape of 'water and hills' so characteristic of old Mexico-Tenochtitlán. The word chinampa comes from *chinamitl*, meaning a fence or a hedge. For the Aztecs it meant simply 'fenced land': a garden or a fenced urban quarter, also called a *callpulli* (a 'bundle of houses').

In atl, in tepetl: the water in the city, the city in the water. A *chinampa* was a rural *calpulli*; a *calpulli*, a 'fenced patch' of the city.

To the unprejudiced modern eye, this fusion of water and 'hill' (in many languages 'hill' means 'city': see Indoeuropean *pur*, Greek *polis*, German *Burg*, Turkish *tepe*, etc.), of rural and urban forms, takes on an ecological dimension. The chinampa was the perfect form of integration of a city and its rural hinterland. It was the model of a form

of cultivation that more than "agri-culture" would deserve the name *urbi-culture*. And the reciprocal penetration of water and soil into a unique matrix could be followed down to the small, quasi-microscopic scale: every emerging chinampa was a jar full of capillary water, so that the Aztecs never cared to water their gardens and orchards. Rather they built a dam across the lake so that they could control its level on the chinampas' side by opening or closing sluices.

Though the Spaniard never understood the ecology of the lake, he and his descendents could not do without the Aztec lake gardens. At the beginning of our century, Mexico's chinampas still supplied all of the city's markets through a network of canals along which glided heavily loaded launches.

Since 1900, however, more than 90% of the then existing *chinampas* have become casualties of asphalt, that is of progress and land speculation, subsisting only as a small core - and a tourist attraction - around Xochimilco ('town of the fields of flowers').

RE-TOOLING COMMUNES: TECHNICAL AND LEGAL EXAMPLES AND SUGGESTIONS

III. THE CHIMALTZACUILIA CHINAMPA PROJECTS (*'protect the chinampa' projects*)

According to recent estimates, between 1,000 and 3,000 hectares of chinampas continue to exist around Xochimilco. The variations in these estimates are due to the circumstance that not all lands which still could be cultivated as chinampas are in fact so used. In other words, there are 'actual' and 'potential' chinampas.

According to the Mexican Secretary of Agriculture and Water Resources (SARH), 1,200 ha of the Xochimilco municipality were still in use as chinampas in 1987 (Canabal et al., 1988; González et al., 1990). This drop from the 5,690 ha of active chinampas in 1960 (*ibid.*) in turn compared with the more than 10,000 in 1900 gives an idea of the acceleration of the rate of their destruction.

The *chinampería* (chinampa farming) belongs, with Paris' now disappeared *cultures maraichères* (or: Marais), to history's most intensive and productive forms of cultivation. The following table gives, in kilograms per square meter, the yearly productivity of a typical chinampa for several types of vegetables:

celery 2.5
broccoli 6.5
cauliflower 12
verdolaga
(edible purslane) 3
spinach 3
saltworts 5

On the whole, the 1,200 ha of chinampas still in use provide about 11,000 tons of produce and more than 200 million flowers annually. Far from being a vestige of the past worthy of conservation in some museum, the *chinampería* is alive and lives in Mexico. However, it has been threatened by adverse forces:

- land speculation has an eye on lands that could be 'developed';
- Mexico's municipality has an eye on springs that could become tap water (and are in fact requisitioned by its waterworks);
- land speculators around the chinampas save on sanitation costs by providing their developments with secret outlets to the chinampas' irrigation canals;
- the division of labor sponsored by the world market hardly tolerates remnants of alimentary autonomy and 'wants' the chinampas out.

Against these trends, several groups have stood up and joined the Chimaltzacuilla Chinampa movement. First, but perhaps not best, Mexico's municipal council issued a project to

- treat Xochimilco's water now infested by the city's sewers, rule out illegal outlets and impose norms on the ones that are tolerated;

- integrate Xochimilco within a huge tourist scheme;
- dignify the last effective chinampas as a 'living museum' of what would then be 'what once was';
- in order to carry out the projects, expropriate the chinamperos for the equivalent of US \$4,200 per hectare.

This official protection project was called the Master Plan for the Ecological Recovery of Xochimilco (Plan Maestro de Rescate Ecológico de Xochimilco, see DDF, 1989).

After the proclamation by UNESCO of Mexico's chinampas as part of 'Mankind's Historical Patrimony', the city council felt compelled to museographically embalm them. According to their scheme, the following steps were to be initiated:

- have bulldozers carve the bed of a touristic 360 hectare artificial lake;
- build an artificial island in the center of the lake;
- in the center of this island, erect a crystal pyramid vaguely reminiscent of the one built by New York architect Pei in Paris' Louvre and make of this pyramid the sarcophagus of the now glorious but dead chinampería;
- foster the establishment of a yachting club and its wharf on the lake's shore;
- to give non-yachting tourists something to do, carve a canal for steamers (imported from the Mississippi?) to the salty plain that was once the lake of Chalco;
- uplift some chosen chinampas to the status of 'model chinampas', where "live chinampa farmers will demonstrate chinampa farming";
- transform part of the rest of the chinampas into a golf course; and

- expropriate all collectively owned chinampas (780 hectares, corresponding to the *ejido*) in Xochimilco.

Aside from taking steps toward effectively avoiding illegal dumping of waste water into the chinampas' canals, this was deemed too boastful - too 'Disneyworld' - a project and was dismissed by members of Chimaltzacuilia Chinampa - Pro Chinampa movement - who wanted no yachts, no steamers, no museographic embalment, and no golf links but simply chinampas and the produce from them.

There are still about 30,000 persons directly or indirectly involved with the chinampería, the art of Aztec lake gardening, and these 30,000 persons were not about to accept expropriation. Most of them are the direct descendents of the lake farmers of pre-Hispanic times and, as such, the bearers of one of the three great traditions of very intensive urban or periurban cultivation, the others being the Chinese and the 'French-intensive' (Farallones, 1979) or 'Marais'. Their representatives requested an audience with a man of renowned negotiating abilities, Mr. Camacho Solís, who at the time was Mexico-City's *regente*, or mayor. It was decided that the 'Pro Chinampa movement' would elaborate its own projects and that "the best of the official and the other proposals" would then be considered.

At least two important alternative projects were published:

- The Communal Alternative Plan for the Ecological Regeneration of Xochimilco ('Plan Ejidal Alternativo para el Rescate Ecológico de Xochimilco', see Godoy, 1993) was elaborated by members of the Pro Chinampa movement who constituted themselves within the Frente Emiliano Zapata para la Defensa del Ejido;

- The Regeneration Plan of the Xochimilco basin ('Plan para la regeneración ecológica de la cuenca hidrológica de Xochimilco', see González, 1990) is a joint project of the local civil society and a team of young ecologists and scientists.

The first project emanates directly from the local civil society, which consists mainly of chinamperos who sell their produce at the Xochimilco market. In spite of the terrible water and soil pollution

suffered by the chinampas, the Xochimilco market remains Mexico City's best place for fresh vegetables and fruit.

The second, technically extremely well documented, project is from a group of scientists and technicians who wished to support the civil society group.

What was done ? Thanks to the negotiations led by Camacho Solis, the proclamation of Xochimilco as part of 'mankind's patrimony' did not quite lead to its museographic embalment.

When the works started in 1989, some 3,000 ha of chinampas were deteriorated and virtually abandoned. One of the project's major aims was to reinstall them as chinampas. This required first a complete hydrological regeneration of the whole chinampa area, which was achieved through the following steps:

- all waters were effectively treated and no untreated water was allowed to flow into the chinampa canals;
- water levels were controlled so that no chinampa would dry out for lack of capillary water;
- a hydrological distinction via a regulation sluice was introduced between the touristic and the agricultural area's with the former's level maintained permanently higher than the latter's;
- two regulation lagoons were dug in order to provide the system with a hydrological "flywheel" regulating its levels.

Following the satisfactory implementation of the project, the inauguration of the "new" Xochimilco has recently been celebrated. The canals are no longer full of untreated sludge, the good quality of the water can be seen and smelled, and the excessive amount of water hyacinths has been noticeably reduced. The chinamperos of San Gregorio have seen their produce increase considerably and they report good quality water with controlled levels. The previous high incidence of worms attacking the huejote trees has also diminished.

Other aspects of the project include:

- the construction of a huge flower market with 1800 stands in which more than 100 flower species are sold;
- a large plant nursery;
- a 280 ha ecological park including a botanical garden with a demonstrative chinampa, a large variety of autochthonous trees, and a small museum displaying information about plants and animals, handicrafts, and local archeological findings;
- a lake in the middle of the ecological park;
- pathways for bicycles all around the lake and through the park;
- sports facilities; and
- a new wharf for 6,000 touristic launches.

In addition, 1,000 of the 3,000 restored hectares were allotted for a housing project for residents of the chinampa area. The 'lunapark' aspects of the first official project were toned down or avoided and expropriations were moderate, although some communities are still involved in legal contests.

IV. A CHEAP AND ECOLOGICAL ALTERNATIVE TO CONVENTIONAL TREATMENT PLANTS

As new sanitary regulations are making the price of domestic water boom, alternatives to conventional treatment plants should be considered, and especially in poor countries.

One of the most promising alternatives to overly expensive and energy-intensive sanitary 'high technology' is the root zone process developed in Germany by Dr. Reinhold Kickuth, a professor in ecological chemistry at the University of Kassel. The root zone process is a natural treatment procedure in which the soil 'does the job'. More

precisely speaking, a root zone treatment plant uses the capacity of reeds (*phragmitis communis*) to

- oxygenate the soil thanks to the spongy core of their stems (*aerenchyma*) and
- maintain in the root zone (*rhizosphere*) a network of fine canals through which waste water will flow horizontally and be treated by that process.

Such a root zone treatment plant allows the formation of a humid biotope that, besides treating the waters of a rural, suburban or even urban community, attracts batrachians and birds and has favorable climatic effects.

The first root zone plant ever built is the ecological project 'Humid Biotope Orthfresen' near Liebenburg in the Goslar region. It has operated with minimal maintenance costs since 1974.

This solution is not only satisfactory from an ecological as well as a hygienic point of view: it is also much less expensive than a conventional treatment plant. A good example is the small plant in Havighorster Moor near Hamburg-Bergedorf that treats water seeping from a dumping ground. A conventional plant was estimated at US \$3,300,000. The root zone plant which was built instead cost only US \$530,000.

The specific surface area requirement for the treatment of domestic waste water in a root zone plant is 2.5 - 3 m² per inhabitant. In cold countries, 20% must be added to compensate for diminished activity during winter.

Building costs - including purchase of the land - are US \$100 to 130/m², or US \$200 to 260 per inhabitant.

A student of Professor Kickuth, Dr. Margarita Winter, founded the firm Base-Tech, which has already implemented hundreds of root zone plants in Germany and abroad.

Though root zone plants are especially suitable for small communities of 1000 to 6000, a 20 hectare root plant has been built in Bielefeld. It treats several thousand cubic meters a day of waste waters produced by a textile and dyeing industry.

3.3. 'WATER DECISIONS' AT THE BASIN LEVEL

Is it necessary to recall that the nature and the style of decisions cannot be independent from their scale? Decisions at the communal level are not just domestic decisions blown up to a larger scale. Similarly, decisions at the level of the basin are not just 'municipal decisions' at a larger scale even if a municipality happens to encompass the entire basin. Rather, decisions are scale variant (Atlan in Dupuy, 1979; Coing and Henry, 1989; Haldane, 1956; Thompson, 1971).

Trends show that the smaller the scale the more decisions can be naturally prescriptive, that is take concrete steps toward what shall be. On the contrary, the larger the scale, the more people tend to set proscriptive rules, defining what shall not be.

Historically, riparians coming to terms about water rights tended to define what nobody should do rather than positive norms applying to everybody.

Today, a sound water policy at the basin level should define a 'proscriptive ceiling' under the shield of which riparians should be locally autonomous.

3.3.1. EXAMPLES OF WATER POLICIES AT THE BASIN LEVEL; CRITIQUES AND SUGGESTIONS

I. THE TEXCOCO PROJECT

As we have already seen, the 'Valley of Mexico' has no natural effluent. The first artificial outlet was the Nochistongo tunnel built by Enrico Martinez in colonial times. Due to a geological collapse, the tunnel was later transformed into an open canal.

Nowadays the basin has three man-made outlets: the Gran Canal del Desagüe, the Emisor Central and the Emisor del Poniente. Together with the overexploitation of ground water, these artificial effluents were the cause of the desiccation of the lakes in the area of the chinampas and the salt lake of Texcoco.

The dry lake bed of Texcoco (which was the largest of the lakes) has become a source of dust storms affecting the entire region. Mixed with industrial pollution and dry excrements, this dust is in turn a major correlate of the ever more frequent thermal inversions that represent an increasing threat to public health.

The rehabilitation of the Texcoco lake has been undertaken to address these problems. The Texcoco project consists mainly in restoring part of the ecologically destroyed area of Texcoco to its former lacustrine vocation. It can thus be described as a hydraulic project at the scale of a basin, with beneficial climatic effects. Its surface area covers approximately 2,000 km², 100 being part of the Federal Zone.

The biggest restored lake so far is the Nabor Carrillo Lake with an area of 1,000 hectares. Several methods of restoring dry lake beds were experimented with, among them: consolidation of clay in the subsoil by pumping water from shallow wells; the use of suction dredgers; and through liquifying clays with explosives. Of these methods, the one consisting in inducing clay consolidation by shallow well pumping proved to be the most satisfactory.

II. THE DAM AND TRANS-BASIN TRANSFER PROJECTS PROMOTED BY THE WORLD BANK

Since these projects seem to me to be fundamentally wrong, I have little to say about them and can only orient the reader toward the corresponding literature (Cummings, 1990; Díaz, 1992; Ferrier, 1993; Informal Working Group on Small Irrigation, 1989; Postel, 1986; Schechla, 1992; Wolf, 1986; World Bank, several titles).

Perhaps the problem with the World Bank is that it's too rich and lacks therefore the elementary modesty without which there is no perception of scale.

Nor is the World Bank able to distinguish between efficiency and effectivity (Cochrane, 1972). Its more efficient projects are not only non-effective but often overtly conterproductive (Dupuy and Robert, 1976).

However, there is much to learn in the often skillfully done failure assessments of World Bank experts (World Bank, several titles). Many of these reviews have clearly shown that huge transbasin schemes deterritorialize water and people, expropriate (tribal) people from their land and cultural heritage, and deport them as by the effect of a war. Sometimes everything happens as if the experts wished upon others what they would never tolerate done to their own home, 'for' themselves. Imagine for instance that the Rhône River were dammed at the height of Lyons, or the Rhine River in Koblenz. Devastation that would provoke a scandal in France, Switzerland or Germany is almost breezily assigned to tribal people of the Amazon or of the Narmada Valley in India.

III. A HISTORICAL COUNTEREXAMPLE

Partly due to the fact that water is very limited in most of the countries touched by Islam, Koranic water laws are exemplary and, in Islamic countries, a still living source of inspiration for regenerative politics. The problem of Islamic legislators was: how to foster the cultural avoidance of scarcity in a context of stringent limitation? It was and is still today the core problem of any sound policy of water conservation. Conservation is much more than water efficiency; it has to do with a fundamental surrendering - in Arabic: Islam - to the inherent limitedness of water. Traditionally, it was the path of the avoidance of scarcity by self-limitation which Marshall Sahlins called the 'Zen path' to affluence (Sahlins, 1972). Today it has to be a reembedding of water within its multidimensional limits.

After the *Reconquista*, which expelled the Arabs from most of Spain, a last stronghold of Islamic law was maintained in the region of Valencia. It survives through the present day in the exemplary water laws still in force in that region of modern Spain.

On given days of the week, peasants gather on the porch of the Valencia cathedral as they did five hundred years ago under the protection of the mosque. They express their claims, their complaints and their wishes to the popular water council that regulates the captation of water at the sources, the state of the canals, and the calendar of field irrigation governing the community (Bayarri, 1992).

Following this, and other historical precedents, we propose that a water council with authority to accede to all points of withdrawal and discharge be established in every community.

A survey of all sources and discharges of the region, as well as of the dams, reservoirs and canals shall be carried out, publicly disseminated and regularly updated.

CHAPTER 5

DEFINING ALTERNATIVE RULES

1. ALTERNATIVES

Although the conventional water and sanitation package continues at the forefront, the landscape of alternatives to conventional waterworks and sanitation practices is far from idle. In view of the wealth of ideas and projects promoted by inventive individuals, communities and non-governmental organizations, of the sharp criticisms addressed to trans-basin water development schemes - often issued by technicians who have been involved in them - and also considering the expressed perplexity of public servants who courageously question the appropriateness of ever more costly technology transfers, the following proposals may sound presumptuous. In this last chapter, I have the intention to clarify alternative lines of action in the light of what the previous chapters of this study have taught us. And I will take the risk of making concrete proposals.

First question first:

1.1. WHAT IS AN ALTERNATIVE?

The word comes from the Latin *alter*, meaning 'other', or 'second'. We can hardly escape the inherited ambiguity of words. The word 'alternative' supposes 'otherness', and is thus understood by most NGOs and 'alternative technologists'. However, technocrats attached to 'main-stream' water and sanitary practices understand it differently, as 'second-rankness' or, in the best of cases, as the replacement solution when the prerequisites for the standard technological package are not fulfilled: local water captation 'where there is no pump' (no official waterworks), or dry sanitation 'where there is no sewer'. The formula 'where there is no' can then be the magical formula that provides alternatives with a beginning legitimacy, a narrow door which

must not be despised, as a famous 'alternative doctor' has shown (Werner, 1975).

The concept is thus construed that an alternative is always an alternative to: to the mindless gigantism of water developments, the reckless damming of rivers, the railroading of people's voices in the name of 'progress' or the unsustainability of basin-inconsistent projects. Alternatives are defined in counterposition to the standard freshwater and sanitary package. History can explain why this is so, and why it hardly could be otherwise. Unfortunately it is a situation that leaves the initiative in the other camp. The NGO that implements 'alternative water projects' and the technologist who assists it are deemed to define their action in relation to what they pretend to propose an other way, an alternative path, or in short: 'an alternative'. Given the ideological dominance of the standard sanitary package and the fact that this package is a built-in part of most official water regulation projects (the dam is also built to offer flush toilets to autochthonous well-to-do households), it is not superfluous to give this package a name that sticks.

1.2. AGAINST THE 'PUMP-AND-DUMP MENTALITY'

The common denominator of true alternatives is that they are alternatives to the pump-and-dump method, whose domestic counterparts are: the turn on the faucet and let flow, and the flush and forget mentality. With the unprecedented availability of piped water that they promise, water development projects foster the pump-and-dump mentality and its domestic aftermath even before completion. It has repeatedly been observed that the simple announcement of such a project propagates 'turn-on-the-faucet-and-let-flow' and 'flush-and-forget' habits among future beneficiaries.

Projects aiming to protect nature and culture from these 'progressive' attitudes must be welcomed. Nobody that we know, however, proposes to artificially reinstate the hard - and generally feminine - chores of fetching and hauling water from miles away (Strasser, 1982). Alternatives to domestic waste of water must be sought in the cultural insertion of work-relieving water techniques (Mikkelsen et al., 1993).

1.3. DIS-ESTABLISHING WATER DEVELOPMENT

In general terms, the pump-and-dump method which dominates the scene must be disestablished. That does not mean that all water should stop being pumped and piped, but that the priority - in the philosophical sense of what sets the axiological hierarchy and is therefore prior - of free, gratuitous and flowing water should be recognized. In the realm of philosophical priorities, free water is first. In some way, and before any material pollution, piping degrades water, negates its dignity. We must allow water to recover the dignity of its sparkling flowing presence.

The acts of pumping, piping and dumping water, unavoidable as they may be, are palliatives for which a price must be paid, and this awareness should be the foundation for any pricing policy of pumped and piped water. Sanctioning water withdrawals from the commons with progressive tariffs is a very different procedure than letting so-called price mechanisms 'reveal the real costs' of water. The first is a stern but legitimate political measure while the latter just translates a very anachronic belief in the market's 'regulating powers' (Polanyi, 1957).

But the struggle for an 'other way' must include a plea for another philosophy of water. In fact this is the condition for alternatives to cease to be 'second choice' and for the initiative to be in the camp of those who can say "we" because they have common horizons and recognize common watersheds.

The kind of 'philosophy of water' - or rather its lack - prevailing among westernized 'elites' paves the way for the mindless import of the Western water and sanitary package. Pump and dump are the actions which the type of water-perception spread by the westernization of mentalities literally calls for. When water is reduced to its chemical function - that is: has become H_2O even in non-scientific minds - the only thing which seems to fit its undignified nature is to be pumped and piped and dumped after usage. Alternative practices will remain second rank as long as they remain under the philosophical shield of H_2O .

The advent of water practices founded on a philosophy of water that would take local perceptions seriously and pay honor without

romanticism or nostalgia to genuine traditions would no longer be an alternative to bad ways of doing, but a source of action and inspiration spouting from its own soil like living water.

1.4. INSTITUTIONAL ASPECTS OF 'PUMP-AND-DUMP' PRACTICES

Some readers may remind me that the great 'problem' with the pump-and-dump mentality is that both exercises are performed by separate agencies, as if the pumping hand ignored what the dumping hand does. A general and legitimate critique of sectorization can be founded on that observation (Coing and Henry, 1990). Water, whose flowing essence is to be elementary and ubiquitous, is institutionally channeled along tracks corresponding to disciplinary divisions in a society dominated by professionalism and its classificatory mentality. With respect to the 'wholeness' of water, this specialization is not only inappropriate, it is extremely dangerous. The ubiquity of water in all living bodies makes of it a 'whole phenomenon' in the light of which the divisions of sciences and techniques can only lead to its catastrophic atomization (Böhme, 1988).

We must criticize sectorization and establish, in the words of Coing and Henry, transversal paths of action cutting through the professional division of tasks. Better yet, we must avoid importing this division together with the sanitary package (Coing and Henry, 1990). Still better, we must re-establish the innate transversality of our inherited community patterns of action: is it not the 'transversality' of water itself?

This is, however, the moment to warn against the importation of 'transversal models' that implicitly presuppose a central place for the collection of information. Many so-called 'non-authoritarian organization models' are disguised ways of taxing local communities in a new fashion, namely by collecting so much 'information' about them that they might be stratified in the 'networks' of their observed relations. For instance, "people have such and such water needs" is an 'information' that has a completely different meaning for the people themselves, on the one hand, and for the sanitarian with his manner of thinking on the other (Bradshaw, 1975).

1.5. STYLES OF ALTERNATIVE WATER TECHNOLOGIES

Certain technologies work to momentarily curb the consequences of false action. Thus they can only be undertaken after the damages have been recognized, which too often means long after they have been perpetrated.

Furthermore, by relieving the constraints that reality imposes, they open new spaces for false actions that, since they can be 'corrected', have less reason to be changed.

Thus is raised the place of repair technology. While it must not always be proscribed, repair technology must never have priority lest the gap of generated scarcity be maintained open. Repair technologies feed the spiral which truly sustainable policies and technologies aim to close. For instance,

a sustainable policy in matter of sanitation would curb the production of sewage water by limiting the mingling of its ingredients. It would favor the local captation of water and its local absorption by the soil.

The next question - or the first when alternatives are not 'second' - is:

2. WHO DECIDES?

Decisions must not be the sheer result of administrative processes. Modern administration often negates the essence of communities, namely the sharing of horizons or watersheds and the recognition of common limits. The perception of these watersheds traditionally allows community members to refer to themselves as 'we'. In contrast, the 'we' of administrations and supraregional agencies is a solemn but contourless amoeba (Illich, 1982 (2), p. 94 ff.).

The trend toward the 'municipalization' of decision-making must be acknowledged and supported with measure. Its fruitfulness depends on two conditions:

- that the municipality not be taken indiscriminately for the commune,

- that the inherent scale-variancy of decision-making processes be recognized and respected.

That the acting commune almost certainly never precisely overlaps with the administrative municipality has already been illustrated (see chapter 4). Modern minds, accustomed to think in 'networks', 'graphs' or even 'fractals', are ill-prepared to remember that decision styles closely depend on the scale of the circle in which they are made and of the domain in which they are applied. If Europolitics give today the impression of a shifting of once concrete local decisions to ever more distant and abstract spheres of decision, it is due to the demise of any sense of the right scale of decisions, and the right decisional style for every dimensional level.

Since decisions involving water rights are rarely taken at the one same level, several decisional styles are necessarily involved in one decision. It is Coing's and Henry's merit to highlight this complexity (Coing and Henry, 1990, p. 41). In Lima, for instance, many ill-suited decisions were made as a consequence of a 'municipalization' that did not recognize the variance of decision-making styles with the scale of decisions. Though the discussion of decisional styles should not be disembedded from their concrete context (the commune, the 'parish', the municipality, or at the other end of the spectrum, the central state or supranational agency), it can grossly be stated that the prescriptive character of decisions is inversely proportionate to their scale of application, while their proscriptive character is directly proportionate to it. To prescribe means to decide about what should be, to proscribe is to agree about what should not. The closer the deciders are to each other, the narrower the domain of application of their decisions, the more they will tend to give positive expressions to their sense of what is good. When the scale broadens, people of different perceptions, languages and senses of the good life will tend to agree on what is equally bad to them, which means that they will be prone to conclude negative agreements ruling out what harms them all.

The fascination for scale-invariant representations like graphs, networks and fractals popularized by school education and pop science has wiped the slate of European and American politics clean of the scaled texture of decisional contexts, allowing it to survive in few spots, mainly

in regions termed 'backward' or 'Third World'. Coing's and Henry's recommendation to compose with real communes and other traditional communities must be seen in this light: the common sense of women and men who have not yet been uprooted from all their traditions can often reestablish some measure and scale in decisions implying multilevel agreements.

Administrative divisions are superimposed from above. On the contrary, genuine communities are such because they recognize common limits. Traditionally, water contributed to clarify these limits.

This brings us to take a closer look at the concept of scale.

3. SCALE

The International Conference on Water and the Environment (1992) stated that "...the most appropriate entity [for water politics to be effective] is the river basin, including surface and groundwater".

Water policies must be 'scaled'. They must respect communities of water-sharers, they must recognize watersheds (be basin-consistent).

The inherent limitedness of water must somehow be allowed to limit communities. This limitedness can be observed at three main distinct dimensional levels or scales:

- the domestic domain of shared intimacy;
- the quarter, whose traditional center, the well, fountain or washing place has, in the North, been emptied of its functions and meanings; and
- the basin, whose subtle landmarks and watersheds are hardly acknowledged any more.

One of the first tasks of a scaled water policy shall be to carry out a survey of water sources and discharges in every 'circle of cohabitation' or dwelling scale.

Then:

- A picture of those concentric 'water matrices' shall be drawn: In everyone of them, the points of contact between the cultural and the natural cycles should be declared zones of common concern, that is, in right, commons;**
- natural and cultural watersheds should be recognized and the basin-consistency of water policies enhanced.**

4. SUSTAINABILITY RE-VISITED

I would argue that 'sustainable development' is no less an oxymoron than 'witty fool', 'peaceful war' or 'honest greed'. Sustainability must be redefined in complete independence from development. The valuable intuitions behind the slogan of 'sustainability' must be better expressed. I contend with Pucci (Pucci, 1991) that sustainability is, fundamentally, closing the spiral of generated scarcity. In that respect, the Montreal Charter is not far from the point when, among rights, it gives priority to access to water (Montreal International Forum, 1993). And access to water must be understood concretely as access to where free water is.

However, the access right of the poorest to gratuitous water must be affirmed more courageously. Before water is to be seen as a 'service', one should recall that it is a commons and stress its essential gratuitousness.

5. REGENERATING COMMUNITY ACCESS TO SOURCES

Any attempt to regenerate the community's relation to water must aim at enlarging the basis of citizen action and citizen control on water sources.

In other words, communities must regain some direct forms of control on the water now withdrawn from their sources for agricultural and industrial purposes.

The illusions generated by decades of water development have led us to forget that a region's sources of water are in right commons of the communities cohabiting in this region. In the face of this old forgotten truth, the technical term 'water withdrawal' acquires a deep meaning: water withdrawn from sources for agroindustrial and other industrial purposes is in fact and in right withdrawn from the commons and from the communities' legitimate control.

In this study I propose that all points of withdrawal and of discharge be regulated by laws inspired by the tradition of the commons and the spirit of common law. This again does not oppose all non-communitary withdrawals but sees them as palliatives. Water development must cease to be considered as the panacea in front of all water demands.

It is not superfluous to repeat that this awareness should be the foundation for the pricing policy of all water withdrawn from community control for agro-industrial and industrial purposes.

The rule of community access to all sources (e.g. of a fair control over them) is the principle of transversality that must correct the sectorial approach of current water development. Meanwhile, and according to the determination of alternatives as alternatives to conventional development, the landscape is sectorized in 'agricultural', 'industrial' and 'domestic' water uses.

6. PRICING

The principle underlying all water pricing should be the following:

All withdrawal of water from common sources should be subject to possible sanctions in the form of a price or other means.

Furthermore, it should never be irreversible, but have instead the form of a temporary concession.

I will let the reader decide if the opposite pricing method of 'scarcity made evident through prices' is a means to protect watercourses and curb the pollution of soil, or part of the 'new deal' of the privatization of services - including 'de-pollution' services.

Critics who will see in my proposal a step toward a kind of 'dual economy' are not entirely incorrect: sanctioning withdrawals from the commons with progressive tariffs instead of letting the so-called 'iron laws of the market' fix the price of water would favor the coexistence of a domain of gratuitous water - common and free as the air - and, on the other hand, a sphere of sanctionable withdrawals from these commons. However, if my proposal were to be understood, sanctioned water withdrawals would not give rise to a formal economy in the modern, Western sense, but quite on the contrary the traditional, now 'informal' rule of the protection of the weakest's subsistence would prevail, a rule which, according to Pucci, would also take care of the environment.

An immediate advantage of the approach proposed here is that it would cut through false problems and dilemmas. One of those presently plagues Israeli agriculture. Some economists have recommended that, since the real costs of irrigation water cannot be covered by the gains from exportation but are 'subsidized' in part by government loans and in part by unsanctioned withdrawals from Arab communities, Israel's irrigation agriculture should be discontinued. The dilemma is: import food to save water or grow food at the cost of basin-inconsistent water policies. However, the radical return of water sources to the regional commons would make the 'dilemma' appear in a radically different light, since the commonality of water does not go without the commonality of the - cultivable - soil from which it spouts.

These proposals might sound as unrealistic as the demolition of the Berlin wall could have sounded less than six years ago. Yet the certainties of industrial societies concerning water (promised in potentially infinite supply but scarce, piped, basin-inconsistent and hence scale-less and place-less) are becoming so shaky that they could crumble from one moment to the next. Like the East-European emblems of power suddenly debunked from squares and public parks, the legitimacy of water development could fade away in the face of

reality. The not unpredictable worldwide collapse of the drinking water industry should allow the conversion even of its former promoters to the hope of a world where rivers would cease to be dammed, deltas to be dried up, and the waters of one basin diverted to another. A world where there would be free flowing water, fresh, sparkling, and gratuitous for all.

WATER-BIBLIOGRAPHY

Besides providing the bibliographical references to the state of the art analysis on drinking water and sanitation which constitutes the core of the present study, this thesaurus has a broader purpose. In the view of its author, it should stimulate the founding of a **transcultural library on water** to which everybody concerned by the question should have easy access, be it by means of personal visits, xerox copies, fax or e-mail.

In order to help define this library's bibliography, readers of this document are invited to:

- choose from the following list the 50 items which they find the most important, and to
- add the 10 to 20 additional items which they suggest should also be part of the library's core collection.

HIC will collect the readers' lists and gladly send the resulting bibliography to anyone requesting it.

WATER RELATED THEMES

The 'water bibliography' should be categorized under headlines that will help structure the future library's catalogue. Nevertheless, at this stage I have intentionally refrained from proposing an overt thematic classification that would only hamper bibliographical research by the readers. Thus I have limited classification to three general categories according only to the nature of the document:

- 'direct tools', encompassing technical suggestions and hints at concrete projects;
- 'indirect tools', consisting mainly in orientations into the institutional landscape of the water question;

- 'contextual tools', aiming at a broad philosophical understanding of man's water matrix, with the related water rights and political climates.

Many entries end with the rubric: "**See: ...**" The listed names present 'bouquets of thematic affinities'. In other words, this rubric points to the implicit thematic organization of the bibliography.

Take for instance the following entry:

Crapper, Thomas, the alleged inventor of the WC. **See:** Fitch, Giedion, Heller, Richardson, Schwartz-Cowan, Strasser, Tarr, Waring, Wright.

The "**See: ...**" rubric opens to authors who all deal with a specific aspect of the history of the 'English solution'.

LOCATION OF MATERIAL

It might happen that, while the Water Library does not yet exist, readers may wish to obtain copies of the items that interest them but are unavailable in their local libraries. The indication "a-" followed by the initials HIC, CITA or JR, is meant to facilitate that research. **a-** stands for 'available', HIC for the database of **Habitat International Coalition**, CITA for the **Centro de Información sobre Tecnologías Alternativas** located at the same address as HIC, and JR for the author.

For example, in the following citation:

a-JR

Borgstrom, George, "The green revolution", in: **Focal Points**. New York: Macmillan, 1971, p. 172- 201.

a-JR indicates that Borgstrom's seminal paper on the social costs of the green revolution can be obtained through the author of this study, Jean Robert.

SPECIAL SOURCES

When an item has not been personally examined by the author but has been found in another author's bibliography, it is generally marked with the sign s-... (s- for 'source', followed by the name of the source). In the following example,

s-Strasser

Atkinson, Edward, "Invention in Its Effects Upon Household Economy", in: *Proceedings and Addresses, Celebration of the Beginning of the Second Century of the American Patent System at Washington City, D.C., April 8, 9, 10, 1891*, Washington: Press of Gedney & Roberts Co, 1892,

s-Strasser indicates that the source for the conference pronounced by Atkinson in 1891 to celebrate the centennial of the American patent system was

Strasser, Susan, "Fetch a Pail of Water", in: *Never Done. A History of American Housework*. New York: Pantheon Books, 1982.

I want to specially thank Dr Carl Mitcham, director of the Science Technology Society (STS) Program of Pennstate University (Willard Bdg.), who allowed me to copy (by night) technical articles from the Pattie Library on his personal Xerox copier. Without his help, I could never have gathered the extensive documentation on water from which I quote in this bibliography. This proves that non-conventional critical intellectuals like the author of this bibliography can benefit from the help of a 'Schindler' from within.

A

Abdel and Al-Azharai -See: Water Engineering and Development Centre

a-JR Achterhuis, Hans, ed., *De maat van de techniek*, Baarn: Ambo, 1992.

a-JR Achterhuis, Hans, *Het rijk van de schaarste. Van Thomas Hobbes tot Michel Foucault*, Baarn: Ambo, 1988.

Achterhuis attempts here to write a comprehensive 'history of scarcity', that is of the main idea out of which modern economics took shape. -See: Dumouchel, Dumont, 1977, Polanyi

a-JR Amar, Georges, *Concept de Réseau - Concept de Système*, Paris: RATP, 1985.

A 'network-theoretician' of the Régie Autonome des Transports Parisiens - the state agency running the Parisian subway - Amar attempts to distinguish the material network ('réseau') from the experience of she or he who is immersed in it. Amar argues that before all else one should speak of the network's 'réticularité' - physical 'network characteristic' -, while he coins the word 'réseauté' - 'network quality' - to describe the experiences, perceptions and feelings of those who are caught in the network. It might be said that Third World networks - of transportation, power works, waterworks, etc. - are characterized by a pronounced heterogeneity between their 'réticularité' and their 'réseauté'. However, when debates become so Byzantine, one should ask if the 'Turcs' are not at the door. -See: Coing and Henry, Dupuy, Joseph, Le Goff

a-Illich Anderson, E.B., "Metamorphosis in Water", in: *Latomus*, 50,3 (1991).

This essay is dedicated to fountain architecture in Ancient Rome. Water, transformed from spring water to fountain water, can represent the self-willed metamorphosis of a God.

a-Hic Añorve, Cesar, *Sociedad civil y tecnología sanitaria alternativa: el caso del excusado seco ecológico. Reporte de actividades 1984-1994*, Mexico: Habitat International Coalition, 1994.

This is a report of ten years of activity by the Mexican pioneer of dry sanitation, who is also a plastic artist and a caricaturist. -See: CEMAT, CETAL, ENDA, Hopping Stoner, Jacobs, Kickuth, Lehmann, Nguyen, van der Ryn

Arlosoroff -See: World Bank, 1991

a-Strasser

Atkinson, Edward, "Invention in Its Effects Upon Household Economy", in: *Proceedings and Addresses, Celebration of the Beginning of the Second Century of the American Patent System at Washington City, D.C., April 8, 9, 10, 1891*, Washington: Press of Gedney & Roberts Co, 1892.

An earth closet was presented at the exhibition accompanying the event. It is interesting to follow how the 'comfort' of 'flush-and-forget' wiped out the very sound arguments of the proponents of the earth closet. -See: Giedion, Handlin, U.S. Centennial Commission

Atlan -See: Dupuy (J.-P.)

a-JR

Aylesworth, T., S., *This vital air, this vital water. Man's Environmental Crisis*, Chicago: Rand McNally, 1968.

This early ecological warning brings some puzzling facts to light:

- The author already warns against industry-induced thermal pollution.
- He gives interesting data on detergents: Conventionally, detergents were basically made of ABS (alcil benzenosulfonates). However, two less aggressive kinds of chemicals are increasingly preferred: SAS (sodium and alcane sulfonates) and LAS (linear alcilate sulfonates). 16 PPM of detergents in water kill the larvae of the ephemere fly.
- He sees sludge as a major pollutant: The daily excrements of one single person in water destroy 0.35 kg of oxygen. Multiply this by 1 million: the oxidation of the sludge produced by a city of this size claims 350.000 kg of oxygen a day. Because of their sludge content, the Mississippi has been called the colon of the US; the Danube, the sewerage of Europe.
- The first treatment plant of the Quebec province was built at the occasion of Expo 67. Treatment plants consist basically of: a primary treatment, favoring mainly mechanical sedimentation; a secondary treatment which is biological (action of bacteria); a tertiary treatment which is mainly chemical.

As Surgeon General, D. Luther L. Terry declared that the separation of storm waters and sewage waters absolutely had to be introduced.

- If I were to subsist on only bread and water, I would need (directly and indirectly) more than 1,200 litres of water a day, for 1,200 litres a day is the quantity required for growing the wheat necessary to feed me with bread.

- If I were to add some meat and vegetables to that diet, than I would consume between 6,000 and 10,000 litres of water a day, since 9,000 litres of water per day for a pound of meat and some 800 litres for the vegetables are required. However, Aylesworth's argument must be qualified by the following consideration: the fields where the wheat grows are generally rainfed, which means that they receive gratuitous water. When water is provided by means of irrigation, it is no longer gratuitous, so steaks 'cost' not only the water and the grass to feed the cattle, but also the additional land necessary to collect the irrigation water. -See: Chadwick, Richardson, Waring

B

a-JR
a-Illich

Bachelard, Gaston, *L'eau et les rêves: essai sur l'imagination de la matière*, Paris: J. Corti, 1956. English translation: *Water and Dreams. An Essay on the Imagination of Matter*, Tr. and ed. by E.R. Farrell, Dallas: Dallas Institute of the Humanities and Culture, 1983.

Bachelard, Gaston, *La poétique de l'espace*, Paris: Presses Universitaires de France, 1957. English translation: *The Poetic of Space*, Tr. by Maria Jolas, Boston: Beacon Press, 1969.

a-Postel

Bartone, Carl and Salas, Henry, J., "Developing Alternative Approaches to Urban Wastewater Disposal in Latin America and the Caribbean", *Bulletin of the Panamerican Health Organization*, vol. 18, no. 4, 1984.

a-JR

Bätjer, K. et al., "Wassermangel, ein Lebenselement wird knapp", Gerd Michelson, et al., ed., *Der Fischer Öko Almanach*, Frankfurt am Main: Fischer, 1980, pp. 229-243. -See: Falkenmark

a- HIC

Bayarri, Francesc, "La milenaria justicia de la huerta", *La Jornada*, Mexico, August 5, 1992, p. 6.

The Valencia region was the last Mozarabic stronghold after the Reconquista. The Islamic heritage consists in exemplary water laws and customs.

a-HIC

Bays, Leonard, "Urbanization and birth-rate thwart global water progress", Mary Monro, ed. *Water Technology International*, London: Century Press, 1991, pp. 11-13.

Written by the Secretary General of the International Water Supply Organization, this position paper argues that the transition from polluted to potable water is a matter of technique. However, the author recognizes that industry threatens a total destruction of potential sources of drinking water and claims that the "the polluter pays principle" should prevail. He praises the resolution of the 1977 United Nations Conference at Mar del Plata for stating that "all people have the right to access to drinking water in quantity and of

quality equal to their basic needs', a statement that led to the decision by the United Nations to establish 1981-1990 as the International Drinking Water Supply and Sanitation Decade. The stated aim of the decade was to supply everyone on earth with a minimum of safe drinking water by 1990. It was 'entirely praiseworthy, but too ambitious and unrealistic' comments Bays, and he concludes asking: "Can the water industry worldwide deal with this situation?" -See: Monro, Pickford, Safe Water, Dupuy and Robert

Bentham, Jeremy, *Panopticon or, The Inspection Houses*, Crecheff in White Russia, 1787.

Bentham's ideas about 'new principles of construction of establishments in which persons of any description are kept under inspection' were very influential throughout the 19th century. In his ideal prison or 'panopticon' - place of 'overall visibility' - every cell was equipped with a personal toilet consisting of a cast-iron seat connected to a vertical pipe dimensioned in such a way "that a prisoner could not escape through it". Bentham also recommended the installation of a water faucet in every cell. Yet his sanitation scheme was still 'dry', water being still too worthy in his eyes to be wasted in a toilet. Bentham thought that he had disclosed the 'inherent paradox of social organization', which is that "the most horrible of all institutions" provides us with "an excellent model" for the organization of society. He praised the Inquisition for having had the intuition of this model. Through Edwin Chadwick, father of the 'sanitation sciences', and 'sanitary economics', pioneer of the urban sewerage and one-time secretary of Bentham, Bentham's ideas had a direct influence on the 'sanitary revolution' of the 19th century. See: Halévy, Richardson

a-JR

Berque, Augustin, "Espace et Société au Japon: la notion de fûdo", in: *Mondes Asiatiques* no. 16, Hiver 1978-1979, pp. 289-309. -See: Tamanoi, Watsuji

Berque, Augustin, "Natura e comunicazione in Giappone", in: Franco La Cecla, ed, *Pomoecologia: la natura e la sua immagine*, no. 2/92, Milano: Volontà , 1992, pp. 73-80.

Berry, Wendell, "Forward", in: Sim van der Ryn, *The toilet papers*, Santa Barbara: Capri Press, 1978. -See: van der Ryn, Warshall

Bertaud, Alain and Marie-Agnès -See: World Bank

a-JR

Blume, Georg, "Alle Ästhetik beruht auf Wasser", *Die Tageszeitung*, Berlin, World Media, May 30, 1992, p. 36.

This is an enlightening article on Japanese tea ceremonies. Tea is one of the most sophisticated cultural expressions of water; the Japanese tea ceremony is hence a highly ritualized celebration of the cultural aspects of water.

Boeke, Julius, H., *Economics and Economic Policy of Dual Societies, as Exemplified by Indonesia*, Phoenix: A.M. Shipley, reprint of 1953.

At the beginning of the century, Boeke warned the Dutch administration in Indonesia to respect Indonesian agriculture, markets, water rights and customary laws because they were the true basis for the thriving of the Dutch colony. This is the first known formulation of dualism or dual economics. Under the tribute to colonialist rhetoric, the merit of Boeke's deep understanding of a non-European subsistence and local market economy must be recognized. Similar insights - more radical though less theoretical - about India are to be found in Voelcker. -See: Dogra, Luij and Tijmes

a-JR

Böhme, Hartmut, "Umriß einer Kulturgeschichte des Wassers. Eine Einleitung", in: Hartmut Boehme, *Kulturgeschichte des Wassers*, Frankfurt am Main: Suhrkamp, 1988, pp. 7-42.

A plea for a cultural history of water capable of inspiring politics. -See: Cassirer, Grewe, Illich 1985, Rudhardt, Sénéfiance

a-JR

Bolle, Eric, *Lessen in ontheemding*, Enschede: E.Bolle, 1992.

The Dutch have a name for the situation of he or she who has lost all bonds with a place: ontheemding, 'de-homing'. The author announces in cold blood that "the community and reality have left us" (p. 4).

a-JR

Borgstrom, George, "The green revolution", in: *Focal Points*. New York: Macmillan, 1971, pp. 172- 201.

Borgstrom wrote: "This (...) Green Revolution could with justification be described as a hydrological feast - a water festival. From four to seven times more water is required per acre to produce the increased harvest (the trebling or quadrupling claimed), either through double-cropping or high acre-yields, mostly a combination of both. The success of [agriculture] in the Western World since the turn of the century is to a very great extent to be credited to our ample and reliable precipitation" (p. 189). "We apparently have been under the spell of two (...) misunderstandings: 1) believing that the ground water was unlimited and supplemented from inexhaustible resources; 2) the need for costly drainage was underrated".

In reality, the 'green revolution' requires huge loans, credits or grants. The tapping of groundwater has predictable, if not foreseen repercussions in heavily irrigated land: local wells dry out, whole landscapes become neo-steppes, and in cultivated land, swamping and salination soon outweigh the benefits of irrigation. Borgstrom - who wrote this book more than twenty years ago - already complained that "Some experts have recommended huge water regulation projects of the kind supported by the World Bank in the regions (...) touched by the Green Revolution", for "this is in the long run the only way to involve the enormous acreages needed in this case, and guarantee sufficient water quantities during drought periods". This gigantism is a whirlpool of mutually generating costs: high-tech water management is necessary if the evaporation of half or more of the withdrawn water before it reaches the crops is to be prevented; selected crops, which since they are products of the lab have no 'natural niche', are not adapted to any specific milieu and must be protected by much more artificial means than local species; the massive use of insecticides causes the elimination of birds, which in turn calls for more insecticides; huge irrigated extensions offer new habitats to rodents, whose population can explode.

In 1972, Borgstrom already asked with bewilderment: "How can the poor world afford such extravagant projects when even rich nations can scarcely finance them for their own agriculture?" He pointed out that the big yield increase of wheat in Mexico is attributable to irrigation and benign favoritism. Wheat is not favored in this way in the United States or in Europe, which partly explains why the acre-yield for wheat in Mexico is 35 percent higher than it is in the US. Yet we should keep in mind that wheat crops represent but 3% of Mexican tilled acreage and only one tenth of the corn acreage. High-yield wheat in Mexico is a demonstration project without many effective results (see Cochrane) for the country at large.

Borgstrom rightly foresaw that, in the long run, more people would go hungry as a consequence of the green revolution. The reasons are multiple, some quite obvious: the green revolution requires a capitalization of agriculture that pushes the small farmer out of business; international companies see in it the opportunity to establish monopolies on seed, fertilizers and chemicals, depriving small farmers of their autonomy and destroying irreversibly the time-old correspondance of soils and cultures.

This dark prospect, the author concludes, is by no means improved by presumptuous proclamations of "goodbye to famine" or high-pitched assurances that "there is food enough for many more billions": "Such unfounded talk dulls perception of the extreme gravity of the situation. No individual and no group of experts deserves the title 'conquerors of world hunger'. It cannot be dealt with 'once and for all' and certainly not through any one-time trick" (p. 201). -See: Cochrane, Cummings, Esteva, Postel, Wolf

Borremans, Valentine, *Guide to Convivial Tools*, with a preface by Ivan Illich, New York: Bowker, 1979.

a-JR

Bossel, Hartmut et al, ed., *Wasser. Wie ein Element verschmutzt und verschwendet wird*, Frankfurt am Main: Fischer, 1982. -See: Huber, Michelsen

a-JR

Bourdieu, Pierre, *Esquisse d'une théorie de la pratique*, Genève, Paris: Droz, 1972.

Bourdieu defines the Berber house of South Marocco as a **topocosmos**: a place in a **cosmos** or a placed (oriented) cosmos, or still a 'monde renversé'. He then analyzes the polysemy of the verb *qabel*, which applies to fundamental space orienting activities as well as to hospitality. -See: Illich, Leroi-Gourhan, Robert, Vemant

a-JR

Bradshaw, Jonathan, "A taxonomy of social needs", Cuemavaca: CIDOC Cuademo IV, Doc 75/80, 1975.

The concept of 'needs' used in social policies is a construct and has a significantly different meaning following the way it is construed. The author distinguishes between: **felt needs**, **expressed needs**, **imputed needs** and **comparative needs**. Felt needs - for instance the thirst of a solitary desert traveler - are not always expressed, expressed needs not always felt (for instance the 'needs' expressed in presence of governmental officials or members of a helping agency). Imputed needs are construed by professionals on the basis of their supply of services (pregnant women 'need' sonograms because this service is available at the province's hospital). Comparative needs stem from comparative judgments derived from statistics (desert people can for instance be said to 'need' more water, because the national average of the country in which they are registered is so much higher than their own daily consumption). -See: Cochrane, Groenemeyer

a-JR

Brandenberg, Bjorn, *Manual de latrinas melhoradas*, Maputo (Mozambique): Secretaria Nacional do Planeamento Físico, 1985.

The improved pit latrines presented here seem less recommendable - more expensive, more dependent on industrial technology - than the Vietnamese latrine and its 'descent'. **See in contrast:** Añorve, Lehmann

British Broadcasting Corporation (B.B.C.)

According to Gerd Müller, director of the Aquarius Museum of Mühlheim, the best available comprehensive documentation on water is in the B.B.C.'s archives. -See: Mü, Greenpeace

Broda, Johanna, *The great Temple of Tenochtitlán, Center and periphery: the Aztec world*, Berkeley: University of California Press, 1987. -See: León Portilla, Reyes

C

a-JR

Caba Martín, Pedro, "Wenn Wasser krank macht", *Die Tageszeitung*, Berlin: World Media, May 30, 1992, p. 34.

a-HIC

Cabannes, Yves -See: De Boismenu

a-González

Caraba, B.P., Torres, A., and Burela, G., *Viabilidad de las actividades agropecuarias como generadores de ingreso en Xochimilco, DF*, México: Universidad Autónoma Metropolitana-Xochimilco and Fundación Friedrich Ebert, México, 1988. -See: González

a-JR

Cassirer, Ernst, "Goethe und die mathematische Physik, eine erkenntnistheoretische Studie", in:____, *Idee und Gestalt, Goethe, Schiller, Hölderlin, Kleist*, Berlin: Bruno Cassirer, 1921.

Goethe's fight against Newtonian physics exemplifies the desperate struggle for survival of natural philosophy in a world increasingly submitted to science, 'raison d'état' and technology. -See: Böhme

a-JR

CEMAT (Cáceres, Armando and Roberto), *Presentación de CEMAT sobre sistemas bioenergéticos (1981-1982)*, Guatemala City: Centro Mesoamericano de Estudios sobre Tecnología Alternativa (CEMAT), 1982.

Years before ENSIC's translation made the Vietnamese experience with dry sanitation accessible to Westerners, CEMAT obtained from the (South) Vietnamese Embassy in Guatemala a home-made translation of the work of the (North) Vietnamese doctor Nguyen Dang Duc, with plans and exact specifications, according to which the first 'guatemalan latrine' could be built. When Aforve and Robert built their first Mexican 'ecological toilet', they knew the Guatemalan experience and were inspired by it. -See: Aforve, Nguyen

a-JR

CETAL, "Letrina abonera a base de tambor", in *Boletín Técnico*, Valparaiso (Chile): Centro de Estudios en Tecnología Apropriada para América Latina, CETAL, 1984.

This project originated after the author of this bibliography sent the Swiss center SKAT, who transmitted to CETAL a sketch interpreting a proposal made by Peter Warshall. The principle is the same as that of the Vietnamese latrine, only that the containers here are mobile. -See: Añorve, CEMAT, Nguyen, Warshall

a-JR

Chadwick, Edwin (pioneer of the sewerage in London) -See: Bentham, Halévy, Crapper, Richardson

a-JR

Cochrane, A.L., *Effectiveness and efficiency*, London: The Nuffield Provincial Hospitals Trust, 1972.

This essay is an important methodological contribution to the evaluation of medical acts. The author sees a great difference between what he has chosen to call **effectiveness** and **efficiency**. The latter is an indicator of the cost-benefit relationship of particular therapies. In other words, efficiency matches the problem of the optimum use of personnel and material in achieving the goals that professionals have fixed to themselves.

Effectiveness is something quite different, that implies the consideration of historical depth, that is of time. It can be defined as the measure of the effect of a particular medical action in altering the natural history of a natural disease for the better. The introduction of randomized control trials (RCT) is said to have increased our knowledge in this sphere. In a historical perspective, most medical therapies, though they may be deemed 'efficient', are extremely ineffective: they don't alter the natural diseases for the better, often on the contrary.

The difference between efficiency and effectiveness can be transposed from the evaluation of medical acts to the evaluation of any technical intervention. For instance, when financing agencies evaluate a water regulation project, they should not only consider its 'efficiency' following self-ascribed objectives, but also its effectiveness, that is its ability to effectively modify the situation for the better. If this would be done, the effectiveness of most such projects would have to be declared negative. -See: Bogstrom, Cummings, Postel

Coing, Henri and Henry, Etienne, "Pour une approche transversale des services urbains en pays en voie de développement", in: *Cités Unies, Les villes, moteurs du développement économique des pays du tiers monde?* Lille, November 6-10, 1989, vol. 2, pp. 414- 422 - See: Cabannes, Dupuy (G.), Dupuy (J.-P.), Fleck, Godoy, Haldane, Mangin, Ortiz, Wray

a-JR

Corbin, Alain, "Le péril vénérien au début du siècle: prophylaxie sanitaire et prophylaxie morale", in: *Recherches*, Fontaines-sous-Bois, 1978.

Corbin, Alain, *Le miasme et la jonquille: l'odorat et l'imaginaire social, 18e - 19e siècles*, Paris: Aubier, 1982. Translated into English as *The Foul and the Fragrant. Odor and the French Social Imagination*, 1986.

Is it possible to write a history of the most volatile of all experiences: smell? This passionate book is an attempt to meet that challenge. -See: Illich, 1985

Corbin, Alain, *Le territoire du vide. L'occident et le désir du rivage, 1750-1840*. Paris: Aubier, 1988.

This is a history of the fascination for seashores and beaches. -See: Koschorke

Crapper, Thomas, the alleged inventor of the WC. -See: Fitch, Giedion, Heller, Richardson, Schwartz-Cowan, Strasser, Tarr, Waring

a-HIC

Cummings, Barbara, *Dam the Rivers, Damn the People. Development and Resistance in Amazonian Brazil*, London: Earthscan Publications, 1990.

The author documents the war waged by dam builders against the inhabitants of the Amazon basin and the growing resistance of local people. She recalls some basics about gigantic water regulation projects:

- **Dams deport people**, who are 'relocated' somewhere else:

"[The Indians] are also threatened with relocation to posts or reserves where they cannot support themselves and must rely on insufficient or corrupt government agencies for the necessities for survival".

- **Dams make diseases proliferate**: "Among the most obvious and direct effects of large dam construction is the increase in the incidence of disease in the local population (...) Common disease epidemics brought about by dam construction projects include malaria, schistosomiasis, onchocerciasis (river blindness) and indirectly gastroenteritis, respiratory and even venereal diseases. Additionally, Tukurui is threatened with Chagas disease (South American sleeping sickness) and bubonic plague" (p. 29).

- **Dams accelerate erosion processes**: Dam builders often have the illusion that tropical forests can be transformed into fertile meadows and fields. However:

"The thin layer of topsoil creates a great vulnerability to erosion when the forest cover is removed. The root systems of a standing forest act to hold the soil in place. Regional settlements and development in the areas of large dams often lead to the clearing of surrounding forestlands and expose the soil to the erosive force of the rain (...)".

- **Dams are generally short-lived**: "In the areas of large dams, eroded soils are often carried into the reservoir where siltation results" (p. 21).

- **Dams can provoke drastic climatic changes**: "On a grander and poorly understood level of ecological interactions and regulation, the trapping of water in the formation of large reservoirs may affect the local climate" (p. 24). -See: Díaz, Esteva, Ferrier, Informal Working Group on Small Irrigation, Postel, Schechla, Wolf

D

d'Arcy Thompson -See: Thompson, d'Arcy Wentworth

DDF, *Plan Maestro de Rescate Ecológico de Xochimilco*, México: MS. DDF, 1989.

s-González

DDF, *Rescate ecológico de Xochimilco*, México: DDF, 1989. -See: González

De Boismenu, Isabelle and Cabannes, Yves, "Programme MUDH/REXCOOP à Nazareth en Ethiopie: vers une maîtrise d'ouvrage populaire", in: *Cités Unies, Les villes, moteurs du développement économique des pays du tiers monde?* Lille, November 6-10, 1989, vol. 2, pp. 503-510.

This article explores the possibility of tentatively defining the profile of a 'barefoot architect' or better of a **grassroot master workman** capable of mastering building operations through his knowledge of local habits, concrete communities, techniques, materials and costs. This **popular master workman** ("maître d'ouvrage populaire") would be much more **effective** (Cochrane) than the architects, contractors and building firms of the formal sector. However, several conceptual changes are required:

- The notion of the 'finished product' must recede in favor of that of an ongoing process.
- Local skills must be recognized and favored over imported know-how.
- Traditional forms of mutual aid must be sustained.

The article also contains an interesting discussion of the conditions under which technological innovations can reach the poor in a beneficial way (for them!). Some of these conditions are:

- the costs of innovation must not be carried by the users of innovative technologies;
- to avoid that, a clear institutional - and financial - separation must be drawn between the agencies which dedicate themselves to the research of new techniques and the ones which are practically involved with the housing process;
- research and practical involvement must themselves be articulated in innovative and "dialectical" fashions that transcend conventional 'R. and D.' (Research and Development) slogans and programs*.

It is this articulation which the authors (tentatively) propose to obtain through the formation of popular master workmen, who by their example will multiply successful innovations at the grassroots level. -See: Aforve, Cochrane, Ortiz, Turner

De Suremain, Marie-Dominique et al., ed. -See: Guibert

a-HIC

Díaz, Marcelino, *Asentamientos humanos, desarrollo y medio ambiente. Alto Balsas, Pueblos Nahuas en Lucha por la Preservación del Medio Ambiente y su Cultura*, México: Habitat International Coalition, 1992.

Written by the 'Comisionado de Pueblos Nahuas del Alto Balsas', this essay documents the threat constituted by the dam project of San Juan Tetelcingo.

Among the casualties of this dam are the region's cemeteries, places of high symbolical and topocosmical significance: losing cemeteries means, for traditional cultures, losing space orientation. -See: Bourdieu, Cummings, Díaz, Esteva, Ferrier, Informal Working Group on Small Irrigation, Postel, Robert 1994, Schechla, Wolf.

D.O.F., *Ley de aguas nacionales*, México: D.O.F., 1 December 1992.

a-Luijf

Dogra, Bahrat, "Traditional Agriculture in India: high yields and no waste", *The Ecologist* 13, 2/3, 1983.

Around the turn of the century, the English government sent an agriculturist named Voelcker to India with the mission to study ways to improve traditional Indian agriculture. In his report Voelcker wrote: "I do not share the opinions which have been expressed as to Indian agriculture being as a whole primitive and backward, but I believe that in many parts there is little or nothing that can be improved (...). I make bold to say that it is a much easier task to propose improvements in English agriculture than to make really valuable suggestions for that of India". I thank Reginald Luijf and Pieter Tijmes for having provided us with this bibliographical track. -See: Luijf, Boeke

Duda, Alfred -See: World Bank

a-JR

Duden, Barbara, *Geschichte unter der Haut*, Stuttgart: Klett-Cotta, 1987. -See: van den Berg, Robert 1994

a-JR

Duden, Barbara, *Der Frauenleib als öffentlicher Ort. Vom Mißbrauch des Begriffs Leben*, Hamburg, Zürich: Luchterhand, 1993.

a-JR

Dumézil, Georges, *La Religion Romaine archaïque*, Paris: Payot, 1966.

This book (with Rykert's) contains the most comprehensive modern study on ancient foundation rites. Foundation rituals and myths are an important chapter of the history of water. -See: Bourdieu, Illich 1985, Robert 1994, Rykwert

a-JR

Dumont, Louis, *Homo aequalis. Genèse et épanouissement de l'idéologie économique*, Paris: Gallimard, 1977. English version by the author under the title: *Genesis of the economic ideology*. -See: Achterhuis, 1988, Dumouchel, Dupuy and Robert, Polanyi

Dumont, Louis, *Essai sur l'individualisme. Une perspective anthropologique sur l'idéologie moderne*, Paris: Seuil, 1983.

Dumont, Louis, Préface de l'édition française de Karl Polanyi, *La Grande Transformation: aux origines politiques et économiques de notre temps*, Paris: Gallimard, 1983. -See: Polanyi

a-JR

Dumouchel, Paul, *L'ambiguïté de la rareté*, in: Paul Dumouchel et Jean-Pierre Dupuy, *L'enfer des choses*, Paris: Le Seuil, 1979.

Scarcity is a social construct (or relation), not an inherent characteristic of things. It is the relation that can make of 'the world of things' a hell: an 'enfer des choses'. -See: Achterhuis, 1988, Dumont, Dupuy (J.-P.), Foster, Polanyi, Sahlins

Dupuy, Gabriel and Amar, Georges, ed., *L'enjeu des réseaux. Exposés et débats de l'atelier "l'Enjeu des Réseaux" au colloque "Crise de l'urbain, futur de la ville" in Cerisy-la-Salle*, Paris: RATP, 1985. -See: Amar, Coing and Henry, Joseph, Le Goff

Dupuy, Gabriel and Tarr, Joel, *Technology and the Rise of the Networked City in Europe and America*, Philadelphia: Temple University Press, 1988. -See: Coing and Henry, Tarr

Dupuy, Gabriel, *Eau et informatique*, Paris: Presses de l'Ecole des Ponts et Chaussées, 1986.

A systemic view on water that leaves no room for the realization that water is a commons.

a-JR

Dupuy, Jean-Pierre and Robert, Jean, *La Trahison de l'Opulence*, Paris: Presses Universitaires de France, 1976.

Economic logics is inherently the 'logic of substitution'. The authors insist that there are damages for which no price can be paid, irremediable losses, encroachments upon people's autonomy for which no 'compensations' are decently thinkable. Hence, economic 'substitutions' for most damages are fallacious. The realization that economic logics involves such a fallacy as evaluating the 'price' of irreparable losses convinced one of the authors, a brilliant 'mathematical economist', to become a philosopher. -See: Robert, Sachs

Dupuy, Jean-Pierre, "Le signe et l'envie", in: Paul Dumouchel et Jean-Pierre Dupuy, *L'Enter des Choses*, Paris: Seuil, 1979.

The author builds his main argument upon the **observation ethics** of the Hebrew-French epistemologist Henry Atlan who stated that "...the information which I lack to build an operative model - a blue-print or a functional copy - of my object of observation can be a measure of its space of autonomy". In other words, Dupuy acknowledges with Atlan that: **the information deficit of my observation procedures warrants the respect of their object as a subject**. To try to curb this deficit at any costs is eminently unethical. **See:** Coing and Henry, Foster -**See in contrast:** Amar and Dupuy (G.)

E

a-JR

ENDA, CEMAT, ANADEGES, CETAL, COTESU, CESTA, IRCWD, CIID, SAIS, SKAT, *Primer Seminario Latinoamericano sobre Saneamiento Alternativo*, Medellín, Colombia, July 24-29, 1987. List of participants and presentation document.

In 1986, the author of this bibliography had taken the initiative of organizing a small seminar on dry sanitation. Urs Heierli of SKAT and Jean-Jacques Guibbert of ENDA convinced him to rather collaborate with them in the organization of a Latin American seminar on alternative sanitation in general. After more than seven years, I still regret that the advantages of dry sanitation over all other alternatives and its potentialities for further improvements are not more widely recognized.

During the Medellín seminar, a 'paraprofessional' organization of 'alternative sanitarians', the RETA was founded - o corruptio bonarum rerum quae es pessimal - and the decision to organize a Second Latinamerican Seminar on the same subject in 1988 was taken. As part - with Añorve, Esteva, Pitot, Quadri, Vargas et al. - of the organization of this seminar, which effectively took place, I must confess that the proceedings are still due! See: Nguyen -A contrario: Obladen -See also: Pitot

a-JR

Enciclopedia de México, México, 1978.

Volume 9 contains part of the basic information on the State of Morelos cited by Añorve in his report of activities. -See: Añorve, Mariaca y Narváez

ENSIC (Tam, D.M. et al.) 'Low cost options', in: *Environmental Sanitation Abstracts*, Bangkok: Environmental Sanitation Information Center (ENSIC), vol. 3, no. 2, August 1981.

No longer quite up-to-date, this bibliography of low cost options edited by one of Dr Nguyen's translators is still very useful for beginners in the field of alternative sanitation. See: Nguyen

a-JR

Esteva, Gustavo, "Development", in: Wolfgang Sachs, ed., *The Development Dictionary*, London: Zed Books, 1992, pp. 6-25. -See: Dumont, Groenemeyer, Polanyi, Sachs (2)

F

a-JR

Falkenmark, Malin, "Geht der Welt das Wasser aus?", *Die Tageszeitung*, Berlin: World Media, May 30, 1992, p. 23. -See: Bätjer, Dumouchel, Geiler, Lehmann, Pucci

a-JR

Farallones Institute, *The Integral Urban House*, San Francisco: Sierra Club Books, 1979.

Published during California's 'green spring' under Governor Jerry Brown and State Architect Sim van der Ryn, this book contains valuable recycling tips and comparative tables of dry sanitation alternatives. -See: Huppung Stoner, van der Ryn

a-JR

Feachem, Richard and Cairncross, Sandy, *Small Excreta Disposal Systems*, London: The Ross Institute of Tropical Hygiene, 1978.

In the style of ENCIC's abstracts, this little manual is completely surpassed by the recent improvements of the Vietnamese latrine. Part of the history of alternative sanitation rather than of its state of the art, it would be misleading for beginners. -See a contrario: Añorve, CEMAT, Lehmann, Nguyen

a-HIC

Ferrier, Christian, "Grands barrages, grands désastres. La Banque Mondiale et les expulsions", *Le Monde Diplomatique*, February 1993. See: Cummings, Díaz, Informal Working Group on Small Irrigation, Postel, Schechla, Wolf

a-Strasser

Fitch, James Martson, *American Building: The Historical Forces That Shaped It*, 2nd edition, Boston: Houghton Mifflin and Co, 1966.

The author is an architectural historian interested in the history of the sewerage. See especially his chapter on Philadelphia. -See: Giedion, Richardson, Schwartz-Cowan, Strasser, Waring

Fleck, Ludwik, *Genesis and Development of a Scientific Fact*, Chicago and London: The University of Chicago Press, 1979 (1935).

Recently 'rediscovered' by science historians, Fleck stated that every institutionalized group with a precise aim, be it a scientific discipline, a technical profession or a civil association, can best be understood as a **thought collective** constrained by its specific **thought style**. Such an analysis could greatly contribute to understanding the respective thought styles of the agencies involved in sanitary planning (municipalities, sanitary engineers, central governments, NGOs, etc.). -See: Coing and Henry, Esteva, Haldane

a-JR

Foster George, "An anatomy of envy. A study of symbolic behavior", in: *Current Anthropology*, vol. 13, no. 2, 1962, pp. 165-102.

Traditional societies - Foster often recalls his studies on Tzintzuntzan in Mexico - seem to be ruled by the fear of the consequences of envy and not, like our, by open envious rivalry on limited stocks, that is by what we call 'scarcity'. Three main cultural mechanisms refrain traditional societies from being ruled by invidious rivalry or scarcity: sharing, hiding, depreciating symbolically. -See: Dumouchel

Foster, George, "Peasant society and the image of limited good", in: *American Anthropologist*, 67, 1965, pp. 293-315.

When everybody's knowledge of the limitedness of goods prevails, the one who has obtained more than his share can only have harmed others. He is thus in danger of exposing himself to **envy** and society to its **dangerous consequences**. Before any conflict explodes, he generally will be offered the opportunity to barter richness for prestige (see for instance the institution of the *mayordomo* in Mexico, or the *remojo* ritual). -See: Dumouchel, Dupuy (J.-P.), Dumont, Sahlins

Fourth World Review, the editors, "American Comrades...", in *Fourth World Review*, no. 56, 1993, reproduced in Spanish translation in: *Opciones*, no. 42, August 20, 1993, pp. 9-10.

If groundwater tables under the Great Plains are exhausted, a new 'Dust Bowl' could occur. -See: McPhee

G

a-JR

Gallegos, Luis, "Una letrina de dos tanques para hacer abono orgánico", conference presented at the first Latinamerican Seminar on Alternative Sanitation (co-organized by the author of this bibliography), Medellín, Colombia, July 24-29, 1987, written in Quito, Ecuador: Funhabit, 1987.

This interesting adaptation of the 'Californian composting privy' is more expensive and requires more attention than the Vietnamese latrine. -See: Añorve, Brandenburg, Enda, van der Ryn

Geddes, Patrick, *Cities in Evolution*, with a preface by John Tumer, New York: Fertig, 1969 (1915). Geddes was a major influence on John Tumer's early ideas about communities. Geddes' notion of 'a valley' within its geographical and cultural watersheds can fruitfully be compared with Watujj's concept of 'a climate'. -See: Tumer, Watsujj

a-JR

Geiger, Markus and Heeb, Johannes, *Naturnahe Abwasserreinigung*, Lucerne: Caritas, 1988.

There exist two different books with this same title. -See: Heeb, Kickuth

a-JR

Geiler, Niklaus, "Der Wasserpreis wird explodieren", *Die Tageszeitung*, Berlin: World Media, May 30, 1992, p. 31.

If present trends continue, the price of water will skyrocket, ruling the poor out of access to it. -See: Dumouchel, Falkenmark, Lehmann, Warshall

a-JR

Giedion, Sigfried, *Mechanization takes command*, New York: Norton, 1969.

This study of the mechanization of daily life, by a leading historian of architecture and technology, includes information on the mechanization of 'water techniques'. -See: Crapper, Fitch, Heller, Richardson, Schivelbusch, Schwartz-Cowan, Strasser, Tarr, Waring, Wright

a-HIC

Godoy, Lucas and Legorreta, Jorge, *Xochimilco, participación popular en el plan de rescate ecológico*, México: Habitat International Coalition, 1993. -See: Canabal, Coing and Henry, DDF, González, Rojas

Goldstein, Jerome, *Sensible Sludge. A new look at a wasted natural resource*, Emmaus, PA: Rodale Press, 1977. -See: Kickuth.

a-HIC

González Martínez, Alfonso, coord., *Plan para la regeneración ecológica y el desarrollo regional de la cuenca de Xochimilco*, México: Fundación Friedrich Ebert, 1990. -See: Canabal, DDF, Rojas, Wilken

a-JR

González Tascón, Ignacio, 'Influencias recíprocas en tecnología hidráulica entre el Viejo y el Nuevo Mundo', Madrid, 1987, manuscript. -See: Palerm, Sahab, Wittfogel

a-JR

Greenpeace, A 'water exhibition' in Germany.

From May to October 1992, a 70 meter long ship carried a 'Water Exhibition' which 'showed where water comes from, what happens to it, and who's responsible' up and down the canals and rivers of Germany. -See: British Broadcasting Corporation, MÜ

a-JR

Groenemeyer, Marianne, *Die Macht der Bedürfnisse. Reflexionen über ein Phantom*, Reinbek bei Hamburg: Rowohlt, 1988.

A radical critique of the imputation of needs that gives power to proxies. -See: Bradshaw, Illich 1987

a-JR

Groenemeyer, Marianne, 'Helping', in: Wolfgang Sachs, ed., *The Development Dictionary*, London: Zed Books, 1992, p. 53-69. -See: Esteva

Groeneveld, Sigmar, Hoinacki, Lee, Illich, Ivan and friends, 'The declaration on soil', in: *IFDA Dossier 81*, April/June 1991, pp. 57-58.

Grewe, Klaus, *Die Wasserversorgung im Mittelalter*. Mainz: Verlag Philipp von Zabern, 1991, Bd. 4, 'Geschichte der Wasserversorgung'.
See: Illich 1985, Sénéfiance

a-HIC

Guerra, Luis Manuel y Mora Rodriguez, Judith, comp. *Agua e Hidrología en la Cuenca del Valle de México*, México: Fundación Friedrich Ebert, 1989. -See: Lacombe, Musset, Oswald, Panabière, Quadri, Ziccardi

a-HIC

Guibert, Jean-Jacques, y otros, ed., *Saneamiento alternativo o alternativas al saneamiento, Proceedings of the first Latinamerican seminar on alternative sanitary technologies*, Medellín, Colombia, July 24-29, 1987, Bogotá: Editorial Presencia, 1988. -See: ENDA

H

a-HIC

Habitat, *Community Participation and Low-Cost Drainage*, Nairobi: United Nations Centre for Human Settlements (Habitat), 1986. -See: Kickuth

Habitat, *Environmental aspects of waste management in metropolitan areas of developing countries*, Nairobi: United Nations Centre for Human Settlements (Habitat), 1984.

This study includes a panorama of the situation in Mexico City (p. 27 ff). -See: Habitat 1989; Rubi

Habitat, *Stormwater drainage and land reclamation for urban development*, Nairobi: United Nations Centre for Human Settlements (Habitat), 1991.

Habitat, *The conservation of drinking-water supplies. Techniques for low-income settlements*, Nairobi: United Nations Centre for Human Settlements (Habitat), 1989.

Useful source for case studies in Washington, Denver, Mexico City. -See: Habitat 1984, Rubi

Habitat, *Delivery of basic infrastructure to low income settlements: issues and options*, Nairobi: United Nations Centre for Human Settlements (Habitat), 1986 (1).

Habitat, *The design of shallow sewer systems*, Nairobi: United Nations Centre for Human Settlements (Habitat), 1986 (2). -See: International Reference Centre for Waste Disposal, 1983, Water Engineering and Development Centre

Habitat, *Techniques for Low-Income Settlements*, Nairobi: United Nations Centre for Human Settlements (Habitat), 1989 (1).

Habitat, *Malawi gravity-fed rural piped-water programme. A case study*, Nairobi: United Nations Centre for Human Settlements

(Habitat), 1989 (2). -See: Informal Working Group on Small Irrigation, Postel, Wolf

a-HIC

Habitat International Coalition, "The Sardar Sarovar Project: Resettlement or Forced Evictions?", draft. -See: Cummings, Esteve, Schechla

Habitat International Coalition (Ylätalo, Riitta and Grahl, Jodi, ed.) *How Common is Our Future? Mexico: International Forum, March 4-7, 1991.*

I have concentrated on talks defining 'sustainable development' and 'sustainability' in general; these are:

Ramachandran, Arcot, "Human Settlements, Environment and Sustainable Development", p. 25 ff., "The essence of the concept of sustainable development is the satisfaction of present needs without compromising the ability of future generations to do the same" (p. 31).

Mitlin, Diana, "Sustainable Development and Cities", "... the term 'sustainable development' seeks to bring together two strands of thought about the management of human activities - one concentrating on development goals, the other on controlling the harmful impacts of human activities on the environment" (p. 53, see also p. 47).

Workshop 1, "North-South Relations, Poverty and Sustainable Development", p. 229 ff., In this text - a not very consistent proclamation of good intentions - sustainable development is loosely related to:

- the satisfaction of basic subsistence needs
- the fulfillment and guarantee of all (sic) material and non-material human needs and rights
- the maintenance of ecological integrity
- social self-determination
- equity.

Workshop 2, "Design, Technology, and Production of Sustainable Human Settlements", p. 235 ff. Here, sustainable human settlements seem to be something depending on such things as the funding of NGOs, ecological balance and technological alternatives [most interesting point, p. 236]. -See: International Secretariat for Water, Montreal International Forum (the 'Montreal Charter'), Safe Water 2000 (the 'New Delhi Declaration')

Haldane, J.B.S., "On being the right size", in: James, R. Newman, *The World of Mathematics: A Small Library of the Literature of Mathematics from Ah-mose the Scribe to Albert Einstein 2*, New York: Simon and Schuster, 1956, p. 952-57.

In nature, the form of all organisms is determined by their scale: an ant the size of a mouse would suffocate for lack of lungs, a mouse the size of a cow would fall in under its own weight, a cow the size of an elephant would need legs as strong as columns and could hardly support its horns. Similarly, every scale of decision in politics needs its own 'shape', e.g. a style corresponding to its scale and no other. Only in mathematics are there 'scale-less' or 'scale-invariant' objects. As a mathematical object, a 'network' is scale-invariant, hence the danger of its transposition to politics. -See: Coing and Henry, in contrast: Dupuy (G), Kohr, d'Arcy Thompson

Halévy, Elie, *The Growth of Philosophical Radicalism*. Translated from the French by M. Morris, with a preface by John Plamenatz, Clifton, N.J.: Kelley Publications, 1972.

In this book, written just after the turn of the century, Halévy examines the conditions of the arise of a form of social thinking for which the worst of institutions could be the model for society at large. He calls **philosophical radicalism** the reduction to the 'organizing power of the worst', ultimately founded on the belief that the economy is the mother of social order. Halévy sees Jeremy Bentham's ideas as the prototype of that kind of thinking. -See: Bentham, Chadwick, Dumont, Richardson

a-Strasser

Handlin, David, *The American Home: Architecture and Society, 1815-1915*, Boston: Little, Brown and Co, 1979.

Handlin, David. "The chance to get rid of human waste", *The American Home: Architecture and Society, 1815-1915*, Boston: Little, Brown and Co, 1979, p. 463. -See: Bentham, Chadwick, Crapper, Fitch, Richardson, Strasser, Waring

Hardin, Garrett, "The Tragedy of the Commons", in *Science* vol. 162, 1968, p. 1243 ff.

For beginning readers into the literature on **the commons**, I would describe this pessimistic assessment of the 'impossibility', today, to have commons as the most 'anti-Pucci' statement of my bibliography. Or perhaps should I say, since chronologically Pucci comes after Hardin, that Pucci gives us hopes in spite of -and beyond - Hardin's pessimism. -See in contrast: Pucci

a-JR

Hardin, Garrett and Baden, John, ed., *Managing the Commons*, San Francisco: Freeman, 1977.

The concepts have been revisited, the pessimism remains. One author of this collective book, though - Beryl L. Crowe - considers the tragedy avoidable.

a-v.d.Berg

Harvey, William, *Exercitatio anatomica de motu cordis et sanguinis in animalibus*, Frankfurt, 1628. -See: Chadwick

a-JR

Heeb, Johannes and Schudel, Paul, *Naturnahe Abwasserreinigung*, Langenbruck (Switz.): Zentrum für Angepasste Technologie, 1987.

There exist two books with this same title. -See: Geiger

a-JR

Heller, G., '*Propre en ordre*', *Habitation et vie domestique 1850-1930. L'exemple vaudois*, Lausanne: Editions d'En Bas, 1978.

Mrs. Heller studies the 'sanitary revolution' in the paradise of cleanliness, Switzerland. See: Crapper, Fitch, Giedion, Handlin, Richardson, Schwartz-Cowan, Stern, Strasser, Tarr, Waring

a-JR

Huber, Joseph, *Die verlorene Unschuld der Ökologie*, Frankfurt am Main: Fischer, 1982. -See: Bossel, Michelson

a-JR

Hopping Stoner, Carol, ed., *Goodbye to the Flush Toilet. Water-Saving Alternatives to Cesspools, Septic Tanks, and Sewers*, Emmaus, PA: Rodale Press, 1977.

Particularly valuable is the chapter on gray water, p. 161 ff., and in this, the report on the Small Scale Waste Management Project of the University of Wisconsin (One Agriculture Hall, University of Wisconsin, Madison WI 53 706). -See: Aforve, International Reference Centre for Waste Disposal, Kickuth, Lehmann, van den Ryn, Warshall

Illich, Ivan, *Limits to Medicine: Medical Nemesis - The Expropriation of Health*, New York, Random House, 1976. -See: Dupuy and Robert.

Illich, Ivan, *Tools for conviviality*, London: Calder and Boyars, 1973.

Illich, Ivan, *Gender*, New York: Pantheon Books, 1982 (1). -See: Bourdieu, Robert 1994

a-JR

Illich, Ivan, "Über die ökumenische Ver-Wirung", in:____, *Vom Recht auf Gemeinheit*, Reinbek bei Hamburg: Rowohlt, 1982 (2), pp. 94-99. - See: Sachs (2)

a-JR

Illich, Ivan, *H₂O and the Waters of Forgetfulness*, Dallas: The Dallas Institute for Humanities and Culture or Berkeley: Heyday Books, 1985. -See: Rykwert

Illich, Ivan, "Die Gesellschaft in den Fangen der Bedürfnismacher", Jürgen Dahl and Hartmut Schickert, ed., *Die Erde weint. Frühe Warnungen vor der Verwüstung*, München, Stuttgart: Deutscher Taschenbuchverlag and Klett, 1987, pp. 179-187.

Professionals have become 'need-makers'. -See: Bradshaw, Cochrane, Groenemeyer

Illich, Ivan, "Alternatives to Economics: Towards a History of Waste", speech to *The Eastern Economic Association Meeting, Human Economy Session*, Boston, March 11, 1988.

Waste reveals the true nature of the economy, which is **disvalue**. Disvalue is prior to value in that before any value to be produced, genuine capacities have to be disvalued in order to make the new value 'a need'. -See: Robert 1992, Tamanyo

Illich, Ivan, *In the Mirror of the Past*, London: Marion Boyars, 1992.

Illich, Ivan, "La sombra que tiende nuestro futuro", Opciones no. 41, México, August 6, 1993, p. 18.

Illich, Ivan and friends, "Declaration on soil", -See: Groeneveld, Sigmar, Hoinacki, Lee, Illich, Ivan and friends

Informal Working Group on Small Irrigation -See: Water Engineering and Development Centre

a-HIC

International Conference on Water and the Environment, *The Dublin Statement*, Dublin, January 26-31, 1992.

"Scarcity and misuse of freshwater pose a serious and growing threat to sustainable development and protection of the environment" (p. 1). The participants called for fundamentally new approaches to the assessment, development and management of freshwater resources. The Conference's slogan was: **water and sustainable development**. Four were the principles recommended to participants:

- **Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment.**
- **Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels.**
- **Women play a central part in the provision, management and safeguarding of water.**
- **Water has an economic value in all its competing uses and should be recognized as an economic good.**

The reader will notice that the fourth point is the opposite of the principle of gratuitousness that I defend in this study.

The other recommendations of the Conference were presented under the following headings:

- **alleviation of poverty and disease:**

give priority to water resources development, accelerated provision of food, water and sanitation;

- **protection against natural disasters:**

economic losses from natural disasters, including floods and droughts, increased threefold between the 1960s and the 1980s; climate change may exert a much bigger toll; the Conference recommended the fostering of a **preparedness to catastrophes**;

- **water conservation and reuse:**

curb excessive waste: for instance, agriculture (some 80% of withdrawals) loses up to 60% of withdrawn water;

recycling of industrial water (could favor a reduction of 50% or more)

multiple use of water (which requires effective discharge standards to protect successive downstream consumers);

- **sustainable urban development:**

after a generation or more of excessive water use and reckless discharge of municipal and industrial wastes, the situation in the majority of the world's cities is appalling and

getting worse; as water scarcity and pollution force development of ever more distant sources, marginal costs of meeting fresh demands are growing rapidly;

- agricultural production and rural water supply:

agriculture shall not only provide food, but also save water; challenge: **water-conserving** and **water-regenerating agriculture**; new concepts for rainfed and irrigation agriculture; rural population must have a better access to sources and alternatives to the conventional sewer;

- protecting aquatic ecosystems:

earth-water-air matrices must be respected;

- resolving water conflicts:

the declaration recognizes that water is an important motor of peace-making.

In spite of the mandatory **water-scarcity revelation ritual** that seems to have become an inevitable landmark of 'global thinking' and every meeting enacting it, this document offers new perspectives on such crucial issues as the necessity of a 'new approach', alternative water technologies, and, last but not least, the possible contribution of transboundary agreements to peace. -See: Habitat International Coalition, 1991, International Secretariat for Water, Luijff, Montreal International Forum (the 'Montreal Charter'), *Safe Water 2000* (the 'New Delhi Declaration')

a-CITA

International Reference Centre for Wastes Disposal, "On-Site Sanitation and Groundwater: The Pollution Risk", *IRCWD News* no. 16, January 1982, Dübendorf, Switzerland.

International Reference Centre for Wastes Disposal, "Emptying On-Site Excreta Disposal Systems in Developing Countries: An Evaluation of the Problem", *IRCWD News* no. 17, August 1982, Dübendorf, Switzerland.

It does not seem to be the best technique. The more modest Vietnamese latrine does a better job at lower cost. -See: Above

International Reference Centre for Wastes Disposal, "Community Water Supply and Sanitation Programme of the Western Development Region of Nepal", *IRCWD News* no. 18/19, December 1983, Dübendorf, Switzerland. -See: Habitat 1986, Water Engineering and Development Centre

International Reference Centre for Wastes Disposal, "Horizontal-flow Roughing Filtration: An Appropriate Pre-treatment for Slow Sand Filters in Developing Countries", *IRCWD News* no. 20, August 1984, Dübendorf, Switzerland. -See: Hopping Stoner

Equipment in Gaboone (Botswana)*, *IRCWD News* No 21/22, Dübendorf, Switzerland. -See: Aforve, *IRCWD News* no. 16

International Reference Centre for Wastes Disposal, "Health Aspects of Nightsoil and Sludge Use in Agriculture and Aquaculture", *IRCWD News* no. 23, December 1985, Dübendorf, Switzerland. -See: Goldstein

International Reference Centre for Wastes Disposal (Lewis, John, W., et al., ed.) *The risk of groundwater pollution by on-sites sanitation in developing countries. A Literature Review*, Dübendorf, Switzerland: International Reference Centre for Waste Disposal, 1980. -See: Strauss, Warshall

International Secretariat for Water, Non Governmental Organizations in Interaction toward Water Supply and Sanitation, *Report of the International Forum NGOs - Water - Environment Strategies for the Future*, December 12-14, 1991, Strasbourg.

This UNDP and World Bank sponsored meeting issued the following statements (from chairman Sanjit Bunker Roy's address): "... the provision of drinking water and of safe sanitation all over the world in disadvantaged and poor communities living in rural and urban areas is no longer a technical problem. Increasingly, it is becoming more a social, political and economic problem of accessibility and of a just distribution of water. In many areas where the communities have been made aware through the efforts of voluntary agencies and NGOs, the demand for drinking water and sanitation as a right has put pressure from below on the government and donor organizations to change their strategies and look for alternative solutions that are low cost, innovative and which respond to the real needs of communities" (p. i). "The question of ownership of the infrastructure and control of scarce natural resources - by the communities themselves who are the actual end users - has to be addressed very seriously by governments and international donor agencies" (p. i).

The report recommends a more intense involvement of women and grassroots populations in general in the **selection and certification of potability**:

"Like war is too big an issue to be left to the generals alone, drinking water and safe sanitation [are] too crucial an issue to be left to engineers and technocrats" (p. i).

When war is left to generals, granted that it is made. The issue is to avoid making it by politically 'coming to terms'. Similarly, when questions of water are left to engineers and technocrats, it inevitably becomes a scarce good. The issue is to avoid scarcity: "The issue of self-respect within communities and the development of confidence in their own capabilities can be addressed only if voluntary groups, NGOs, governments and international agencies start trusting in the power, capabilities and potential of the communities to tackle their own problems. Only then will communities have enough space to grow and reduce their dependency on external [scarce] resources" (p. i).

Traditionally, it must be recalled, societies have the ability to symbolically avoid the invidious confrontation of individuals for limited stocks. This ability must be trusted,

restored, and regenerated. It is that popular ability which is expressed by words like *salam* or *shalom*.

- Governments are disengaging from their conventional role as providers of services and financiers of the development of social infrastructures, such as water policies and sanitation services. The conditions of this disengagement must be carefully analyzed. In the best of cases, governments become promoters and facilitators for planning and implementation: they set the rules, refraining from 'playing the game': "Governments are expected to provide guidance and support to this strategy, to coordinate the allocation of resources, and to ensure the application of national standards and regulations" (p. 1).

- Communities are encouraged to become active (p. 1) while power is increasingly decentralized and authority is devolved to the non-governmental sector.

One of the activities put forth by the International Secretariat for Water was the organization of the so-called regional '**H₂O seminars**' (p. 3). -See: Habitat International Coalition, 1991, International Conference on Water and the Environment (the 'Dublin Statement'), Montreal International Forum (the 'Montreal Charter'), Safe Water 2000 (the 'New Dehli Declaration'), Turner (on autonomy)

a-JR

Jacobs, Jane, *The economy of cities*, New York: Vintage Books (Random House), 1969.

This very imaginative book contains an early plea for overall **dry sanitation** in cities: "... the first priority in dealing with water-borne wastes (...) is to keep them out of the water to begin with, if at all possible - to collect them in some other way. This is indeed possible with some water-borne wastes: those that are in the water only and solely because the water is a means of carrying them away (...). Human excrements are in this category; to carry these wastes away by flowing water is extraordinarily primitive. It is amazing that we continue to use such old-fashioned makeshifts. Excrements in sewage complicate the handling of all city waste waters, including even the runoff from rainstorms, and exacerbates all the problems of public health connected with water pollution" (pp. 114, 115).

Another aspect of this work makes it especially valuable: it is the author's deep insight into the deep nature of cities and the anthropological processes that bring them forth. In the beginning of the book - written just after the Braidwoods, Mellink and others had launched the archeology of **neolithic urbanizations** in the Near East - Jacobs formulated the controversial thesis that cities appeared before any agriculture. -See: Afiorve, Berry, Lehmann, and, for the archeological part: McNeish, Mellaart, Muschg, Rykwert

Joseph, Isaac, "L'enjeu des réseaux. Notes de lecture", George Amar et al., ed., *Groupe de recherche 'Conception de Réseau*, Comptes-rendu de la séance du 6 décembre 1985, Paris: RATP, 1985.

According to Joseph, the description of a relation in terms of a 'network' does not speak of its content, but only of its 'form'. A mathematician would recall that, for him, a network is a scale-invariant object and as such a poor descriptor of reality. -See: Amar, Coing and Henry, Dupuy G., Dupuy J.-P., Tarr; -See in contrast: Haldane

K

a-JR

Kalbermatten, John, DeAnne, Julius and Gunnerson, Charles (World Bank), *Appropriate Technology for Water Supply and Sanitation*, Washington: World Bank, 1980.

This study is good on septic tanks and pour-flush toilets but far from convincing on dry sanitation.

a-HIC

Kalbermatten, John and Middleton, Richard, *Future Directions in Water Supply and Waste Disposal*, draft. -See: Water Engineering and Development Centre

a-JR

Kickuth, Reinhold, "Das Wurzelraumverfahren in der Praxis. The Application of the 'Rootzone Process'", in: *Landschaft und Stadt*, 16. Jahrgang, 1984, Stuttgart: Eugen Ulmer, pp. 145-153. -See: Añorve, Geiger, Habitat 1986, Hopping, Stoner, Lehmann, Small Scale Waste Management Project, Warshall

Kohr, Leopold, "Critical Size", in: *Resurgence*, vol. 1 no. 8, July/August 1967, pp. 8-11.

Leopold Kohr, who was E.F. Schumacher's teacher, in a master of 'dimensional analysis' and 'social morphology' in the spirit of d'Arcy Thompson and Haldane. Schumacher owes him his notion of the right scale. -See: d'Arcy Thompson, Coing and Henry, Haldane

a-JR

Koschorke, Albrecht, *Die Geschichte des Horizonts. Grenze und Grenzüberschreitung in literarischen Landschaftsbildern*. München: Suhrkamp, 1990.

As the visible horizon limits the experienced landscape, there is in every region a 'hydric horizon' marked by its watersheds. -See: Corbin 1988, Robert 1994

L

Lacombe, Bernard and Martínez, Rogelio, *La boue et la poussière, Chalco, México*: UAM, ORSTOM, CCE, 1992. -See: Guerra, Musset, Panabière, Quadri, Ziccardi

a-JR

Lange, Gaby, "Wasser ohne Wahl", *Die Tageszeitung*, Berlin: World Media, 30 May 1992, p. 34.

a-JR

Lave, Sue and de Waard, Kors, *Blair Latrines Builders Instruction Manual*, Harare, Zimbabwe: Ministry of Health.

Co-financed by the World Bank and the German Society for Technological Cooperation (GTZ), this improvement of the pit latrine is now obsolete and surpassed by the recent improvements of the Vietnamese latrine. -See: Brandenburg, Kalbermatten, World Bank (Parlato), In contrast: Añorve, CEMAT, Lehmann, Nguyen

Leckie, Jim, Masters, Gil, Whitehouse, Harry and Young, Lily, *Other Homes and Garbage*, San Francisco: Sierra Club, 1975. -See: Farallones

Le Goff, Jacques and Guieysse, Louis, *Crise de l'urbain, futur de la ville*, Paris: Editions Economica, 1986.

Many texts exemplifying the network ideology are to be found in the proceedings of a seminar organized by RATP, the company that runs the Parisian subway. Surprisingly, the medieval historian Jacques Le Goff is one of the editors of these proceedings. This does not give any historical legitimacy to the 'network view' on society, but should rather have incited the historians attending the seminar to take an intellectual purge! -See: Dupuy (J.-P.), Haldane, Thompson

a-JR

Lehmann, Pierre, "La pollution des eaux, notre responsabilité à tous", speech delivered at the *35èmes Journées Internationales du CEBEDEAU*, Liège, Belgium, 24-26 May 1982.

By the pioneer - a repented nuclear physicist - of overall dry sanitation in Switzerland, this essay is a critique of laws that favor centralization and repress decentralized, on-site treatment. It also contains interesting reflections on the domestic use of water - that makes up less than 10% of total water use - and on the 'machine that puts shit in drinking water' - the flush toilet. -See: Oswald

a-JR

Lehmann, Pierre, *Essais avec des toilettes à compostage. Gestion de l'eau et des 'déchets' organiques dans l'habitat*, Vevey, SEDE, 1983.

The toilet built by Lehmann belongs to the 'two vaults alternating composting toilets' in which one vault is alternatingly in activity while the other is the site of a slow maturing process. That type of toilet has also been evolved from the Vietnamese toilet. The novelty is that, while in most of the toilets inspired by that example, the two vaults are of equal size, Lehmann's toilet consists basically of a small, domestic container of a one week capacity while the other 'vault' is a collective container located in the court or in the basement.

The first container is a bucket to be placed under the toilet seat. Thanks to the adjunction of a biologically very active substance made out of grape residues, the composting process in the bucket is so intense that no odors are produced, while its heat evaporates liquids, which are expelled through a special pipe. Once a week, the bucket is emptied into the large collective container.

This rough description does not translate the sophistication of the experiment. Lehmann has worked with 'pilot households' that accepted the drawbacks of a pioneering technology and contributed to correct them. For instance, a user has proposed that a cheap pasteboard, analogous to the one used for making egg boxes, be shaped into a size corresponding to the inside of the bucket, so that it will coat it, avoiding any visible soiling. It is that box that is thrown into the collective container. After a two year maturation process, the content of the collective container makes an excellent organic fertilizer.

It is not intended that every household should be converted overnight to all-dry sanitation. But it is an experiment that should be followed, because it reveals that dry sanitation has much more potential than generally assumed. -See: Añorve, Berry, Huppig Stoner, Jacobs, van der Ryn, Warshall

a-JR

Lehmann, Pierre, *Gestion de l'eau et recyclage des matières organiques dans l'habitat. L'utilisation de toilettes à compostage*, Vevey: SEDE, 1983.

This text is a short version of the former.

León Portilla, Miguel, *Los antiguos Mexicanos a través de sus crónicas y cantares*, México: Fondo de Cultura Económica, 1961.

León Portilla, Miguel, *El reverso de la conquista*, México: Joaquín Mortiz, 1964, p. 38 ss. -See: Broda

a-JR

Leroi-Gourhan, André, *Le geste et la parole*. Paris: Albin Michel, 1965.

This text is important for the study of primordial space-orienting practices. The significance of water in these practices should be better explored. -See: Bourdieu, Robert 1994

Lomnitz, Larissa, *Cómo sobreviven los marginados*, México: Siglo XXI, 1984.

Lomnitz, Larissa, "Supervivencia en una barriada de la Ciudad de México", en *Demografía y Economía*, vol. 7, no. 1, 1973, pp. 58-85.

a-JR

Loraux, Nicole, *The Invention of Athen*. Cambridge, Massachusetts: Harvard University Press, 1986 (1981).

Loraux describes Athenian democracy in the 5th Century B.C. as a 'men's club'. Yet this was balanced by the 'women's councils' around wells and in patios of which Aristophane's comedies are full.

Low Cost Water Supply and Sanitation -See: Water, Engineering and Development Centre

a-JR

Luij, Reginald and Tijmes, Pieter, "Kanttekeningen bij het Brundtlandrapport", in: Petran Kockelkoren, ed. *Boven de groene zoden. Een filosofische benadering van milieu, wetenschap en techniek*, Utrecht: Jan van Arkel, 1990, pp. 59-70.

A Spanish translation from the Dutch by J. Robert was published in Opciones, México. See: Dogra, Habitat International Coalition 1991

s-Strasser

Lynd, Robert, S. and Helen, *Middletown: A Study in Modern American Culture*, New York: Harcourt, Brace and World, 1929.

'The' pioneering work in community studies.

M

a-JR

Mangin, William, ed. *Peasants in Cities. Readings in the Anthropology of Urbanization*, Boston: Houghton Mifflin, 1970.

See chapters 2 and 4 as well as chapter 1, a reprint of Tumer's seminal paper. William Mangin, a psychologist and sociologist, spent part of the 1960s living in several *pueblos jóvenes* of Lima, which is where he met John Tumer, a young British architect from the A.A. School of Architecture. Both Mangin and Tumer were influential in shaping present-day ideas about 'squatter settlements', 'shanty towns', 'barriadas' and 'favelas' and their dynamism.

Mangin studied 'communities in the making' in Lima's *pueblos jóvenes* and what happens to them once 'established'. -See: Cabannes, Coing and Henry, de Boismenu, Ortiz, Sousa Santos, Tumer

a-JR

Mariaca, Eduardo y Narváez, Yuriria, *Soluciones Alternativas, Nueva Santamaría*, Cuemavaca: Universidad Autónoma del Estado de Morelos, 1992. Thesis for the obtainment of license in Architecture. Design assistant: Jean Robert.

This thesis is an intelligent application of the achievements of César Añorve to a neighborhood in the process of consolidation in the outskirts of Cuemavaca. One of its authors, a devoted sculpturist, conceived the steel molds with which Añorve's workshop currently produces 120-150 toilets monthly. By special permission of the authors, Añorve used part of the data of Mariaca y Narváez in his report of activities (Añorve, 1994). See: Añorve

a-JR

Maruyama, Makoto, *Economy and living system*, paper presented at the 4th World Congress of Social Economics, Toronto, 13 August 1986.

Written by a pupil of Tamanoy, this essay is a critique of formal economics, inspired by the works of Georgescu-Roegen. -See: Robert, 1992, Tamanoy

a-JR

McNeish, Richard, *The Prehistory of the Tehuacan Valley, vol. 4: Chronology and Irrigation*, Austin: University of Texas Press, 1972. See: Jacobs, Mellaart

a-JR

McPhee, John, "Water War", in: *The New Yorker*, 26 April 1993.

The dry valleys of Eastern Nevada are 'waterlogged basins' ('saturated' valleys): they contain remains of Pleistocene rainfall that naturally emerges as spring creeks and seeps. Hundred of miles south of the saturated valleys, Las Vegas wants the water. A city of nearly one million, Las Vegas has less rain than some places in the Sahara. In Nevada groundwater can be purchased and transported from one basin to another. Las Vegas has applied itself to drill the waterlogged basins and pump the fossil water to its waterworks. As permanent springs go dry, the flora and fauna of the 'saturated valleys' will die forever, and due to the pumping the surface of the earth will sink up to six feet. Los Angeles identically made dust of the Owens Valley. There are proposals to send water from Alaska to California (in an undersea pipeline) and to Texas (in an overland pipeline). -See: Fourth World Review

Meadows, Donella H. et al., *The Limits to growth, A Report for the Club of Rome's Project on the Predicament of Mankind*, New York: Universe, 1974.

a-JR

Mellaart, James, "A Neolithic City in Turkey", in: *Scientific American*, April 1964.

Mellaart turned Gordon Childe's hypotheses about the beginnings of cities upside down. While for Childe the accumulation of agrarian surpluses must precede all division of labor and hence all primitive forms of 'urban life', for Mellaart, city life - along with pottery, weaving, the first true domestication of plants and animals - was 'invented' in pre-agrarian settlements. In Catal Hüyük, an Anatolian settlement from the 8th millenary before Christ, Mellaart found the first seeds of cultivated wheat ever discovered. Since it was imaginatively retaken by Jane Jacobs, this hypothesis over the transition from paleolithic to neolithic cultures is also known as the Mellaart-Jacobs 'city-first' thesis. See: Jacobs, McNeish, Muschg, Robert, 1994

Méndez, Aurelio -See: World Bank, 1988

a-JR

Merino y Guevara, Hector, *Provisión de agua y drenaje en las ciudades mexicanas. Un reto permanente*, México: Banco Nacional de Obras y Servicios Públicos (BANOBAS), 1985, manuscript.

a-JR

Metton, Alain and Bertrand, Jean -M., "Les espaces vécus dans une grande agglomération", in: *L'Espace Géographique*, no. 2, 1974, pp. 137-146.

The authors report about their research on space perceptions among school children of the Paris region. Pupils were asked to draw their home and the surrounding space. The drawings of the pupils living in Paris express a perception of space quite different from that of the children living in the suburbs.

a-JR

Michelsen, Gerd, *Der Fischer Öko Almanach. Daten, Fakten, Trends der Umweltdiskussion*, Frankfurt am Main: Fischer, 1980. -See: Bossel, Huber

a-HIC

Mikkelsen, Britha, Yulianti, Yanti, and Barré, Anton, "Community involvement in water supply in West Java", *Environment and Urbanization*, vol. 5, no. 1, April 1993, pp. 52-67.

This paper exposes an interesting conservation concept, the **IKK concept**. Indonesia's situation is very special: the country is relatively well endowed with water and cultural practices reflect a **sense of abundance of water** which is not strictly quantitative. Praying involves ritual washing five times a day. Personal washing is connected with splashing to a degree which in other societies would be considered a nuisance. In this context, piped water is only a minor share of the total supply. **Running water is considered of vital importance to water quality and purity**. Households with domestic water connections are accustomed to a continuous water flow into a *bak mandi* - a water storage basin the size of a large bath tub. It is in this context that the original IKK concept was developed. The core idea is the following: supply as many households as possible in a culturally acceptable way, that is with a continuous flow into a *bak mandi*. The quantities are of course not 'European!' 50 liters per house connection per day, 250 liters a day per public tap are perceived as sufficient.

IKK stands for Ibu Kota Kecamatan. A *kecamatan* is a subdistrict, a group of *desa* or villages. Few societies are characterized by such a high degree of community organization as Indonesia. There are many structural levels of organization:

- the *das wisma* (consisting of approximately ten households),
- the *rukun tetangga* (neighborhood units of 30-40 households),
- the *rukun warge* (comprising some seven *rukun tetangga*),
- the *desa* or village (or small town),
- the subdistrict or *kecamatan*,
- then the *kabupaten* or district, *asf.*

The IKK concept is an example of a water-bound 'scaled' organization that would be killed by integral piping. -See: Bayari, Whittington 1990

Mitlin, Diana -See: Habitat International Coalition

a-HIC

Monro, Mary, ed. *Water Technology International*, London: Century Press, 1991. -See: Bays, Pickford

a-HIC

Montreal International Forum, *Montreal Charter*, Montreal, 18-20 June 1990.

The 'Montreal Charter' rightly stresses **access to water**. Yet the Charter's main weakness is that it does not distinguish between claims to piped water and scaled access to and control of the sources. However, the Charter is correct in giving explicit priority to persons - to people - before industries or state agencies. It even recognizes the urgent need of a clear definition of the 'necessary - legal? - conditions' of that priority, but does not propose any practical rules. The 'Montreal Charter' insists that 'no discrimination in access to water should be tolerated'. What could be the corresponding rule? I contend that the rule warranting access to water to all can only re-enact the traditional **protection of the weakest's subsistence**.

The 'Montreal Charter' has more noteworthy amenities, for instance:

- It suggests the existence of a strong link between "**sustainability**" and **autonomy**, a crucially right thought since the deep political significance of water is that it is formative of communitary links.

- It denounces institutional threats against access to water. These, as other abuses, should be better analyzed.

- It proposes the formation of **permanent associations** of 'water-concerned' citizens.

See: Habitat International Coalition 1991, International Conference on Water and the Environment (the 'Dublin Statement'), International Secretariat for Water, Safe Water 2000 (the 'New Dehli Declaration')

a-HIC

Mü, Bernd, "Acuarios en Renania: almacén de conocimientos sobre el agua", *La Jornada*, 6 August 1992, p. 2.

The World's first Museum of Water was inaugurated in April 1992 in Mülheim, in the Ruhr. A 50 meter high water tower built at the beginning of the century shelters this Aquarius Museum. The promotor of the project was the Rheinisch-Westliche Wasserwerke.

14 water-related themes are presented to the public. The director, Gerd Müller says: "The best archives on water have been consulted. The world's best are the ones of the BBC in London".

He adds: "Only when man will have learned to appreciate water in all its uses and (...) cease to waste or pollute it, will the cost of production of drinking water cease to skyrocket". -**See:** British Broadcasting Corporation, Greenpeace

a-JR

Muschg, Adolf, "Der Mensch folgt dem Wasser", *Die Tageszeitung*, Berlin: World Media, 30 May 1992, p. 28.

This essay by a leading (Swiss) German writer is especially inspiring on the links between water and community, peace and law. -**See:** Böhme, Illich 1985, Pucci, Robert 1994

Musset, Alain, *De l'eau vive à l'eau morte, enjeux techniques et culturels dans la vallée de Mexico*, Paris: Editions Recherches sur les Civilisations, 1991. Spanish translation as *El agua en el Valle de México, siglos XVI-XVIII*, México: CEMCA/Pórtico de la Ciudad de México, 1992.

This is a master work on the concepts of water in the prehispanic, the Spanish and the colonial worlds, accompanied by chronicles of daily life, of the wells and springs and of the first artificial effluent of the false 'valley' of Mexico. The author also draws comparisons between the state of colonial hydraulic science in the 'Mexico Valley' and the Greek and Roman heritage in the friars' culture. -See: Guerra, Lacombe, Panabière, Quadri, Ziccardi

N

Nguyen Dang, Duc, et al. *Human Faeces, Urine and their Utilization*, translated from the Vietnamese by Tuan, V.A. and Tam, D.M., Bangkok: Environmental Sanitation Information Center (ENSIC), 1981.

This 53 page book is a verbatim translation from the Vietnamese of a manual meant to be read and used by Vietnamese farmers. For many groups in Europe and America, this translation has been the access door to Dr Nguyen's work and the Vietnamese experience with dry sanitation. -See: Aforve, CEMAT, CETAL, Lehmann

Obladen, Nicolau and Melto Garcias, Carlos, "Tecnologías apropiadas ao saneamento ambiental de baixo custo para zonas urbanas periféricas e/ou marginais: o sanamento progresivo", conference presented at the *1er Seminario Latinoamericano sobre Saneamiento Alternativo*, Medellín (Colombia), July 24 to 29, 1987.
See: ENDA

Olowski -**See:** Farallones

Ortega Hernández, Juan Luis, "Nuevas tecnologías para el manejo de aguas residuales", in: Gabriel Quadri de la Torre, compilador, *Aguas Residuales de la Zona Metropolitana*, México: Fundación Friedrich Ebert, Departamento del Distrito Federal, 1989, p. 69-88.
See: Kickuth, Lehmann, *Low Cost Water Supply and Sanitation*.

a-HIC

Ortiz Flores, Enrique, *Housing policies in the context of metropolitan urban growth*, in: Cités Unies, *Les villes, moteurs du développement économique des pays du tiers monde?* Lille, 6-10 November 1989, vol. 2, pp. 487-494.

In his vigorous pleadings for people's freedom to build, the author - who is the Executive Secretary of Habitat International Coalition - remarks that the imposition of rigid housing standards "has made the settlements of the poor illegal and has meant the construction of a world which is monotonous and boring." -**See:** Cabannes, Coing and Henry, Margin, Turner

a-HIC

Ortiz Flores, Enrique, "Interacción Agua-Saneamiento-Energía en la Perspectiva de un Desarrollo Urbano Sustentable: El caso de la Ciudad de México", Presentation in Global Forum, Rio de Janeiro, 1 June 1992.

Oswald, Ursula and Serrano, Jorge, ed., *El recurso agua en el Estado de Morelos y problemas de contaminación*, México: UNAM, 1991.

P

Palerm, Angel y otros, *México prehispánico*, México: Cultura y Artes, 1990. -See: Viqueira, Wittfogel

Panabière, Louis, *Cité aigle, ville serpent*, Perpignan: Presses Universitaires de Perpignan, 1993.

This is a 'Mexicanist's' view on our city. -See: Guerra, Lacombe, Musset, Quadri, Ziccardi

a-JR

Parra, Luis, *Letrinas aboneras a base de tambor*. Experiencia de CETAL, Valparaíso: Centro de Estudios en Tecnologías Apropriadas para América Latina (CETAL, Casilla 197-V, Valparaíso, Chile).

The alternative presented here is part of the descent of Dr Nguyen's Vietnamese 'two vault latrine'. Parra fully acknowledges this filiation "through Peter Warshall and the Mexican experience" (see p.4). -See: CETAL, CEMAT, Nguyen, Warshall

a-HIC

Pickford, John ed., *Developing World Water*, London: Grosvenor Press International, vol. 4 and 5.

"Good quality, easily available, safe water makes a tremendous difference to the quality of life". -See: Bays, Monro, Safe Water

a-JR

Pitot, Hanns-André, *Proposal for municipal solid waste management in Centre County. A paper in environmental pollution control*, submitted in partial fulfillment of the requirements for the degree of Master of Engineering, State College: The Pennsylvania State University, The Graduate School, October, 1986.

Pitot, a (very fluently) Dutch-, French-, German- and English speaking Maurician educated at State College, a holder of several technical patents who has been Barry Commoner's assistant and who helped me organize the Second Latinamerican Seminar on Alternative Sanitation (México 1988, see ENDA) has recently founded a network "helping organize intensive recycling pilot projects". He wrote me, asking me to announce this service, which I thankfully do. His address is: Vrijheidslaan 129, NL 2806 KH Gouda, Netherlands.

a-JR

Polanyi, Karl, *The Great Transformation. The political and economic origins of our time*, Boston: Beacon Hill, 1957 (1944). -See: Dumont

a-JR

Polanyi, Karl, *The livelihood of man*, New York: Harcourt, Brace, Jovanovitch, 1977.

a-CITA

Postel, Sandra, "Increasing Water Efficiency", *State of the World*, New York, London: Norton, 1986, pp. 40-61.

This is a condensed version of the *World Environment Report*, 4 April 1984. -See: Cochrane, Cummings, Díaz, Esteva, Ferrier, Schechla

a-JR

Pucci, Gianozzo, *Acqua risorsa o gratuita meraviglia? Unicat Extracts*, 1991. -See: Illich 1985, Muschg, Robert 1994

Pucci, Gianozzo, *Per un programma con Firenze*, Florence, 1993, manuscript.

In this essay, Pucci argues that florentine humanism must be allowed to inspire an urban planning which be a recovery of the city by its people. One of the points of this program is "to allow people to recover the nightsky" (which can be understood as getting rid of excessive electric illumination as well as as recovering clear air).

Q

a-HIC

Quadri de la Torre, Gabriel, comp. *Aguas residuales de la Zona Metropolitana de la Ciudad de México*, México: Fundación Friedrich Ebert, 1989. -See: Guerra, Lacombe, Panabière, Ziccardi

R

Ramachandran, Arcot -See: Habitat International Coalition, 1991

Reyes, G., Cayetano, *El altepetl y la reproducción de la cultura nahua en la época colonial*, Zamora, Michoacán: El Colegio de Michoacán, s.f. -See: Broda

a-JR

Richardson, Benjamin Ward, ed. *The Health of Nations. A review of the work of Edwin Chadwick. With a biographical dissertation*, London: Dawsons of Pall Mall, 1965 (1887).

Through Chadwick, Benthamite utilitarianism was allowed to engender the **sanitary revolution**: "However long the time may be, however far back the historian may have to look, he will feel, we doubt not, that in this man some particular interest was embodied; that the man did some work or works which exerted a striking influence over his time, and caused great changes in its social system: and yet there will be a haze about him which will be scarcely penetrable. The man did and did not. He made laws? Yes. Was he then a Legislator? No, not even a member out of office in the Lower House. Did he do something for sanitary improvements? Yes. Was he then a doctor? No; on the contrary, he had not much faith in doctors..." (p. xvii).

The Health of Nations was published when Chadwick was 87 years old. Some chapter headings are:

- *Life as a commercial problem* (ch. IV, p. 41 ff.)
- *Sickness amongst the masses* (ch. VI, p. 56 ff.)
- *Registrations of births, marriages and deaths* (ch. VIII, p. 76 ff.)
- *The physiological limits of mental labour* (2nd Book, ch. VI, p. 176 ff.):

"The capacity of attention is found to be greater in cold weather than in hot, in winter than in summer..." (p. 177). [Too bad for us, Mr Chadwick: our essay has been written during a hot tropical summer].

- *House drainage* (2nd Book, ch. XXIII, p. 192 ff.)

Here are exposed the **"sanitary principles of defence of the first General Board of Health"**, which was meant as defence against **"cholera's visitations"** that had become more frequent since the invention of the W.C. This chapter also contains a critique of the "enormously wasteful error of the combined system" which has befallen Boston and other places [and will, in spite of Chadwick, befall London].

- *The separate system of town drainage* (2nd Book, Ch. XXIV, p. 204 ff.) delves into the same argument: "The sewage to the land, the rain to the river", that means that the storm water of a town should be separated from its sewage. Chadwick was in favor of the separate system... but it was the other that was realized: the system carried out by the Metropolitan Board of Works was the **combined system**. -See: Bentham, Crapper, Chadwick, Fitch, Giedion, Heller, Schwartz-Cowan, Strasser, Tarr, Waring

Richardson, Benjamin Ward, *Hygeia, a City of Health*, London: Macmillan and Co, 1876.

This sanitary utopia was the object of an address by Richardson before the Health Department of the Social Sciences Congress in October 1875. "I have projected a city that shall show the lowest mortality" (p. 17, 18).

a-JR

Robert and Dupuy, 1975 -See: Dupuy, Jean-Pierre, and Robert, Jean

a-JR

Robert, Jean, *Le Temps qu'on nous Vole*, Paris: Le Seuil, 1980.

This is a study of the counterproductivity of industrial transportation that could be transposed to the counterproductivity of industrial sanitation. In both cases, local capacities are paralyzed by scale-less agencies. -See: Coing and Henry, Dupuy (J.-P.), Illich 1976

a-JR

Robert, Jean, 'Production', in Wolfgang Sachs, ed., *The Development Dictionary*, London: Zed Books, 1992, p. 177-191.
See: Illich 1988, Maruyama, Tamano

a-JR

Robert, Jean, *Zu Hause und unterwegs: Geschichte von Raumwahrnehmungen in Alteuropa* (Home and Abroad: A History of Space Perceptions in Old Europe), Hagen: Fernuniversität, 1994, textbook for the German Open University, 3 volumes.

In this essay I study fundamental space-orienting gestures - like the placing of stones on graves, lithoboly, the tracing of a house's limits - and their bearing to:

- basic myths like Hestia's and Hermes';
- the genesis of domestic - e.g. oriented, founded, centered and limited - spaces;
- the practice of hospitality.

These gestures, rites and myths define places. A history of water should take their significance seriously. -See: Bourdieu, Dumézil, Illich 1985, Leroi-Gourhan, Rykwert

Robert, Jean, 'El auge de la tecnología ambiental alternativa', in: *IFDA Dossier 67*, September/October 1988, p. 19-32.

Rodale, Robert, "Regenerative agriculture. A search for low-cost self-renewing solutions to farming problems. Emmaus, PA: Rodale Press, 1982.

The late Robert Rodale repeatedly described grain exports as exports of American soil and foresaw the now pending desertification of arable land. -See: Fourth World Review, McPhee, Postel

Rodale, Robert, "Regenerative Technology", in: *Resurgence*, no. 98, May - June 1983.

s-González

Rojas, T., ed., "La agricultura chinampera: compilación histórica". Chapingo, México: Colección Cuadernos Universitarios. Serie Agronomía, no 7, 1983. -See: Canabal, Gonzalez, Wilken

a-JR

Roy, A.K., et al., *Manual on the Design, Construction and Maintenance of Low-Cost Pour-Flush Waterseal Latrines in India*, Washington: United Nation Development Programme and (as executing agency) World Bank, 1984.

The 'low water cost' solution presented here is surpassed by the recent improvements of dry sanitation. -See: Kalbermatten, Laver, World Bank (Parlato); -See In contrast: Nguyen

Roy, Sanjit, Bunker -See: International Secretariat for Water, Non Governmental Organizations in Interaction toward Water Supply and Sanitation

Rubi, J. T., "El Programa de uso eficiente del agua en la Ciudad de México", paper presented at the *Seminario Regional de Investigación sobre Alternativas de Tecnología de Saneamiento de Bajo Costo para Zonas Urbanas Marginadas*, July 15-19, Lima: Centro Panamericano de Ingeniería Sanitaria y Ciencias del Ambiente (CEPIS).

The fundamental objective of this programme is to ensure that consumers can satisfy all their water-use needs with small quantities of water. -See: Añorve, Bayami, Coing and Henry, Lehmann, Low Cost Water Supply and Sanitation, Mikkelsen

Rudhardt, Jean, *Le thème de l'eau primordiale dans la mythologie grecque*, Bern: Francke, 1971. -See: Böhme, Grewe, Illich 1985, Sénéfiance

Rykwert, Joseph, *The Idea of a Town. The Anthropology of Urban Form in Rome, Italy and the Ancient World*, Princeton: Princeton University Press, 1976.

Though the relation between water and the foundation of a town is not extensively explored, this work - with Dumézil's - is one of the most comprehensive studies of foundation rites. -See: Dumézil, Illich 1985

S

a-JR

Sahab Haddad, Elías, "La lucha por el agua y contra el agua en el valle de México", conference presented at the seminar *Antiguas obras hidráulicas en América*, México, Palacio de Minería, April 26 1988. -See: Palerm, Gonzalez Tascon, Wittfogel

a-JR

Sachs, Wolfgang, ed., *The Development Dictionary. A guide to Knowledge as Power*, London: Zed Books, 1992 (1).

Sachs, Wolfgang, "One World", in: ____, *The Development Dictionary. A Guide to Knowledge as Power*, London: Zed Books, 1992 (2).

This article is one of the most articulate critiques of 'global thinking' ever written. -See: Esteva

a-HIC

Safe Water 2000 Global Consultation, *The New Dehli Declaration*, closing session of the International Drinking Water Supply and Sanitation Decade, September 10-14, 1990.

The motto of Dehli was: **share water in more equitable ways**. Four guiding principles were formulated:

- The protection of the environment and of health by means of an integrated management of water resources and of liquid and solid wastes;
- Institutional reforms promoting an integrated approach involving changes of procedures, attitudes and behaviors and the full participation of women;
- Community management of water services, legal enforcement of local institutions;
- More healthy financial practices and use of appropriate technologies. -See: Habitat International Coalition 1991, International Conference on Water and the Environment (the 'Dublin Statement'), International Secretariat for Water, Montreal International Forum (the 'Montreal Charter')

a-JR

Sahlins, Marshall, *Stone Age Economics*, Chicago and New York: Aldine-Atherton, 1972.

So-called 'primitive societies' are so organized as to avoid the experience that modern man calls scarcity. -See: Dumont, Dumouchel, Polanyi

Sahlins, Marshall, *Culture and practical reason*, University of Chicago Press, 1977.

Salako and Akinola -**See**: Water Engineering and Development Centre.

s-Dumouchel

Samuelson, Paul, *Economics from the Heart: a Samuelson Sampler*, Newtown: Horton, Thomas and Daughters, 1973.

That scarcity is the foundation of all economic reasonings could hardly be stated more clearly than as Samuelson does in his introductory chapter. -**See**: Dumouchel

a-HIC

Schechla, Joseph, *The Price of Development, Mexico*: Habitat International Coalition, 1992.

Joseph Schechla is a member of the Housing Rights Subcommittee of HIC. He was a member of the first team of the Narmada International Human Rights Panel organized by the Environmental Defense Fund and the Bank Information Center of Washington. Schechla recalls Jawa Harlal Nehru's apothegm: 'People should develop along the lines of their own genius, and the imposition of alien values should be avoided' and demonstrates that sadly that is not what is done in modern dam projects. -**See**: Cummings, Díaz, Ferrier, Habitat International Coalition, draft, Postel

a-JR

Schivelbusch, Wolfgang, *The Railway Journey. Train and Travel in the 19th Century*, Oxford: Basil Blackwell, 1980 (German original: *Geschichte der Eisenbahnreise. Zur Industrialisierung von Raum und Zeit im 19. Jahrhundert*, Frankfurt am Main: Ullstein, 1979 (1977).

Just like the history of the railroad, the history of piped water is a chapter of "the industrialization of spaces and times". Such histories of the nascent material culture of the industrial age deserve careful comparative studies. -**See**: Giedion, Strasser

Schumacher, Ernst, Fritz, *Small is Beautiful, Economics As if People Mattered*, New York: Harper & Row: 1975. -**See**: Haldane, Kohr, Thompson

s-Strasser

Schwartz Cowan, Ruth, "The Industrial Revolution in the Home: Household Technology and Social Change in the 20th Century",

Technology and Culture 17, January 1976, 4. -See: Bentham, Crapper, Chadwick, Fitch, Giedion, Heller, Richardson, Strasser, Tarr, Waring

a-Ilich

Sénéfiance, Publications du Cuerna, "L'eau au moyen âge", *Sénéfiance* 15, Université de Provence, 1984.

A collection of over twenty articles related to water use and symbolism in the middle ages, mainly in French. -See: Grewe, Ilich 1985, Rudhardt

a-HIC

Sharma, Kalpana, "Waiting for water. The experience of poor communities in Bombay", conference presented at the *Round Table on Water and Health in Underprivileged Urban Areas*, Sophia Antipolis, February 21-23, 1994.

Reading such a breathtaking account of the situation of whom is so poor that he is **waterless**, one has to admit that water has very effectively been made scarce. But shall one submit to the claim that, since 'there is scarcity', 'let's make it into the source of a 'new order''? Shall he not rather be recalled of the historical fact that cultures made the world liveable by protecting the poorest livelihood, that is his commons? -See: Hardin and, **in contrast:** Caba Martín, Pucci, Polanyi

Siegrist, Robert L., "Minimum Flow Plumbing Fixtures", *Journal AWWA*, July, 1983.

Small Scale Waste Management Project -See: Hupping Stoner

Smout -See: Water Engineering and Development Centre

Sousa Santos, Boaventura, de, **Law against law: legal reasoning in Pasargada law**, Phd thesis, Yale University, 1973. Reproduced in: CIDOC Cuaderno no. 87, Cuernavaca: CIDOC, 1974.

Sousa contrasts formal law with the customary law of a Rio favela and shows that the latter is better adapted to localities than written law. -See: Cabannes, Coing and Henry, Mangin, Ortiz, Turner

a-HIC

Starr, Joyce, "¿Ha empezado la guerra por el agua?", *La Jornada*, 6 August 1992, p. 7.

Two billion people depend on cooperation between countries for water. -See: Muschg, World Media

a-JR

Stern, "Die Geschichte des Klo", in: *Stern*, No 47-50, 1979.

This profusely illustrated 'history of the loo' shows how recent most of our sanitary certainties are. -See: Crapper, Fitch, Giedion, Handlin, Richardson, Schwartz-Cowan, Strasser, Tarr, Waring

a-JR

Stolpe, Harro, "Wasserversorgung aus dem Grundwasser", in: Hartmut Bossel, et al, ed., *Wasser. Wie ein Element verschmutzt und verschwendet wird*, Frankfurt am Main: Fischer, 1982, pp. 77-97. -See: Bossel, Huber, McPhee

a-JR

Strasser, Susan, "Fetch a Pail of Water", in: *Never Done. A History of American Housework*. New York: Pantheon Books, 1982.

The fifth chapter of this book is one of the best short accounts of the 'indoor-plumbing revolution' in the U.S. Parts of my chapter 2 rely heavily on this study. -See: Bentham, Crapper, Chadwick, Fitch, Giedion, Heller, Richardson, Schwartz-Cowan, Stern, Tarr, Waring, Wright

a-CITA

Strauss, Martin, *Report of a Mission to El Salvador, Guatemala and México*, Dübendorf, Suiza: IRCWD, 1987.

Strauss, a Swiss sanitary engineer with experience in Tanzania and Nepal, reports on a trip to Central America during which he evaluated several projects, among others the Guatemalan experience with dry sanitation. -See: Aforve, de Suremain

T

a-JR

Tagesanzeiger Magazin, *Aus dem Wasser kommen wir, am Wasser hängen wir, was aber wenn das Wasser versiegt?*, Zürich: Tagesanzeiger, 1988. -See: *Die Tageszeitung*

a-JR

Tageszeitung, "Der Mensch stört den Kreislauf", *Die Tageszeitung*, Berlin: World Media, 30 May 1992, p. 30. -See: McPhee, Stolpe

a-JR

Tamanoy, Yoshiro, Tsuchida, Atsushi, Murota, Takeshi, "Towards an entropic theory of economy and ecology", in: *Économie appliquée*, Vol. XXXVII, 1984, No 2, pp. 279-294.

In the third chapter of the essay, "The key to understand the renewability of the ecocycle: the water-soil matrix", the authors refer to the classical Japanese perception of the 'water-soil matrix': the *suido*, an ancient concept akin to that of *fudo* (air-soil matrix) in today's Japan:

"As Murota has shown, some Japanese philosophers of the Edo era (1603-1868) often used the concept of *suido*, which can be translated as **water-soil matrix**. They discussed that the conservation of such a water-soil matrix as of including rivers and forests in each region was essential for a prosperous economy" (p. 186). -See: Berque, Illich 1988, Maruyama, Watsuji

a-HIC

Tardieu, Vincent, "Algas Asesinas: ¿Invadirá la taxifolia Francia y España?", *La Jornada*, 5 August 1992, pp.9 - 10.

Tarr, Joel, "Water and Wastes: a Retrospective Assessment of Wastewater Technology in the U.S., 1800-1932", in: *Technology and Culture*, April, 1984.

s-Illich

Tarr, Joel, A. and McMichael, Francis Clay, "Decisions about wastewater technology, 1850-1932", *Journal of the Water Resources Planning and Management Division ASCE*, no. 103, pp. 47-61.

This is one of the best existing historical articles on wastewater. -See: Crapper, Fitch, Giedion, Heller, Richardson, Schwartz-Cowan, Stern, Strasser, Waring, Wright

a-Starr

Taylor, Christian, "[Reports on the ecological catastrophe of the Aral region]", in: *London Financial Times*, July, 1989.

Thompson, d'Arcy, Wentworth, *On Growth and Form*, Cambridge, 1971.

A classic formulation of the law of scale-variance, this book was written at the turn of the century by a teacher at London College who was both a natural scientist and an 'aficionado' helenist. Thompson's 'law of similitude' states that every natural shape is scale-variant, meaning by that: determined by its scale. (On the contrary, the mathematical object called 'fractal' is the paradigm of scale-invariance). -See: Coing and Henry, Haldane, Kohr

Thompson, E. P., *The Making of ye English Working Class*, New York: Random House, 1966. -See: Polanyi, 1957

a-HIC

Thual, Jean, "El Señor del Agua, aguador de Mauritania", *La Jornada*, 7 August 1992, p. 2. -See: Whittington (p. 11)

a-JR

Turner, John, F.C. "Barriers and Channels for Housing Development in Modernizing Countries", in: *Journal of the American Institute of Planners*, vol. 33, No 3, 1967. Repr. in: William Mangin, *Peasants in Cities*, op. cit., p. 1-19.

The author, a British architect, spent seven years in Peru, most of the time in one or the other of Lima's *pueblos jóvenes*. After he led her to share his enthusiasm for people's courage, community dynamism and skills, Monica Pidgeon, a visiting British editor, convinced him to write down what he had explained to her. The result was this article, a seminal paper for the re-visitation of ideas about popular urban settlements. -See: Mangin, Ortiz

a-JR

Turner, John, F. C., *Housing by people: Toward autonomy in building environments*, London: Marion Boyars, 1976. -See: Cabannes, de Boisemenu, Mangin, Ortiz, Sousa

U

a-HIC

Union de Colonos, Inquilinos y Solicitantes de Vivienda, UCISVNER, *Xalapa, impactos ambientales del desarrollo periférico de la ciudad, México: Habitat International Coalition, 1992.*

s-Strasser

U.S. Centennial Commission, *International Exhibition 1876, Reports and Awards...*

This report includes comments on the **earth closet**, an ecological sanitary tool 'avant la lettre' providing its users with independence, and once awarded a prize in an international exhibition celebrating the centennial of the Declaration of Independence. **See:** Atkinson, Waring

Valverde, Jaime and Argüelles, Juan Domingo, *El fin de la nostalgia, nueva crónica de la Ciudad de México*, preface by Carlos Monsivais, Mexico: Nueva Imagen, 1992.

a-JR

van den Berg, Jan Hendrik, *Het menselijk lichaam. Een metaboleisch onderzoek*, Nijkerk: Callenbach, 1959.

This book presents the historicity of anatomy. -See: Duden

van den Berg, Jan Hendrik, *Metaboleica of leer der veranderingen. Beginselen van een historische psychologie*, Nijkerk: Callenbach, 1974.

This book on 'the doctrine of changes' is a very radical statement of the historicity of experience. -See: Corbin, Robert 1994

a-JR

Van der Ryn, Sim, *The toilet papers, Designs to Recycle Human Waste and Water: Dry Toilets, Greywater Systems and Urban Sewage*, with a forward by Wendell Berry, Santa Barbara, CA: Capra Press, 1978.

By California's State Architect under Governor Jerry Brown, this book explores feasible alternatives to the flush toilet and conventional sanitation. However, our experience leads us to recommend the small 'vietnamese' two-vaults latrine with separator of the 'Afiorve' type rather than the large compost toilet proposed in this book. -See: Afiorve, Farallones, Goldstein, Hugging Stoner, Lehmann, Warshall

van Domelen -See: World Bank, 1988

a-HIC

Vega Rodríguez, Rosalba, et al. *Frontera Norte: El impacto de la industria maquiladora en el medio ambiente de Ciudad Juárez*, Mexico: Habitat International Coalition, 1992.

Nuclear waste dumped on the Northern side of the border pollutes groundwater and wells on the Southern side (p. 23 ff.).

a-JR

Verbrauchsinitiative Bonn, "Mineralwasser: eine Alternative?", *Die Tageszeitung*, Berlin: World Media, 30 May 1992, p. 31.

a-JR

Vernant, Jean-Pierre, "Hestia-Hermès. Sur l'expression de l'espace et du mouvement chez les Grecs", in: *L'Homme*, Revue française d'anthropologie III, 1963, pp. 12-50. -See: Bourdieu, Robert 1994

Viqueira, Carmen y Urquiola, José Ignacio, *Obrajes en la Nueva España: 1530-1630*, Mexico: Cultura y Artes, 1990. -See: Palem, Wittfogel

W

s-Strasser

Waring, Georg E., *Draining for profit and Draining for Health*, rev. ed. New York: Orange Judd Co. 1911.

This book was written by a proponent of the earth closet and the separate drainage system acclaimed by Chadwick. -See: Atkinson, Bentham, Crapper, Chadwick, Fitch, Giedion, Heller, Richardson, Schwartz-Cowan, Stern, Wright

s-Strasser

Wame, Sam Bass Jr, *The Private City: Philadelphia in Three Periods of Its Growth*, Philadelphia: University of Philadelphia Press, 1968.

a-CITA

Warshall, Peter, *Watersheds: Sails, Water and Living-in-Place*, New York: Penguin Books, 1980.

By an articulate proponent of on-site treatment and alternative sanitary technologies, this book contains many valuable tips. -See: Berry, Hopping Stoner, Kickuth, van der Ryn

a-HIC

Water, Engineering and Development Centre, *Water, Engineering and Development in Africa*, Loughborough, Leicestershire: Department of Civil Engineering, Loughborough University of Technology, 1989.

Contains among other items: Abdel, M. and Al-Azharai, J., "Efficiency and cost containment of water and sanitation in Sudan", p. 11 ff. Salako, M., A. and Akinola, J., K., "Municipal water supplies-technologies costs", p. 15, ff.

Wray, A., G., "Municipal-community co-operation in urban development", p. 19 ff. Smout, I., K., "Small scale irrigation in Africa - any lessons from Asia", p. 23, ff.

This paper follows the working definition of small scale irrigation which has been adopted by the UK based Informal Working Group on Small Irrigation:

"...irrigation usually on small plots, in which farmers have the major controlling influence, and using a level of technology which the farmers can effectively operate and maintain" (p. 23).

A useful classification for irrigation in Sub-Saharan Africa is proposed: valley swamp irrigation; floodplain irrigation; irrigation in upland environments; irrigation of coastal environments.

The conference on water in Africa held at Loughborough University focused further of the following themes: **groundwater** (Session 2), **rural water supply** (Session 4), **sanitation** (Session 5), and **water resources and supplies** (Session 6).

interesting is the Discussion Group Report, "Low-cost water supply and sanitation", p. 152, 153. Some of this group's recommendations are:

- rely on local manufacture of parts; use local materials or imported materials as models for local production (importation substitution);
- put local skills to work;
- elaborate a concept for integrated water and sanitation projects whose main rule would be: introduce the sanitation component and then water as a follow up. -See: Cummings, Pickford, Rubi

a-JR

Watsuji, Tetsuro, *Climate and Culture, A Philosophical Study*, original title: *Fudo*, translated by Geoffrey Bownas, Tokyo: Printing Bureau, Japanese Government, 1961 (also available at Greenwood Press, London).

Watsuji, who studied with Heidegger, wanted to do for 'space' what Heidegger had done to 'time' in *Being and Time*. Being Japanese, Watsuji found in the old concept of *suido* - water-soil matrix - as well in the more recent concept of *fudo* - air-soil matrix - a cultural equivalent of the essence of 'being in space' that could be obtained by the 'phenomenological reduction'. The book's Japanese title is *Fudo*, a name that Watsuji himself accepted to render in English by 'a climate'. -See: Berque, Geddes, Illich 1988, Maruyama, Robert 1992

Webster, C., "Water as the ultimate principle of nature: the background to Boyle's 'sceptical Chymist'", *Ambix* 13, 1965, pp. 96-107. -See: Böhme

a-JR

Werner, David, *Donde no hay doctor. Una guía para los campesinos que viven lejos de los centros médicos*, Mexico: Pax, 1975.

a-HIC

Whittington, Dale, Lauria, Donald, T., Mu, Xinming, *Paying for urban services. A study of water vending and willingness to pay for water in Onitsha, Nigeria*, Washington: The World Bank, Policy, Planning and Research Staff, 1989. -See: Thual

Whittington, Dale and Lauria, Donald, T., *Planning in Squatter Settlements. An Interview With a Community Leader*, Washington: The World Bank, Policy, Planning and Research Staff, 1989. -See: World Bank

Whittington, Dale, Okorafor, Apia, Okoro, Augustine and McPhail, Alexander, *Cost Recovery Strategy for Water Delivery in Nigeria*, Washington: The World Bank, Policy, Research and External Affairs, 1990.

This is a report on the so-called 'kiosk system' and experiments with kiosk systems with metered private connections. -See: World Bank, Mikkelsen

Whittington, Dale, Mu, Xinming and Roche, Robert, *The value of time spent on collecting water: some estimates for Ukunda, Kenya*, Washington: The World Bank, Policy, Planning and Research Staff, 1989.

s-González

Wilken, G.C., "¿Por que persisten las chinampas?", contribution to the *Conferencia Internacional Pasado, Presente y Futuro de las Chinampas*, México, 23-25 April 1990. -See: Canabal, González, Rojas

Wittfogel, Karl, *Oriental Despotism. A Comparative Study of Total Power*, New York: Random House, 1981 (Yale U.P., 1957). -See: Palerm, Sahab, Gonzalez Tascón

a-CITA

Wolf, Edward, C. "Beyond the Green Revolution: New Approaches for Third World Agriculture", in: *Worldwatch Paper 73*, Washington: Worldwatch Institute, 1986. -See: Borgstrom

a-HIC

World Bank, *The Urban Edge. Issues and Innovations*, April 1991, Washington: The World Bank, 1991.

This is conservation according to the World Bank: use less; recycle; reduce amounts lost to leaks; increase efficiency. The stumbling blocks for the construction of an organigram for water development schemes World Bank style are mainly: correction of political biases, know-how transfer, money inputs, correction of "ineffective institutions and attitudes".

Potential gains of new waterworks are expected to be realized by: industry, government agencies, households with incomes above the poverty level, farmers who irrigate with water supplied by utilities.

An often recommended tactic is to reallocate water from agriculture to urban households and industry, which can mean bartering food import for drinking water:

"When the nearest resource other than farmers is remote and the cost of developing water projects becomes prohibitive, reallocation may be the most economic and feasible

way to supplement the thirst of growing cities", says Mr Arlosoroff. (Caveat: poor countries have little foreign exchange to feed their population with imported staples). This article contains an interesting section on Tucson's Casa del Agua and an exposition of some principles derived from that experiment: use up-to-date water-conserving fixtures; prefer dry landscaping (**xeriscaps**) to the conventional grass lawns; concede fiscal advantages to citizens who have built a cistern to store rain water for the garden; idem for citizens who have installed special greywater plumbing systems with slow sand filters to recycle the water from the family's sinks, tubs, showers and washing machines into the flush toilets or the garden cistern.

Besides, waste water can be carried to a solar greenhouse adjacent to the house that supplies the power for the filters and pumps. Once treated, the grey water is fed into an underground storage tank and from there is pumped for use both in the toilet (in the house) as well as for watering the outdoor garden. A house equipped with these fixtures consumes just one third of the amount of water used in a single-family house of the same size. Refitting existing houses might be expensive, but if the separate network of pipes is installed when houses are first built, it costs only a bit more than conventional systems. Either the government or water companies could finance installation costs and deduct the amount from monthly bills over a period of time; **and the funding could be an integral part of World Bank loans.**

If cities succeed in cutting back consumption by such means, they will be able to delay huge investments to expand their systems, since laying new pipes and building dams and treatment plants costs hundreds of millions of dollars. In other words, the Tucson projects 'produce' a 'good' for which Cesar Añorve has coined the term **negaliter**, 'negative' liters in the sense of a reduction of the need to tap more water.

Finally, the report on Tucson stresses the usefulness of meters. However, sound conservation principles cannot be merely technical; they should also include a popular control of the sources. As a palliative to technocratic views, I propose the concept of **regenerative conservation** that poises technological innovation with the protection of the poorest's access rights.

a-JR

World Bank (Parlato, Ronald), *A Monitoring and Evaluation Manual for Low-Cost Sanitation Programs in India*, Washington, 1984.

In my opinion, this study does not give sufficient attention to the possibilities offered by recent improvements of dry sanitation. -See: Roy, A.K., Kalbematten, a **contrario**: Nguyen

World Bank (Julie van Domelen, Consultant), *Public Investment and Expenditure Reviews in the Water and Urban Sectors: An Overview of Recent Experience*, Washington: The World Bank Policy Planning and Research Staff, Discussion Paper, 1988.

World Bank (Aurelio Mendez, Economic Institute of the ___), "Access to Basic Infrastructure by the Urban Poor", *Edi Policy Seminar Report* no 28, Washington, 1991.

World Bank (Bertaud, Alain, Bertaud, Marie-Agnès and Wright, James, O., from the Policy Planning and Research Staff), *Efficiency in Land Use and Infrastructure Design. An Application of the Bertaud Model*, Washington, 1988.

World Bank, (Alfred, M. Duda) "A comprehensive approach to water resources management for the 21st century", *Environment Bulletin*, vol. 5, no 2, Spring 1993, pp. 6, 7.

In this article, Alfred M. Duda, Senior Water Resources Management Specialist with the Pollution and Environmental Economics Division of the Environment Department asserts that without appropriate policy and institutional adjustments for making the transition to comprehensive resources management and without properly trained human resources to implement a new, cross-sectorial approach, the 21st century will begin with enormous water scarcity, international water conflicts, and significant environmental degradation on every continent. For instance:

- Excessive water withdrawals for agricultural irrigation projects have caused ecological catastrophes in arid regions across the world (ex: the Aral Sea).
- Another instance is the pollution of groundwater: when contaminated, subsurface waters are essentially lost forever.
- Irreversible damages can also occur in surface waters: once rivers experience excessive withdrawals of water, low minimum flows can decimate the ecological functioning of deltas which are important hatcheries for rivers and marine resources which the poor depend on for food. (p.6). -See: Whittington, Laurie

World Bank -See: Kalbermatten

a-HIC

World Media, "Agua en Medio Oriente: ¿esperanza para la paz o riesgo de guerra? Mesa redonda", *La Jornada*, 6 August 1992, pp. 3 - 4.

Shared water requires good will. -See: Muschg, Starr

Wray -See: Water Engineering and Development Centre

a-JR

Wright, Lawrence, *Clean and decent. The History of the Bath and Loo*, London: Routledge and Kegan Paul, 1980 (1980).

A pleasant history of the 'secret places'. -See: Bentham, Crapper, Chadwick, Fitch, Giedion, Heller, Richardson, Schwartz-Cowan, Stern

Z

Ziccardi, Alicia, *Las obras públicas de la ciudad de México (1976-82), política urbana e industria de la construcción*, Mexico: UNAM, Instituto de Investigaciones Sociales, 1991.

This article gives a striking picture of politicians, entrepreneurs and the philosophy of public works during the 'oil boom' under Lopez-Portillo. -See: Guerra, Lacombe, Musset, Panabière, Quadri