

An aerial photograph of a city, likely Helsinki, Finland, nestled in a valley. The city is surrounded by dense green forests and mountains in the background. The sky is clear and blue.

Lauri M. Oikarinen

How to Design a Truly Sustainable City

An aerial photograph of a vast, dense forest of evergreen trees covered in a thick layer of snow. A winding road or path cuts through the forest. In the background, a body of water and distant landmasses are visible under a hazy sky.

What does it take to reach true sustainability?

How to design a truly sustainable city

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Introduction

As so called eco cities and eco villages have began to appear all around the world, it is very important to address the issue of an eco city and a sustainable city. To call a city or village an eco city does not necessarily mean that it has anything to do with true sustainability. I have now been trying to find the “true Eco City” which would present to most sustainable city model possible with current technology and understanding. It has been a huge disappointment to notice how far from sustainable most of these projects are. One calls a development an eco city even if it only has one partial improvement from the standard development.

It is time to put all the best technologies together and integrate them with innovative thinking to create a truly sustainable city. It is amazing how little people actually know about our own Planet Earth and its ecosystem, the system we would need to know better than our own pockets. We only need to mimic as well as possible the natural ecosystems own processes and circles. It surely is not difficult, as we can find all the solutions and examples directly from the nature if we know what to look for and learn the secrets of Ecology.

No technical solution will be sustainable unless it is a natural part of the ecosystem it is based in. These kinds of solutions will not get us to be a natural part of Planet Earth. And on the other hand, why bother doing expensive and difficult technical systems (like waste water treatment plants) when we can have the same thing provided by using so called ecosystem services? We can learn to effectively mimic nature’s own ways to clean our water, take away the unnecessary parts in it and accelerate the process, help it to do it all much faster. Anyone who says that a sewage treatment plant is

in any way clean or ecological, no matter what the quality of the treated water, does not understand how many chemicals are used for typical waste water treatment. All these chemical are not only extremely expensive and dangerous but also completely unnecessary and will destroy the natural water cycle. Chemicals have a huge ecological footprint and demand a lot of energy in production – ie they have a large carbon footprint. The life cycle of chemicals used in waste water treatment is so unsustainable that true sustainability can only be achieved by getting completely rid of them.

Why should we climb a tree backwards facing down? It is so much easier climbing forwards facing up. It is now time to put down an example of a truly sustainable way of living as could be done with today's technology, if we would want to. What is not working optimally yet can be made to work with only a few years of development. Do you want to do it?

How to design a truly sustainable city

CHAPTER ONE

The concept of an eco city

What is an eco city?

Eco city is a very misleading and over-exploited term. Another word commonly used for the same meaning is a sustainable city. Nevertheless, both terms are very badly misleading the untrained. Normally eco is an abbreviation and means ecological.

Ecological (from The Free Dictionary) =

“tending to benefit or cause minimal damage to the environment.”

Sustainable again is defined as:

1. Capable of being sustained.
2. Capable of being continued with minimal long-term effect on the environment: “sustainable agriculture”.
3. (Life Sciences & Allied Applications / Environmental Science) (of economic development, energy sources, etc.) capable of being maintained at a steady level without exhausting natural resources or causing severe ecological damage “sustainable development”.

Combining these definitions gets us Ecological City (Eco city) = a city that tends to benefit or cause minimal damage to the environment.

Sustainable City = a city that is capable of being maintained at a steady level without exhausting natural resources or causing severe ecological damage.

Ecologically Sustainable City then would be = a city that tends to benefit or cause minimal damage to the environment and is capable of being maintained at a steady level without exhausting natural resources or causing severe ecological damage.

Officially accepted definition of an ecocity is: “An ecocity is an ecologically healthy city.” (Eco City World Summit 2008, Eco City Builders).

More detailed definition is as follows:

“Ecocities as analogous to living organisms Like living organisms, cities (including their inhabitants) exhibit and require systems for movement (transport), respiration (processes to obtain energy), sensitivity (responding to its environment), growth (evolving/changing over time), reproduction (including education and training, construction, planning and development, etc.), excretion (outputs and wastes), and nutrition (need for air, water, soil, food for inhabitants, materials, etc.).”

“An Ecocity is a human settlement modeled on the self sustaining resilient structure and function of natural ecosystems. The ecocity provides healthy abundance to its inhabitants without consuming more (renewable) resources than it produces, without producing more waste than it can assimilate, and without being toxic to itself or neighboring ecosystems. Its inhabitants’ ecological impact reflect planetary supportive lifestyles; its social order reflects fundamental principles of fairness, justice and reasonable equity.”

— *Working definition adopted by Ecocity Builders and the International Ecocity Standards advisory team, 2/20/10, Vancouver, Canada.*” (Eco City Builders)

To make it easier to understand what an ecologically sustainable city is, I will try to simplify the above mentioned definition to a commonsense definition.

Ecologically sustainable city in its most describing definition would be:

“A city that is a natural organic part (an ecosystem itself) of all the normal ecosystems of our planet Earth. It is not consuming more that it can produce and it does not have any negative long-term effect on any of the other ecosystems on our planet. It takes in valuable resources (suitable for humans) from the surrounding ecosystems and gives back valuable resources (suitable for the other living organisms) to the surrounding ecosystems. “

Only in this way human life can be a normal part of the natural nutrient cycle. We use the valuable resources suitable for us and we do no longer produce waste but valuable resources suitable for other life forms (bacteria, insects, algae, fungi etc.). Then these other life forms will again process these resources to other valuable resources suitable for plants. And plants again will process these resources to be suitable for human and animal use. This is the normal natural cycle in all truly sustainable ecosystems. None of the nutrients ever disappear. They only change form, which is not suitable for the same life form. Thus, we are 100 % dependent on all the other life forms of our Planet Earth. Only by understanding the natural cycle can we come close to true sustainability. Planet Earth itself as a whole is a self-sustaining sustainable ecosystem. It changes form all the time, but as a whole it is sustainable. If any population grows in unsustainable manner (ie it consumes more than there is available), it will collapse and hunger will instantly drop it back to sustainable level. This cycle happens all the time in all and any natural ecosystems and life form populations.

Humans were also a natural part in this cycle ever before. Now, in a globalized world, humans are able to extract resources from areas far away from their own habitation in case of a natural resource deficiency and famine. This has given humans a strong buffer against the normal cycle of ecology. The problem with this is that it will, in natural ecological cycle, end in a devastating collapse after the last buffer potential is exceeded. The “put back to sustainable level” in this case will be a horrible famine and catastrophe.

Also, all the extra resources that humans consume for themselves, is taken away from the other life forms that require the same forms of resources, especially animals. This cycle is a vicious circle. Humans, in the short-term, think this does not affect them, it just endangers the animals. Who cares as long as we survive ourselves? However, animals and humans play same role in the whole ecosystem. We consume one form of the resources and then process it to a form suitable for the other of the three life form sections, the decomposers, as we call them (bacteria, insects, algae, fungi etc.). It is their main food. What we call a waste, is their food. So, the term waste must be eradicated, for it is so misleading.

The problem comes here. Human excretions, in most parts of the modern world, have been treated as an unwanted waste for much over hundred years. On the other hand, in normal agriculture, animal excretions have been treated as a valuable fertilizer. In the natural ecosystem, animal waste is pure food for the decomposers, and through their processing an essential nutrient source for plants. What the humans ceased to understand is the fact that so are human excretions. Only humans themselves started to think differently.

So, for well over hundred years, humans have produced only unwanted waste, instead of food. And humans have thought it must be “taken care of”. This waste was then treated with heavy chemicals and neutralized to a form unharmed for humans. It was not available anymore for the natural nutrient cycle as it was ever before. And with the number of animals decreasing fast, the total amount of nutrients directly available for the decomposers radically changed its form. So did, in direct consequence, the nutrients available for plants. It is then naturally clear that plants also suffered from this major change in the nutrient cycle and then humans themselves started to suffer from the depleting growth of plants.

The wise human being now faced starvation and had to come up to a solution to solve this human-made problem. They started to look up for solutions in chemistry and found out that inorganic artificial fertilizers would help plant growth. These types of fertilizers are not so much used in the normal natural nutrient cycle. They become available from natural weathering of harder bedrock and soil substances. This process in nature is slow and the vegetation quickly adapts to increased amount of nutrients available and grows better in these areas.

Now, humans took one step off from the natural process and started to use heavy amounts of primary energy to extract these nutrients from the harder bedrock and soil substances. This was not possible before a huge amount of free energy was available – from fossil fuels. These artificial fertilizers then were used to produce better crops. It provided increased amount of food for humans in smaller production areas. However, what humans did not understand was that the plants mostly used for human cultivation cannot take up a major part of these nutrients so quickly and in such large quantities. Much of the nutrients ended up in the waterways and eutrophication of many of the waterways close to agricultural areas was a severe consequence. Solving a problem,

where it's true origins were misunderstood, provided a solution and another problem. As a matter of fact, several new problems, which never existed before – eutrophication, soil depletion, humus depletion, huge amounts of fossil fuel based energy needed for fertilizing etc.

It is very clear, that humans have seriously altered the natural nutrient cycle and never understood it well. The alterations have caused many new problems. The chemical artificial fertilizers do not help humus and soil depletion, instead induce it. More and more energy is needed to extract more nutrients and process them to a form suitable for plants. What then happens to the nutrients taken out of the cycle – human excretions? Processing this unwanted waste costs a lot of fossil fuel based energy and producing heavy chemicals to treat the waste requires even more. And once treated, this waste still must be disposed of.

All human excretions in the “civilized modern world” are flushed down the toilets and end up into the water treatment plant. After this expensive and unneeded process, the “treated” water will be drained directly to local waterways. Only major parts of the nutrient contents are able to be removed and some nitrogen, phosphor, potassium etc. will remain intact after treatment. This will end up eutrophying the waterways. Also the sludge produced by the water treatment plant, where most of the nutrients are, will need to be disposed of. That requires another process. This does not make any sense when the whole cycle is understood correctly. It is a major alteration of the natural ecosystems services humans are endowed with by the planet Earth and its other life forms. It is a huge waste.

Now, a very major part of the normally earth-based nutrients are completely taken out of the nutrient cycle by humans and disposed into the water elements. It is no wonder

why people need to fertilize more and more their fields and still nutrient depletion is a continuing vicious circle. There are over 6 billion human beings living on the planet today. It could be quickly calculated and estimated how much excretion an average human being produces daily, if people would really take responsibility of their lives as a vital part of the natural ecosystem. This total amount is a staggering pile of excretion containing an inconceivable amount of prime nutrients, pure food for the decomposers. Taking this much nutrients completely away from the natural nutrient cycle has to be a major alteration. It is the missing chain in understanding the world ecology.

In speculations, it must be hard for a human to take full responsibility of himself, for he cannot, and does not want to, take any responsibility of his own major products, shit and piss. This is more a mental issue than a practical issue. Once understood correctly, it is most essential to also understand the importance of our best friends, the decomposers. Of whom, the most are “disgusting” insects, and even more mysterious bacteria, which very wrongly have many times been deemed as the main cause for all illnesses.

Only that day when human beings are able to face the reality and take full responsibility of all the reality and themselves, they can truly live sustainably and prosper on this planet. That requires feeding efficiently our best friends the decomposers with our excretions and then helping that processed matter to be efficiently transferred back to the feeding of our second best friends the plants. And, accept it or not, then we eat the plants or our cattle and herds eat the plants and we then consume their meat. No matter how you put it, we will eat the same nutrients which we some time ago excreted. It is so that you have to accept this natural fact or then you refuse to understand the planet and the whole life here on the Planet Earth. And how can one live if he does not understand life? It is very very difficult...

This is a major example of many of the ways how modern civilized human has completely misunderstood the natural ecosystem function of our own planet Earth. This is creating major new problems which are then tried to be solved in another technical manner which again provides a solution and several new problems.

The only solution to human's environmental problems is to start living sustainably. That is to be a natural part of the nature's own ecosystem. We must understand the natural ecosystem completely and live by its rules. Those rules are a certain fact, despite of the rules that humans try to develop themselves. This kind of a sustainable living would be achieved by a truly ecologically sustainable city.

As there are currently many projects underway, which have nominated themselves as eco cities, I need to take a closer look at all the current eco cities easily found. In this research it is a good and interesting method to create a top 5 eco city list. The ranking is of course based on the most sustainable scale where the number one is considered the most sustainable from all those found. This naturally does not mean that the number one in the ranking would be a truly sustainable city.



This book is a comprehensive combination of all the issues that need to be seriously considered to achieve true sustainability.

There are many things that have never been taken into consideration when talking about sustainability and ecocities.

Even a small improvement has been called "an ecocity" or even "a sustainable building". This has fouled the term and badly misled the large public unfamiliar with the true concept of a sustainable city.

Building so called ecocities and sustainable buildings has just been an advertisement trick for the industry and the market economy. An excuse to keep on going as usual without taking any true responsibility of our Planet Earth and all its residents.

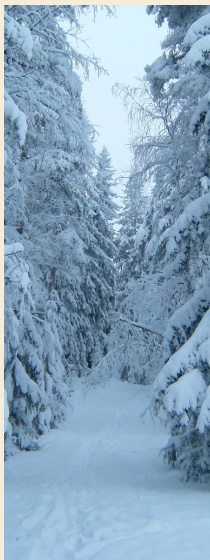
All the current "ecocity" projects are very far from true sustainability, practically taking into account only some minor parts of the whole context of sustainability.

I have conducted a large personal research into the ecology, sustainable development and human societies.

Many technologies which would make our lives much more sustainable exist already. Many of them are hindered hard by the market leaders to promote their own old technologies on the cost of the Planet and human beings. Just to make profit... Now it is finally time to make profit with clean technology and responsible action.

I have seen a whole vision of the new green sustainable Planet Earth. I will do my best to present it to you in this book.

It is time that we took the full responsibility of our actions and put things right on our precious Planet Earth. For the greater benefit of all!



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