The Blue Economy
vs EAUTARCIE

«The Blue Economy» [1] vs EAUTARCIE [2]

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(adapted and translated by André Leguerrier)

When analyzing the goals of The Blue Economy, one will come to conclude that the EAUTARCIE concept and most especially EAUTARCIE's version of ECOSAN (from ECOlogical SANitation) share those same goals, with an added feature: integrated management of water and biomass, for the benefit of soils and climate. The EAUTARCIE concept can help in revising today's dominant views on water. Worldwide water problems are often presented as a sort of inevitability that needs to be managed through significant investment. This does not prevent some to claim that the severity of the situation is such that «we will go to war over water». Based on scientific data and field observations, the EAUTARCIE team has taken a decidedly different and optimistic stand: with a shift in paradigms and a change of vision, and in spite of increasing world population, humanity can shake off its water problems in less than two generations (± 50 years), provided that be implemented a global policy aimed at regenerating ecosystems through proper integration of wastewater and biomass management.

Remark:
Nowadays, ECOSAN is a popular neologism for « ecological sanitation ». Even if it is the expression of justifiable concerns, it is unfortunately a carryall term for various concepts that have notable shortcomings and reveal incoherent guidelines. EAUTARCIE's version of ECOSAN (called SAINECO in French) remedies this situation.

The reasoning behind EAUTARCIE's ECOSAN

Wastewater treatment

The starting point is the discovery that there exists an intimate link between domestic wastewater treatment and agricultural production. By extension, one comes to find that restoring this somewhat cooperative relationship has a significant positive influence on climate change.

Human water supply

The shortage of drinking water in the world is also a problem which, according to the prevailing view, requires ever greater investment in order to be resolved. The desire to provide drinking water for all household uses results in costly and often unsustainable solutions. The paradigm shift we propose for this problem is found in the sixth principle of EAUTARCIE's version of ECOSAN (see next pages) formulated as follows: « adapting water quality to its end-uses ». In reality, 5 litres per day per person of potable drinking water is sufficient for drinking and cooking needs. For all other uses, lesser quality water (i.e. not necessarily compliant with drinking water standards) is suitable. By applying this principle and diversifying supply sources, we could provide high quality drinking water for all inhabitants of the planet at very little cost. Currently, access to drinking water requires having a tap connected to a mains water distribution network or another source of potable water. This expensive system is not accessible to all. Yet less costly alternatives exist.

[1] Link: http://www.theblueeconomy.org/ .
[2] Link: http://www.eautarcie.org/ .

The guiding principles behind EAUTARCIE's ECOSAN

Nowadays, nobody seems to dispute the need for a change in vision and a paradigm shift on water management. However, to our knowledge, nobody has attempted to formulate new paradigms in a holistic approach with respect to all problems. Whoever speaks of new paradigms must first be familiar with the current paradigms that should be forsaken. In fact, today's paradigms have never been literally expressed, but they are quite present, both in the minds of technicians and environmentalists.

Today's (inadequate) paradigms are:

Paradigm 1. In sanitation, the better you purify wastewater (greywater combined with black water), the greater you protect the environment.

Paradigm 2. Wastewater must therefore be treated, regardless of the financial, social and environmental costs. All wastewater treatment systems are assessed with respect to their purification efficiency.

Paradigm 3. The technician has no control over pollution. Wastewater's pollution load is immutable, cast in the law under the name « Population Equivalent ».

Paradigm 4. You must combat « faecal hazards » at all cost.

Paradigm 5. To maintain agricultural production, you need only introduce nutrients (N-P-K, etc..) in the soil in sufficient quantities.

Paradigm 6. It takes drinking water for all domestic uses.

Remark:
The words « sanitation » and « purification » have paralysed our reasoning. This may seem surprising, but current paradigms are obstacles to sustainable management of water and the biosphere. One can show that the assertion of **Paradigm n°1** is false. **Paradigm n°2** leads to the development of techniques that are cumbersome, complex and costly. **Paradigm n°3** in fact excludes all simple preventive techniques that seek to prevent pollution at the source.

In today's context, **Paradigm n°4** is undoubtedly the most difficult to change, yet it must change. A more pragmatic view based essentially on field observations has led us to re-examine the concepts on sanitary hazards. This new vision would allow the implementation of simple, inexpensive and effective techniques for wastewater treatment and drinking water production, while providing better protection of health.

Paradigm n°5 has led to a rift between sanitary engineering and agriculture. This rift is the source of our water problems [3]. **Paradigm n°6** also compels significant investment and hinders the onset of simple, cheap and effective alternatives. Today's paradigms must be abandoned. If not, we may actually « go to war over water » as some have predicted. On the contrary, replacing these paradigms with those we advocate herein will gradually eliminate worldwide water problems.

[3] Link: http://www.eautarcie.org/en/02b.html#c

New paradigms for sustainable water management:

On the treatment of domestic wastewater (and wastewater discharged by the agro-food industry), any system can be used, provided it meets the first five following paradigms, that we will call **principles**, to avoid confusion with the previous paradigms.

Principle 1. Grey (soapy) water and sewage (or « black water », containing faeces) should be collected separately to undergo a specific selective treatment tailored to their composition, in order that sewage and greywater be exploited as resources. They become waste only when combined.

Principle 2. Sewage or other wastewater containing human or animal dejecta (nitrogen- and phosphorus-rich) should never be released into surface waters, spread on land, or infiltrated into the soil, *nor undergo a sanitation plant treatment*. Rather, they must be treated with cellulosic carbon-rich plant biomass.

Principle 3. The primary goal of sewage treatment is no longer to combat «faecal hazards» at all costs, but restore the humus content and biodiversity of soils. At this level, the amounts of nutrients (N-P-K, etc.) have less importance than their embedding within the molecular structures of the raw materials needed to form humus.

Principle 4. Greywater is a precious resource for irrigation of living soils, and most certainly for groundwater recharge.

Principle 5. By all possible means, avoid the discharge of wastewater (even when treated) in surface waters. For greywater treatment, admit soil, oxygenation and natural light as biological reactors that eliminate the pollution load.

On sustainable water supply for the population, **Principle n°6** is the basis for the sustainable management of water and public health.

Principle 6. Adapt water quality to its end-uses. Provide an identical legal status for all water sources, including rainwater. We must also admit the principle by which water used for domestic purposes other than drinking and food preparation need not be potable, only «inoffensive».

The application of **Principle n°6** is likely to facilitate the provision of the 5 litres of high-quality drinking water per day that everyone needs, relatively inexpensively. It will also remove water from financial speculation. Only by respecting this paradigm can we ensure that water does not become a cash commodity. To conclude: it is best to abandon wastewater treatment – even using plants for phytoremediation. Instead of being treated, wastewater can and should be fully recycled. Failing to recognize these new principles, such slogans as…

- Water is a common good
- Collective financial support of access to water for all
- Democratic management of water
- Sharing information on water
- Improving the state of water resources
- Towards prevention policies
- Towards «water citizenship»
- More global solidarity about water

…will remain fruitless wishful thinking. What we need are concrete solutions.

Preliminary findings from EAUTARCIE's ECOSAN

A brief description of sustainable wastewater management is presented in the following video: http://www.youtube.com/watch?v=u9er47QA_yM

Despite the fact that almost all the techniques mentioned in the video are available and already developed, this system has never been done on a scale exceeding a few homes within a cohousing cluster. Larger-scale experiments are needed. To fully comply with scientific rigour, certain predictions arising from the new principles should either be field-tested or be the object of further research. Among these, we can cite:

- The study of the interactions between the pollutant load of greywater and the various soil types. For a more effective application of **Principle n°4**, new research is needed to categorize household cleaning products with respect to their environmental impact when infiltrated into the ground. Currently available data is only valid in case of discharge into surface waters, after prior treatment.
- To our knowledge, the decomposition of medicinal drug residues and the composting of micropollutants have only been the subject of a preliminary study [4]. A more comprehensive study is needed.
- To confirm our observations in the field, further studies need to be done on the spontaneous clarification of greywater when exposed to air and light.

A paramount experiment that needs to be done

As mentioned earlier, sanitary engineering's current **Paradigm n°4** presents a major obstacle to the implementation of sustainable water management. The notion of « faecal hazards » is derived from a 19th century concept called « hygienics ». It is based on the assumption that the majority of our health problems are attributable to microorganisms around us [5]. Thus, we have developed a real phobia of microorganisms. This fear is largely fueled by advertising. Dejecta, especially of human origin (also called « Humanure »[6] by Joseph Jenkins), have been and are still decreed as « Public Enemy N° 1 » for public health. The statement according to which « we drink 90% of our illnesses » is questionable, to say the least. Conventional sanitation's prime goal is to « get rid of human waste » by discharging it into water but also destroying it (in reality, by transforming human waste into pollution that is comparable to chemical fertilizers). Presently, the agricultural use of human waste is allowed only after it's been disinfected: an additional chemical treatment which destroys the molecular structures that could otherwise lead to the formation of humus.

On the other hand, with the expanded use of BioLitter toilets (BLTs), a growing number of families have been composting their dejecta for many years now, and using the compost to fertilize the home garden. So far, despite the absence of any chemical treatment for « disinfection », no health problems have been reported on this practice [7]. However, today's discourse on the potential

[4] Link: http://www.eautarcie.org/en/05f.html#e

[5] Scientists refer to certain laboratory observations that suggest that the sole cause of infectious diseases is the presence of bacteria or viruses. Already in Pasteur's time, they were unable to conclusively show a direct link of cause and effect between bacteria and disease. At the time, opponents of Pasteur reported that although the occurrence of any disease is a multifactorial phenomenon, what is called the body's «terrain», or diathesis (i.e. the immune system's constitutional predisposition), plays a role at least as important as the presence of microorganisms.

[6] Link: http://en.wikipedia.org/wiki/Compost#.22Humanure.22

[7] It is nevertheless true that when the BLT was launched, the regional authorities were tempted to prohibit its use «due to health risks». In 2000, the Walloon Region Water Commission appointed the *Université Catholique de Louvain*'s School of Public Health to study and evaluate the risks. From the results, it was not possible to show the existence of any risk.

agricultural use of composted dejecta heavily emphasizes the « need to sanitize » the organic soil amendment thus obtained. And yet, « faecal contaminated » bacteria are ubiquitous in our environment : analyses detect them everywhere! This means that without chemical disinfection, it's impossible to guarantee their absence in any soil amendment of organic origin. To get to the crux of this matter, nothing would be better than a full scale field experiment. Instead of proclaiming that without disinfection, « there is a danger », it would be more appropriate to measure the danger by evaluating the healthiness of a population sample exposed to said « danger ». Given the widespread use of composted dejecta, it would be easy to find families willing to lend themselves to such an experiment. However, we believe that such an epidemiological study should also be extended to the comparative evaluation of the potential danger to health posed by biocidal disinfectants commonly used in households. Therefore, you need to select two population samples with comparable social profiles.

The first group's food would be largely provided by gardens fertilized with humanure compost that has not been disinfected. These families would therefore produce most of their vegetables in their gardens. Their homes would not be connected to the mains water supply network, but would depend entirely on rainwater harvesting as per the PLUVALOR System[8]. This means that these families would use non-potable water of «inoffensive» (or harmless) quality for all non-food uses. They would pledge not to use chemical disinfectants for household cleaning and personal hygiene. They would also prioritize the consumption of organic foods or those foods purchased from local producers, and reduce their intake of foods produced by the agri-food sector. They would also abstain from non-mandatory vaccines - as much as possible.

The second group would be invited to live in conditions involving as little risk as possible from bacterial or viral contamination. The families would pledge to only drink and use mains water whose quality is guaranteed by law. They would only use flush toilets and household cleaning products containing disinfectants to prevent any contact with pathogens. They would ensure superior cleanliness, for household cleaning as well as personal hygiene of family members. They would commit themselves to consume food guaranteeing health safety and traceability at all stages of production and marketing. They would give preference to products from the agri-food sector, including prepared ready-to-eat meals. If possible, they would get vaccinated at maximum.

The study, which can be expected to take several years, would aim to monitor the health evolution of both groups. Particular attention would be paid to the presence or absence of all infectious diseases, be they bacterial or viral in nature. The frequency and severity of the following afflictions, among others, would therefore be assessed: enteritis, diarrhea, colics, food poisoning, flu, colds, bronchitis, otitis, angina, rhinopharyngitis, etc., (even those that have nothing to do with faecal contamination). Add the frequency of emergence (or disappearance) of allergies, cancers, osteoporosis, osteoarthritis and multiple sclerosis. The data would be an exhaustive epidemiological study that could be completed with data recorded by health insurance companies, accounting the treatment costs for each individual on afflictions studied.

Larger scale EAUTARCIE experiments

As a first step, we can consider the application of EAUTARCIE's ECOSAN system in a village or suburban neighbourhood. To do this, set up a few pilot homes to be equipped with EAUTARCIE's different subsystems, with the homes being open to the public to show how the systems work. The

[8] Link: http://www.eautarcie.org/en/03a.html#c

families will have the choice between the use of a dry toilet like the BLT for example, or a low-flush toilet. Those who choose the flush toilet will need to install a septic tank reserved exclusively for toilet waste (no grey water) and needing to be periodically emptied. In all cases, the home's greywater will be treated on site. For this purpose, different techniques are proposed:

- In summer : greywater is used for watering plants, without prior treatment; in winter, greywater is discharged into a soakaway [9] or a dispersal drain [10].
- Greywater is discharged into a small wetland set up at the lowest point of the garden where the plants will contribute to evaporate the water.
- Greywater is discharged into a watertight constructed wetland [11] where daylight and air will contribute to clarify the water.
- Greywater is managed according to one of the TRAISELECT System [12] variants.

For the treatment of the toilet waste discharged in the septic tanks, set up an impregnation and composting centre similar to the Trecofim set-up in Moréac [13] (France) for composting at a larger scale.

It would be desirable to extend the experiment to include the households' water supply, through whole-house rainwater harvesting, as per the PLUVALOR System [14].

Heating homes with heat supplied by composting of human waste

This is an experimental technology that requires further development and testing for proper control of its operation. The system is based on the recovery of heat generated by a large compost heap (greater than 4 m³) via a heat exchanger placed in the pile and connected to the home's underfloor heating circuit. In Hungary, there are currently four homes heated by this system. One of them is going through a third winter, with a compost heap of 9 m³ (that is renewed before each winter) and it provides basic heating (18 to 19 ° C) for two levels of living space having an area of 120 m². To attain a higher temperature in this conventionally insulated house (i.e. not very energy efficient), the home is also supplied with auxiliary heating.

[9] Link: http://www.eautarcie.org/en/09b.html#so01
[10] Link: http://www.eautarcie.org/en/09b.html#di01
[11] Link: http://www.eautarcie.org/en/09b.html#co06
[12] Link: http://www.eautarcie.org/en/04b.html
[13] Link: http://www.trecofim.com/
[14] Link: http://www.youtube.com/watch?feature=player_embedded&v=637cdB5x9ss

Conclusions

EAUTARCIE's concept for ECOSAN presents no risks for human health or the environment (see the article on « A Congolese Experiment »[15]) when applied in the field. Already, it is quite reasonable to attempt experiments on a larger scale. Our vision is shared by the *Réseau d'Assainissement Durable* [16] (Sustainable Sanitation Network) of the Walloon Region (Belgium). In its main document entitled « Sustainable Sanitation, vision of the network », one reads, among other things:

« *Sustainable sanitation is intimately linked to the biosphere ; its goals are fertile soils, soil life and groundwater recharge. In addition to concepts already applied in sanitation such as the control of health hazards and nuisances, sustainable sanitation emphasizes the importance of the state of the molecular structure in which elements are returned to the soil, the recognition that soil is a biological reactor, the efficient management of matter and energy, and local action* [17]*. Source separation of waste* [18] *is an important lever in the realm of sustainable sanitation.* » The introduction reads: *« The raw materials of sustainable sanitation are domestic and industrial wastewater, rainwater, and all organic biodegradable residual materials. Most of these materials are currently classified as waste, a term which induces their disposal, in mind as well as in reality. Sustainable sanitation considers them first and foremost as resources contributing to soil fertility and to the balance of soil's biological, physical and chemical properties. Sustainable sanitation accompanies their transformation such that each stage is beneficial to the biosphere.* »

By calling on the extraordinary power of « Soil Life », the EAUTARCIE concept inevitably works much better than the current system, which has shown all of its limitations, and which is growingly expensive [19].

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[15] Link : http://www.eautarcie.org/doc/article-experience-congolaise-en.pdf .
[16] Link: http://www.assainissement-durable.be/
[17] This refers to « short cycles ».
[18] The separate collection and selective (differentiated) treatment of black water and greywater.
[19] There is presently a headlong rush that is extremely expensive in its will to purify everything. A typical example of this hopeless approach is the recent implementation of ultrafiltration for treatment of wastewater in Cannes (France). The concern is to eliminate drug residues contained in sewage. But the majority of these residues, due to their extremely small molecular size, go through the 0.03-micron filtering membrane. Composting as per the EAUTARCIE concept, a much cheaper technique, would permanently eliminate this problem, while producing a highly valuable organic soil amendment for soils - not to mention the energy produced. We must reiterate the fact that by the massive destruction of biomass by conventional sanitation, the greater the wastewater is purified, yet the more we pollute and damage the environment !