

Approaching to Ernst von Weizsäcker's "Factor 4 Doubling Wealth, Halving Resource Use" with special emphasis to Aquatic Systems

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Abstract: The approach of Ernst Von Weizsäcker and his collaborators (Club of the Rome) is an interested consideration concerning both the adequacy and the use of the natural resources in the frame of the dominant living standards. With sufficient scientific evidence and an extensive list of examples the authors document the title and the content of their book "Factor Four. Doubling Wealth Halving Resource Use". The article deals with the consideration that water seems to be, as usually, in the center of this approach, initially for two reasons. First, water is the most important natural resource in our planet ensuring the existence of life, since they are organisms living without air, but not without water. Second, the water is the main factor ensuring the existence of all the rest natural resources either ensuring their existence and development (natural vegetation, agriculture, livestock etc.) or the water's interference in the construction of products such as the mining and processing of ore deposits, the industrial production, the food, pharmaceutical, etc. production, the organization of the land uses, the waste management and disposal and any other human activity. This consideration is examined from the environmental point of view dealing with the land uses, natural resources and waste disposal. It is also examined from the aquatic point of view. Both considerations are finally described in some of the examples used in the discussed Weizsäcker's scientific work.

Keywords: Ernst Von Weizsäcker, natural resources saving, land use, water saving.

Riassunto: L'analisi di Ernst Von Weizsäcker e dei suoi collaboratori (Club di Roma) è una interessante considerazione sia sull'adeguatezza che sull'uso delle risorse naturali nell'ambito di un tenore di vita medio. Con sufficienti prove scientifiche e una lunga lista di esempi, gli autori documentano il titolo ed il contenuto del libro "Factor 4. Doubling Wealth Halving Resource Use". L'articolo si prefigge quindi di prendere in considerazione del perché l'acqua è al centro di questa analisi essenzialmente per due ragioni.

In primo luogo, l'acqua è la risorsa naturale più importante del nostro pianeta ed assicura l'esistenza della vita, dal momento che ci sono organismi che possono vivere senza aria, ma non senza acqua. In secondo luogo, l'acqua è il fattore principale che assicura tutto il resto delle risorse naturali, sia garantendo la loro esistenza e il loro sviluppo (vegetazione naturale, agricoltura, bestiame, ecc) sia giocando un ruolo importante nella lavorazione e nella realizzazione di molti prodotti come l'estrazione e lavorazione dei minerali, la produzione industriale, il settore alimentare, il settore farmaceutico ecc, e per gli usi che riguardano la gestione del territorio, la gestione e lo smaltimento dei rifiuti e ogni altra attività umana. Queste considerazioni vengono prese in esame dal punto di vista ambientale trattando gli usi del suolo, delle risorse naturali e lo smaltimento dei rifiuti; ed inoltre dal punto di vista dell'acqua. Entrambe le considerazioni sono infine descritte in alcuni degli esempi utilizzati nel lavoro scientifico di Weizsäcker

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Introduction

The book and, finally, the concept of Ernst Weizsäcker in "Factor 4, Doubling Wealth Halving Resource Use" constitute one of the most interesting contributions, in our days, in the direction of the environmental maintenance and improvement and the confrontation of the global economic recession. The conservation of the natural resources, related to the land uses and the, each time, disposable technology for the direct or indirect transformation of the natural resources into the final products for use and consummation, appears of

absolutely primary priority (Caldecott J., 2007). The latter becomes aggravated because of the augmentation of the earth population and the objective improvement of the life level. The main problem here is the analysis of the whole production procedures and the risk of the use of extended resources for the fabrication of new, low-priced, and

friendly to the environment materials. It is reminded that the aquatic systems are the final recipients of all contaminants irrespective of their quantity, nature, etc. This is more obvious in the case of the water, used in the different stages of the natural resources elaboration. The table 1 is quietly indicative in this field

Tab. 1: *Use of water in the preparation of some products with the technology of 1980 (Laborde A and Motec J, 1980).*

For the preparation of...	It was necessary the use of...
1 l of perfume	10 l of water
1 l of beer	20 l of water
1 Kg of dry cement	30 l of water
1 Kg of steel	80 l of water
1 Kg of sugar	100 l of water
1 Kg of paper	250 l of water
1 Kg of maize	400 l of water
1 Kg of wool	500 l of water
1 Kg of artificial silk	1000 l of water
1 Kg of aluminium	1000 l of water

Adaptation of the Factor 4 procedures to the environment and to the water

From the environmental point of view, the environment is entirely involved and improved by the above procedures. This is, after all, the main target of Factor 4. Leaving the details to the book itself, some general comments are obviously useful to be cited. The relation of the man with the environment is accomplished in three main fields, the *land uses*, the *natural resources uses*, and the *sub products disposal*. For the total of these three fields, the minimization of the land uses, the reduction of the natural resources use (turn to the renewable energy resources, to the materials recycling etc.) and to the reduction of the disposed wastes (materials recycling etc.) means almost the same for each field, with some differentiation to each time priorities.

The land uses. One of the results of Factor 4 procedures is the minimization of the land uses which is after all the main target of the given procedure. At the same time the minimization of the land uses do not coincides with the augmentation of the earth population and the objective improvement of the life level. What is the environmental profit and improvement is displayed in the following results.

Less land used. This means more free space for the natural environment development

Fewer natural resources extracted. This means less disturbance of the natural landscape

Less affected adjacent areas

(Eventually) *less sub products to be disposed*

The natural resources. This is the complementary site of the previous procedure, which means

Less disturbance of the natural landscape

Less land used

Less affected adjacent areas

(Eventually) *less sub products to be disposed*

The waste disposal. This is the most inconvenient and, very often, most dangerous and most costly procedure. It includes, generally, the same components as previously

Less disturbance of the natural landscape

Less land used

Less affected adjacent areas

(Eventually) *less sub products to be dispose*

From the aquatic point of view, it is necessary to proceed to an adaptation of the essential declarations of the Factor 4 procedures to the organization, operation, use, realimentation, and protection of the surface and groundwater bodies, including their hydraulic connections. It is essential to underlay some generalities, especially important for the consideration of the water.

- The water is itself a natural resource, but its presence is deterministic for the rest resources
- There are organisms living without air, but not without water
- The water is the final recipient (receiver) of all contaminants irrespective of the contaminant's type, nature, origin, degree of retouch etc.
- The water in our planet is characterized by an initial unequal distribution, due to the atmosphere circulation, which moreover is modified by the climatic change.
- There is an important differentiation related to the progress and application level in different EE countries of the Water Management Directive. The same situation characterizes the countries of the entire planet.

In most of the cases it is not obvious the eventual profit or extravagance in the field of the water, directly or indirectly, since the technology used should be analyzed in all stages of the each time construction and application.

Some steps in the book's consideration

...Efficiency cures for the wasting disease... Today's economic tuberculosis consumes neither our bodies nor our resources (used energy and resources stay behind as unproductive pollution), but its effect on people, nations and the planet is just as deadly, costly and contagious...

Water: *The water is the final recipient (receiver) of all contaminants irrespective of the contaminant's type, nature, origin, degree of retouch etc. Therefore, the realization of the discussed efficiency is primary involved with the water existence from the quantitative and qualitative point of view.*

FACTOR “4” EXAMPLES Fifty Examples of Quadrupling Resource Productivity			
1. Twenty Examples of Revolutionizing Energy Productivity			
No	Example	Water role	Explanatory notes
1-1	Hypercars: Across the US on One Tank of Fuel	Indirect	Consummation of natural resources Fabrication of parts
1-2	Rocky Mountain Institute Headquarters	Direct	Save water by using especially designed heating and washing system
1-3	The Darmstadt “Passivhaus”	Direct	Save water by using especially designed heating and washing system
1-4	Hot-Climate Houses in California	Direct	Save water by using especially designed heating and washing system
1-5	Superwindows and Large-Office Retrofits	Direct	Raising the temperature outside the building
1-6	Queen’s Building, The New School of Engineering and Manufacture, De Mont fort , University, Leicester UK	Indirect

...The Efficiency cure... Doing more with less is not the same as doing less, doing worse or doing without. Efficiency does not mean curtailment, discomfort or privation. When several presidents of the US proclaimed that “energy conservation means being hotter in the summer and colder in the winter”, they were not talking about energy efficiency, which should make us more comfortable by improving buildings so that they provide better comfort whilst using less energy and less money. To avoid this common confusion, this book avoids the ambiguous term “resource conservation” and instead uses “resource efficiency” or “resource productivity”...

Water: In the case of the water, this means a rationalistic water use, in water supply (water economy without privations), irrigation (use of proper irrigation systems), industry (purification of used water and reuse of cooling water), tourism (application of the environmental principle “the each one water necessities are related to the aquatic capacity of the given area”), environmental river discharge (all the water discharged to the sea is not a lost water) and lake level (all the water existing in a lake is not useless water) etc. Consequently, this rationalistic use is provided by the design and the application of local, regional, and national (at least) developing plan.

...What’s so new about efficiency?... A great deal of engineering and business is about using all kinds of resources more productively but for the past 150 years much of the technological effort of the industrial revolution has been devoted to increasing labour productivity, even if that required more generous use of natural resources... Yet today, not only are there new technologies, but there are also new ways of linking them together so that in principle, big savings can often be had even more cheaply than small savings...

Water: For the water, this means the application of the temporary sides of the water management, including groundwater aquifers artificial recharge, use of new water sources being inert because of certain problems, water transports, desalinations combine water uses, alternative water uses, used water purification etc. This is one of the most interesting, productive, and sustainable overlaps between science and technology.

...The earth summit and the first global revolution...

The two principles of environment and development were encapsulated in Principles 3 and 4 of the Rio Declaration as follows:

(Principle 3) *The right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations*

(Principle 4) *In order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it*

Water: This is initially faced in some laws in the form of the environmental river discharge (all the water discharged to the sea is not a lost water) and lake level (all the water existing in a lake is not useless water). Moreover, the concept of the intrinsic and specific vulnerability is generally adopted, but the problem is the application and the applicability of such concepts in practice. Additionally, the application of environmental principles, concerning the management and protection of the aquatic systems should be reactivated, such as the each one water necessities are related to the aquatic capacity of the given area etc.

...The first global revolution... The First Global Revolution (1991), reported by the Club of Rome outlines how least ten mutually interconnected problems constitute the world problematic:

- armaments and armed conflicts
- the scandalous economic gap between North and South
- population increase and food shortage
- environmental degradation, growing energy demand and the greenhouse effect
- the urban megalopolis trend, chiefly in developing countries
- the collapse of socialism, which did not solve local and ethnic problems in the area, notably in the former USSR
- the economic tensions and cultural differences in the Triad (US, Japan, Europe)
- the widespread prevalence of emotional misery
- the manifold and new problems of the information society

- the general governability problem both at the national scale in modern democracies and, more alarmingly in the context of the world problematique, at the global level

The Club presents some hope by holdly moving from the *problem-atique* to the *resoluting*, in a handle of priority actions for tackling the problem. The list includes:

- conversion from military to civilian production (the authors wisely, and contrary to the widespread and quack notion of peace dividends, warn of substantial costs to be shouldered in the early part of the process)
- new environmental policies with a strong emphasis on a massive worldwide campaign for energy efficiency (we not agree more)
- new initiatives for a development of the South, including population control initiatives, and with a strong emphasis on rural development
- governance taken seriously, emphasasing consensus orientation and the international dimension
- a systematic use of education and the media for the necessary transformation
- a wisdom-and solidarity- oriented change of global consciousness

Water: *The water in our planet is characterized by an unequal distribution, due to the atmosphere circulation, which moreover is modified by the climatic change. The global statistics concerning the water scarcity, use and cost worldwide, are didactic and alarming. The global water consumption increase is not related to all continents consumption increase, but only to the Asian case. This increase is not due to the improvement of living standards, but is related to the population increase, mainly in China, India, Pakistan and Indonesia. Another relevant problem is the involvement of the water in local, regional or international conflicts, under the following states:*

1. *War for the water*
2. *War with the water as an arm*
3. *Water as a victim of war*
4. *Management of the transboundary lakes, rivers, and ground-water aquifers*
5. *Coexistence of the above subjects*

...Sustainable development is inescapable but has hardly begun...

The characterization of the water as renewable or not natural resource is connected to the time and space scale. In the planet scale, water is a non renewable resource since the hydrosphere is definite and specific and since we can not create or destroy water. In the scale of a country, especially of an arid country, and in the scale of a hydrologic year, water is a resource renewable, since after the dry season, the wet season suites. Hence, the differentiate water distribution in our planet, improving, at the same time, the life level, can be faced only by local institutional decisions in the frame of an accepted water management, approved by the international authorities and scientific organizations, adopted to the local particularities.

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