

## **THE SHIFT FROM “LESS BAD” TO “0-IMPACT”**

Ronald Rovers

*Professor Sustainable Built Environment, Research Institute Built environment of Tomorrow, RiBUILT-Zuyd Polytechnic University, Heerlen, The Netherlands, www.ribuilt.eu*

### **Summary**

Some 150 years ago growth in society was limited due to the limited availability of resources, and their immediate availability in the region, due to transport. This balance was kept in equilibrium with too fast growth corrected by disappointing harvests or depleted stocks. Societies faced ups and downs in the ratio between population size and food and distances to other resources and yields.

Around 1860 the “party” started. Humanity bought itself time with new technologies driven by fossil fuels, and materials and fossil fuels could be deployed in an accelerated manner. Base materials could be fetched from places that were further and further away. If in some places a society from so called “undeveloped countries” still tried to manage their resources, this was completely thrown in disarray in the 20<sup>th</sup> century.

The entire world became the hunting ground of the industrialised world. Every time that there was a threat of a short-lived crisis in “developed” countries, we could again sidestep to stocks from other regions. The Hunting--gathering had again risen in all its glory.

**Keywords:** transition, assessment, resources, 0-energy, sustainable building, orbanism, housing, future

### **1 Six billion hunters and gatherers**

You could actually say, in fact, that natural selection as described by Darwin (150 years ago...) had been ‘deferred’ for large parts of humanity. There were no more natural enemies, no food or other resource shortages and humanity itself could grow in number without restraint.

150 years later we are on this world with nearly seven billion peers and all available land has been subdivided and is being developed or is occupied by people. There is no virgin territories any more that can be claimed except Antarctica perhaps but this is for the time being (...?) still under ice. Stocks and (fossil) energy are running out and society is running against a new limit. The last convulsions are taking place: the hunter can only secure resources by force of arms as in Afghanistan where three months after the incursion, contracts for the oil pipeline were signed. The gatherer is stripping the last areas using beads and mirrors as China currently does in Africa with road construction in exchange for base material extraction. Hunting and gathering, or might we say it changes to steeling and plundering. ...

The physical and political limits have again been reached after 150 years. The postponement, bought with fossil fuels, has reached its end. Again we must search for the balance but now with more than six billion people and with an unprecedented consumption

pattern. The credit crisis story we face today is, by the way, not simply a financial one. It is based on wanting to buy and own products and base materials without limit and to conclude lines of credit for this because the resources cannot be acquired fast enough or have been distributed incorrectly. We are literally living on credit.

*Many are no longer aware of the link with the foundation for affluence, base materials: it is as if mobile phones are growing on trees; that is the way they are used ("the new harvest has been collected"). Technology has become a natural phenomenon. It is available and it works. Should it not, there is a replacement since maintenance no longer exists. We process and manage but are no longer related to the base. For the Flower Power generation: it is Zen, but without the art of motorcycle maintenance.*

We are frenetically continuing to search for fossil fuels that are becoming scarcer by the day and are plundering the whole world. When they are found, they are becoming more and more difficult to extract. They will, therefore, become an assault on financial and energy resources with further price increases and economic crises as the result.

We only have to look at the Netherlands: we preach renewable energy, a modest 20% more in 2020 but oil extraction is again being pursued in a Northern province with huge investments in steam to make this oil fluid; energy efficiency drops considerably due to this. Exploring for gas is again being pursued. We, of course, also have planned new coal-fired power plants under the guise of the fact that we can store the CO<sub>2</sub>. In 20 years time. Perhaps. Maybe.

We also have biomass: cultivate energy ourselves on agricultural land. The available land in the world is the first official scarce item in accordance with the EU. So we use biomass for our "energy hunger" This could, theoretically be possible as shown by research. We could cultivate both food and energy on the currently available area of fertile land. All of production on a global scale must then, however, be brought to the yield level of the Netherlands (which is among the highest in the world due to artificial fertilisers) and we must all become vegetarians. This is already inconceivable from a human perspective and also impossible because of fertiliser base materials becoming scarcer...

We may perhaps be able to stretch things a little by developing technologies but that the hunting ground is finished, is clear. That is to say, it has been subdivided, it is in use and there is no way out. The world itself has become an island. The only hunting grounds are those of our own species: Darwin revised. We are having more selection: a fight for resources that Darwin could never have envisaged through, for example, wars or, rather, unnatural selection?



**Fig. 1** Turning Torso: 150 years of playing and experimenting, depleting planet: building consuming ~ 3400 kg / m<sup>2</sup>,

How will this go on if we do not change anything? In research carried out by Barclays Bank into the operation of financial markets, they have currently arrived at the following conclusion: *“Major risk is business-as-usual, which equates to a degeneration into widespread resource conflict and ecosystem collapse.”*

Its is time to change things. To stop hunting an gathering, and start sowing and harvesting , in a way that we can continue for long in a balance with natures potentials.

The world started thinking about this at the end of the last century. Awareness was growing, at least on our energy situation, and, as in our field of knowledge, buildings should become more energy efficient, less energy demanding. So we started improving these buildings, products from a century of abundance, and reduced energy demand of new constructions by 10 pct or so. That was the first step.

It was still a amaturistic attempt: trying to survive our way of life, with just a little bit of improvement, but nevertheless, there was a beginning. Since the last 10 years or so however we have slowly faded away of this direct attempt to improve at least energy performance:

Slowly the holistic approach has entered the scene, in which everyone should be happy: the planet, the people and the profit. The “PPP syndrome”. That is the most astonishing move stakeholders with commercial interest have been able to establish: The energy ambitions have not been fought, They have been able to pack these in a ever growing list of so called “sustainable” ambitions, hiding and diminishing the real burdon .

Tools have been initiated and supported which enable a high score without even having saved a single Joule ( except some minimal performance for countries with mandatory energy standards) . Because both the people and the profit should score well, its more like “People making profit depleting Planet”

When will the notion emerge that resources are at the basis of society: food, energy, water and materials. If they are not available or if they are not managed properly, a society cannot exist and certainly not grow. And these base resources are used by people to give shape to their affluence and wellbeing. Economy and policy are there just to facilitate and give direction to this. They can be adjusted since these are not natural phenomena: we invented them ourselves, somewhere in mediaeval times. And it is rather logical when you are going to steer resources based on an economical profit principle that has proven to be aiming for the opposite that sustainability will remain a farce.

The tools we use have undergone similar trends: more and more is included, from performance to proces management, from architecture to re-use of products, and comfort and health. To make this work we had to find all kinds of innovative ways of calculations. And start using weighing factors to compare what was not comparable. Even in LCA tools...

And we introduced to compare things with the past: Trying to maintain business as usual, by referring and comparing with older buildings, which were the results of the wrong approach... Even at high policy level, this approach has been practiced: The Kyoto protocol measures everything compared to 1990. (We created a bad concept back then, and now measure in how far we improved a little from that, forgetting that it remains a bad concept...)

So now we have arrived at using either broad holistic tools disguising any progress or failure, or on the other side have developed a focus on CO2 reduction, which is a end of pipe approach of a single issue, avoiding again to tackle the main problem: (fossile) energy. Besides issues like materials, water and food constraints, that have become equal stressful.

## 2 Where to go

With Regard to Building and construction: 150 years of experimenting by architects and depleting resources by construction, its time to conclude that there is a need for a new architectonic and urban language. With choices made out of the unlimited options explored the past age, and to select a few that support and maintain modern society. Not only with regard to an individual building but also with regard to a new approach towards the urban organism, the 'urbanism', to ensure it no longer consumes and wastes, but learns to behave as it is becoming in a decent habitat. Forming the biotope together with landscapes in which we can live and reside for many a day.. If we do not, it will be very inconvenient for all of us: and its either we do it ourselves, create a post carbon society, or society will do it for us: A post Crash Society We need a transition from (less..) consuming cities and landscapes to productive cities and landscapes.

And most important of all, It is about time to define where to go to, instead of improving where we came from. What we need to evaluate - in our business - is in how far are we away from a 100 % renewable sources based building? In energy and materials, and of course, we don't add up energy and materials to one score... We need to establish a sustainable balance for both, not for the average!

This creates the approach for a closed cycle management of our resources, and building an built environment management: A use of resources, that can be maintained for long. There is however limits to such an approach: The use of renewable sources requires to renew them, and the potential worldwide is limited. And therefore the renewable resource base sets limits to what can be done: It will most likely require that not only we make a shift for renewables, but to slow down the rate of use, and the speed by which they go in and out a cycle, as well, as to reduce the energy to drive the cyclic use. Or in other words, we will have to divide the growth potential of renewables equally over the population. For energy this seems not such a great problem (the solar route provides an escape), for materials that's an other story, it will create the need for highly efficient management of resources and maintenance of building stocks.

Now how to establish this? How to design new buildings and districts with optimised energy and water systems, and with materials that do not deplete resources, nor created CO2 emissions? And how to re-develop our neighbourhoods and districts in a transition for 0-impacts? How to plan a route for cities to become energy neutral?

Things have started to develop in that direction already though not fully recognised like that. Think of FSC wood: a attempt to manage wood in closed cycle manner, controlled. We see similar trends in fish (fishfarming) and food in general (slow food movements). Even in biofuels: to grow and renew the resources for fuels. (as described



**Fig. 2** Ijburg III :Neo-canalhouse in Amsterdam: 5 levels in prefab timberframe with strawbales.

above a fault strategy, due to the scarcity of land, but nevertheless an example of the search for manageable resources)

And away from the holistic view there is renewed interest in a pure energy focus, like the “0-energy buildings”, that are popping up in every country, and are approaching mainstream. In the Netherlands stakeholders agreed with the government to increase gradually to 0-energy new houses over 25 pct in 2012, and 50% in 2016 and 100 % in 2020. The UK already adapted a policy where all houses should be CO2 neutral by 2016. In Belgium the industrial areas develop 0-CO2 strategies, and in Germany we find the first energy producing buildings and houses. The EU recently adopted the policy that by 2021 all new buildings should be 0-energy. Its obvious that the notion is growing that we no longer should improve bad concepts from the past, but have to look forward: how far are we from the ideal situation. Even cities more and more introduce and explore policies to become energy neutral or even Climate neutral. And this is still only energy. With water, materials and land we face similar approaches: resources are getting scarce or require more and more energy to quarry or produce. Strategies for 0-water districts are tested and a few pilot projects have been established. Food supply will become more critical, if ever more people start living in cities. Urban Agriculture is gaining ground, and integrated in new town planning.



**Fig. 3** Winning student design to be constructed in the District of Tomorrow Eco/nnect, Roel Derkx en Leroy Merks: energy plus, and > 50 renewable materials, with 0-landuse: the roof has become productive.

With G20 in July 2009 agreeing on 80 pct CO2 reduction by 2050, (however not materialised in a treaty in Copenhagen) its obvious there is no escape anymore as to explore the situation where buildings and Built environment have 0 or near 0- impacts.

It makes things easier as well: In the case of 0-energy buildings (defined as buildings that on site provide the renewable energy to meet the buildings demand) its no use to measure CO2: its not an issue anymore. By transferring to renewable energy, we have both tackled depletion of fossil fuels and by definition have eliminated the side effect of CO2 emissions.

And with materials the same: They should be provided from renewable materials, and the eventual energy involved from renewable energy sources. Lets be clear about this: The future will be based on closing cycles: to be able to maintain our lifestyle with

a circular management of resources. Circular as O as a circle, or 0 as zero regarding impact for the different use of (re-) sources, for ages to maintain.

### **3 The Concept of O**

Related to building and construction the approach can be summarised as follows:

#### **3.1 O-energy**

No life without energy... But only life with 0-energy: the use of energy without climate impacts or depletion.: 0- fuels degradation, or 100 % renewable. With Buildings and Built Environments that manage within their system borders the energy needs.

#### **3.2 O-materials**

Energy and mass are two of the same, and materials, as the earthen form of mass, are diluted and depleted, unless based on a renewable source, indeed: here comes the sun, again. 0-materials, therefore, is similar to 0-energy: the use of renewable sources, and to renew these in a similar time-space frame, to compose and maintain buildings and built environments.

#### **3.3 O-water**

Water is at the heart of life, and there is enough for everyone, in principle. And in fact like energy is never lost as well, only degraded, by dilution, contamination and poisoning. No problem to use it, however to clean up for re-use as well, and remain available in the area: Leading to a 0-water approach and eco-sanitation concepts for built environments.



**Fig. 4** Hundertwasser: “The vertical is for man, the horizontal for nature”

### 3.4 O-land

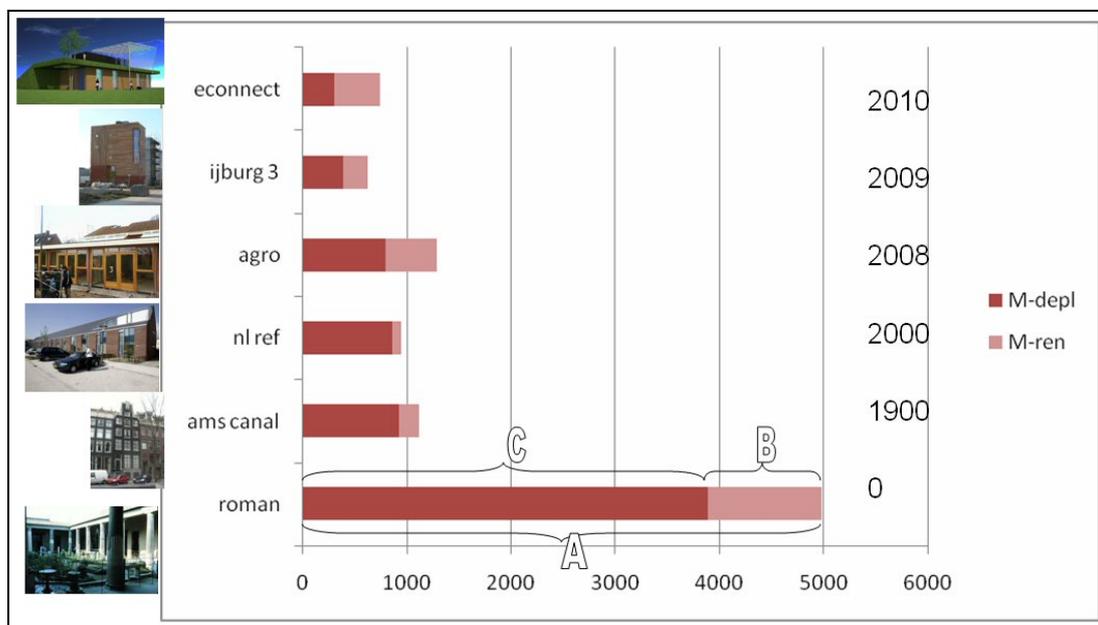
Land is where it all comes together: to collect and convert solar radiation into food, (bio)mass and energy. And with 7 billion people and growing the most scarce ‘resource’. How can we create buildings and built environments that have the least occupation and demand of land? Productive buildings in stead of consumptive built environments, and house 7 billion with a acceptable level of welfare?

### 3.5 O-air

The air carries rain, lets sun rays pass, distributes seeds and makes us breathe. If we change the balance, everything else changes. To live, without unbalancing the air around us, is about designing built environments that are and keep clear of smog, fine dust and other nasty elements. Leading to the concept of 0-air (pollution).

## 4 Assessment

Measuring performance therefore, has to focus on the ideal situation: how far are we from that situation, showing the fraction that is still depleting or impacting the resources, for buildings as well as for districts or cities. Monitoring the distance from O. And not compared to a historic wrong example, but as a direct performance. And without weighing factors: we should establish a balanced situation in all resources. A few trends are visible in that direction: Above I already showed the interest in 0-energy buildings. But there are more. World Wildlife fund launched its One planet principles, which point in that direction. And the Life Cycle Building Challenge develops similar targets.



**Fig. 5** Distance to 0, for different Buildings: A: total mass per m2, B: renewable mass /m2  
 C: non renewable fraction

## **5 Conclusion**

A future system will have to be based upon a closed cycle operational use of our resources. And by definition this can only be renewable sources: The ones that can be regenerated over their time of functional use. All others will deplete our resources, and with 7 billion people and growing, this will be even the more urgent.

It will require a whole different approach to buildings, and proceeding the current way of construction, and only a little bit better can not be maintained as a strategy.

This is what has led to the initiative for a research institute Built environment of Tomorrow, that solely focuses on research to make the 0-options happen; Summarised as “The concept of O” . O stands for a cyclic approach leading to 0-depletion, 0-pollution, 0-climate change etc, by approaches that aim for 0-energy, 0- water etc. And its not only the concept of O in the western technocratic way of things, it also relates to the Eastern notion of O : O as a character in the Japanese for Wa, for Harmony, or in the Chinese for Ying Yang, for balance. O is where all comes together, in a balanced way of managing our resources, with 0-impacts, to be maintained for ever.

It’s the only way we can house over 7 billion people, and remain a certain standard of life, without depleting all earth bound resources and biotopes. It might require us to adapt as well, the People part, to settle at a lower level of materials throughput, but at the end it’s the only way. It will take time, of course, we can’t establish this overnight. But we should start measuring and evaluating our activities, towards this target, to keep the focus straight and gradually change to this ideal future. In stead of trying to maintain, what can’t be maintained.