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# THE IN-TIME(S)

**Inspired by the future, rooted in the past, acting in the present**

*Extracts based on the book "Inventing for the Sustainable Planet" - the inner and outer journey to sustainability.*
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## Introduction to Technosphere

### BY MAX WAHLTER

Economic growth is widely accepted as the best way to create an acceptable living standard. The World is seeing economic growth and living standards.

Average world economic growth is happening at a rate of about 4% per year, in some places like China growth is exceeding 9%. Creating this growth requires an increasing spiral of mineral extraction and commerce in the form of production of products and services and their sales, distribution and end of life handling.

This technological, commercial and economic activity uses a lot of energy and natural resources as well as vast inputs of human activity. For example, the average American uses 600 litres of water a day, the equivalent of 25 barrels of oil a year, produces many kilograms of garbage. Metals and other elements essential for this system are brought in and out of the country by the shipload.

The end of life of each cycle of activity outputs substances categorized as garbage, waste, emissions and refuse. This categorisation denotes they are no longer deemed useful for the technological activities and are deposited, burnt or otherwise disposed of. Although some recycling occurs, where the substances are reclassed as useful resources, a lot end up back in the Earth's crust in landfills, or are released into our water or air systems.

One reason these resources are waste is that they are combined with other substances and so difficult to separate they cannot usefully be put back into the technical and commercial system.

### CONSTANT RESOURCE DEPLETION

These resources include metals, trace elements, elements of organic systems like nitrogen and phosphor, fossil energy. Whilst all were once seen as a resource, at the end of life of a product or service they end up as waste, and are treated in such a way as to be virtually unrecoverable for re-use. For example phosphorous, an essential ingredient in fertilizer, comes mainly from three mines in the world. The mineral is needed for all agriculture that does not reclaim minerals back to the soil. Yet large amounts of phosphorus are emitted to the sea where they are virtually irreclaimable, as the present system finds it cheaper to mine new sources rather than recycle.

Apart from this, these substances can cause problems as they journey through the biological system. In some cases substances enter the biosphere and cause problems with the workings of the climate systems (greenhouse gasses) and eco systems (persistent herbicides). In some cases, these substances act as an extra inflow of nutrients to cause imbalance in population growth, for example phosphorous promotes algal blooming.

This linear flow of material from mine to waste disposal presents several challenges. The first is destruction of natural capital. You could say a nation is endowed with resources like metals, fuels, organic resources and these are used once, never to be available again to future generations. For example, babies in Kuwait and other Arab states are being born into a country whose oil supplies are on the decline by 8% a year.

This is in a situation where the population is growing. In real terms, there are less recoverable natural resources per capita now than there were say 30 years ago.

This could maybe be justified if these resources had been used for the benefit of these coming generations to invest in renewable energy generation, education, large-scale projects which will last generations. But they have not. For the coming generations, creating a standard of living will be harder.

The second area of challenge is the work needed to

### ABOUT THE IN-TIME(S)

We are living at the peak of human achievement, but also at the peak of our resources. Sustainable development means handing over to future generations the possibility to create for themselves a standard of living at least equivalent to that we enjoy. This requires fundamentally re-thinking how we use resources, indeed all of the social arrangements we take for granted. And we need to start now. Ideation, imagining, even fantasizing are tools we can all use in this re-thinking process. The technique used to provide the basis of these extracts, Imagestreaming, opens up endless possibilities to explore our ideal future.

keep the linear flows running. This work is the input of working hours and energy. This work input itself depletes natural resources, especially fossil fuel.

The third challenge lies in the effect of all this activity on the surroundings. Mining, manufacturing and commercial activity all burden the environment and impact health, agricultural land and thereby the capacity of the area to carry future generations.

Finally, setting up the linear systems and infrastructure is an investment which creates a dependence on its continued use.

Rethinking fundamentals is needed

Let us leave the discussion of 'how did we get here?' for another time. We need to be looking at how to change the way we run our societies to reverse this sorry trend. The linear way of thinking is so ingrained in the way we do things that it controls our actions and decisions almost invisibly. A conscious effort to rethink is required.

Which is why we should talk Technosphere. Technosphere modelling shows how living arrangements could be set up to satisfy needs of current generations and actually improve living standard opportunities for coming generations. Technosphere thinking can help redress imbalances in today's systems.

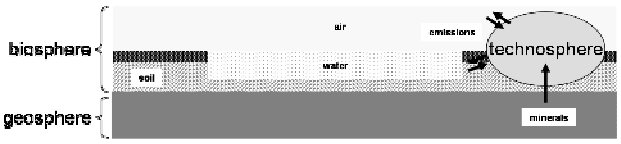


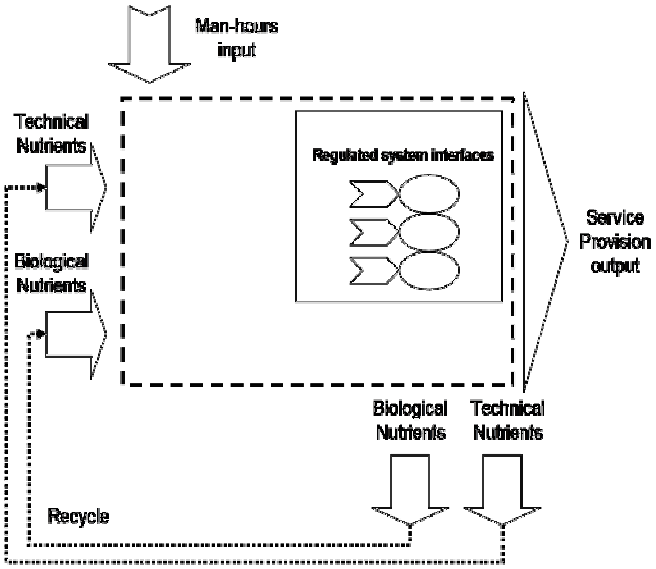

**Illustration: Technosphere in principle**

The technosphere approach sees a combination of technical systems existing within the biosphere. The biosphere is the natural layer above the underlying rocks that accommodates all living organisms and includes the hydrosphere and atmosphere. Materials of non biosphere origin (i.e. originating from the geosphere.) entering the system are identified as technical nutrients.

The concept of services is central to Technosphere thinking. A service is a human life support activity, for example provision of food, transport, housing or clothing.

At the end of the service production cycle, technical nutrients return to the start of another cycle or they return to the start of the cycle they just left. They do not return to the geosphere or technosphere.

Although the Technosphere exists within the bio- and geosphere, they are in principle separate. This means there is no or at least restricted exchange of nutrients between the two systems. Where they do meet, special conditions apply. See below. The system interfaces refer to where the technosphere meets the bio- and geosphere. The dotted line represents the extent of the technosphere.




## CHARACTERISTICS OF THE TECHNOSPHERE APPROACH INCLUDE:

- Technical nutrients: Anything coming out of the Earth's crust is seen as a technical nutrient. This means it should go into the society's technical systems and be recycled indefinitely.
- Separation of spheres: The biosphere should be kept away from the Technosphere, and visa versa. For example, fossil fuel has no place in the air or water. And water and microorganisms have no place in fossil fuel. However, the Technosphere can augment the ecological systems they interface with, by providing for example biological nutrients to improve agriculture or improve raw water for drinking water production.
- Design for recycling. All components of the Technosphere are designed to function within the systems of the sphere through manufacture, assembly, use, repair and reuse and recycling. The components are re-introduced after end of life into new components.
- Design for enrichment: Components and systems are designed to improve the resources in the Technosphere. For example, we could imagine a vehicle that captured nitrogen from

the air and released it as fertilizer.

- System interfaces. Where the biosphere meets Technosphere the exchange of nutrients is carefully controlled to ensure that:
    - No technical nutrients enter the biosphere to upset ecological systems or to deplete the resource pool
    - No biosphere components enter the Technosphere to upset the workings of the systems.
- Clarity of purpose. The purpose of the Technosphere is to provide a standard of living for the inhabitants in the area the technical systems operate. This is important as creating a Technosphere system merely to make money so someone can buy Technosphere services makes little sense. Apart from this Technosphere does not specify how monetary systems would work.
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## APPLYING TECHNOSPHERE THINKING

Some examples:

**Service; availability of bicycle.** Instead of owning bicycles they are leased. At regular service they are repaired, parts replaced are recycled. Irreparable parts go into a nutrient recycle process. New bicycle parts are made or the recycled raw materials go to other processes.

This system is characterised by interchangeable parts, easily disassembled into basic materials.

A typical description of a section of the Technosphere (or technome as an analogy with binome) contains the following categories;

- Service Provided
- Systems involved
- Nutrients input
- Nutrients Output
- Main critical techno - biosystem interfaces
- How these interfaces are managed
- Living standard service provided
- Performance (eg m3 per dollar, per employee)
- Quadruple bottom line performance over time, i.e. effect on health, the environment, society as a whole and the stability of the managing organisation.

## FEATURES AND BENEFITS

- Focus on interface, ensures clarity of thinking and regulates the loss of technical nutrients, something which is today unclear.
- Clarity of purpose: by defining the purpose of the technical component in terms of its contribution to standard of living directly, sub optimization is avoided.
- It also engages ingenuity into solving the right problem in the right way, by defining the problem in terms of need for living standard services.
- Definition at nutrient level. Clarifying at nutrient level what belongs to which system overcomes the need for regulating each individual system component.