BEYOND THE SUSTAINABLE: CHALLENGING THE FLOW OF RESOURCES, MATERIALS AND PEOPLE

WHAT IT TAKES TO MAKE (AND UN-MAKE)

ARCHIPHOENIX

ROUGH NOTES

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COVER: DESIGN TAKEN FROM THE COVER OF *GARBAGE HOUSING*, BY MARTIN PAWLEY (1975).

Beyond the sustainable: challenging the flow of resources, materials and people.
What it takes to make (and un-make)

What does radical ecology imply for architecture?

What would architecture be like after the point of zero carbon emission and peak oil?

Who says the planet is doomed? It's only human existence on this planet, including wealth, welfare and prosperity as we know and cherish it, which is in danger. The planet itself will survive, as will most of the species on the planet. Despite resources running out, carbon levels rising, climate systems changing, life will go on quite merrily and probably more prosperously without us. What we must acknowledge is that the debate on sustainability is primarily anthropocentric; it is about OUR future as human beings, not the planet's. It's about our way of living, the choices we want to make, the resources, wealth and welfare we want to share. In that sense sustainability is very much a political debate.

So do we want to sustain our way of life, our welfare and our prosperity? I certainly would. And more so, I would rather want to share my western levels of wealth and welfare with less privileged human beings elsewhere, than stepping back and become dead poor, undernourished, uneducated, unhealthy, just for the sake of equality and solidarity with the underdeveloped countries. Negative growth on the scale of the planet is therefore not an option. A simple equation may convince.

Pe = Wf x Po x Ei (The Ecological Pressure on the planet equals Welfare times Population times some Ecological Efficiency Index (use of resources available on the planet).

I)

If we want to meet the Millennium Goals (increase welfare in underdeveloped countries

2)

the average welfare on a global scale will probably double (unless we drastically decrease our own western level of welfare), also the world population will rise (at first, because of better healthcare and food, later the curve will flatten out). If we don't want to increase the Ecological Pressure on the planet, knowing that it is already much too high, we need to become at least twice to four times as ecologically efficient (do more with less) as we are now. So in order to sustain our welfare, and in order to share it equally among ourselves as human beings, smart (efficient) growth is a necessity. And why just try to sustain the current situation, why not hope for an increase in equality, prosperity, welfare and happiness? Can we do this? Can we go beyond the sustainable?

Can we think a living, growing system that both enhances our prosperity and wellbeing and decreases out pressure on earths ecosystems.

In other words can we become allies of the other earth ecosystems, instead of enemies? Can we become one, whole integrated system? Let's suppose that we can. Let's suppose we will be able to overcome current problems concerning resources, climate change and carbon emissions. Let's suppose that for us human beings there is a way to live on this planet without exhausting the very resources we need to be able to do this. Let's suppose this ecotopia is a future reality. How would we go about reaching this state? And more importantly: What would it look like? How would it work? Where would our energy come from? Where and how would we produce food? Would we still have cities and we know them now? And political systems?

What would be the role of architecture be in achieving and sustaining this dynamic ecotopia?

1) This Eco-equation or variations on it has been 'on the air' for a while, I'm not sure where or by whom it originates. 2) Of course increase in welfare does not necessarily mean an increase in consumption, but the reality is that it probably will (if only because of consumption increase of food and medicine)

Piet Vollaard

Student column

To sustainability... and beyond!

What would architecture be like after the point of zero carbon emission and peak oil? With the evening crashing in around us at the Dutch pavilion, there was just one hour left to save the world. Jan Jongert (2012 Architecten), Pliny Fisk III (Maximum Potential Building System), Ton Matton and Francois Roche (R&Sie(n)) were asked to give their vision on the possibilities of sustainability.

Yet, sustainability is not about saving the world, but mostly about saving our way of life, Piet Vollaard told us. So what are the strategies to get this done? What can be done, in fact? One could detect almost four distinct prototypes of an attitude towards sustainability.

The dreamer

Francois Roche critiques the grand statements implied in the slogan "Beyond Sustainability", just like in the animation movie Toy Story *where the protagonist shouts the words "To infinity... and beyond!", jumping into the void, crashing immediately. When making bold statements like* Beyond Sustainability, *you are bound to crash hard. Roche compares sustainability with a virus that nestles into the head of a rat, inevitably ending up in the stomach of a cat. Consequently, understanding sustainability might not be so straightforward after all.*

The pessimist

Ton Matton describes his methods as "Trendy Pragmatism". He stated repeatedly that the measures being taken nowadays are not nearly enough. Projects accomplish very little on a global scale. No project ever really suffices. Then, what indeed could be done? Even though he suggested in the debate that all efforts are futile, he makes an attempt in the German pavilion at the Biennale. The world can destroy itself tomorrow, but Matton can be unrealistically optimistic in his exhibition of a forest of small apple trees on feeding tubes. He is not going to save the world, but tomorrow he is throwing an apple party.

The general

Pliny Fisk III mainly advocated in exercising sustainability one needs to inject their ideas into the system almost like a virus. In this way, some of his ideas managed to be realized on a state, federal and global level. According to Fisk, we need to understand the social network with which we deal and the scale of the problem. Instead of just waving your arms around proclaiming the world is about to end, Frisk explains that you need to have three resources: a network, people and land to implement solutions. You cannot change the world on your own, and one could work by tactically mobilizing your network and surgically placing interactions.

The doer

Jan Jongert has a very hands-on and inspiring approach. In his opinion, a lot of energy is wasted on the reuse of materials. So why not directly use waste as building materials? Together with his office 2012 Architects, he has published information on how to directly reuse waste materials as building materials; for example, car tires, kitchen sinks and washing machine parts.

Each of the participants acknowledges that architectural design is an utterly complex matter, so what should the student struggling to design his or her first shed be taught? What should an actual curriculum look like?

Preferable an optimistic approach, like Pliny Fisk III and Jan Jongert have presented. They argue that students and architects should be able to understand that every design is part of a larger network, and in order to design effectively one should be able to understand the network flows of for example waste and energy. Ton Matton taught students by giving them small scale experiments, teaching by getting close to the ecosystem flows. In conclusion, the sustainable issue might rather be an attitude than a curriculum. Thus concluded the night in beautiful Venice, with absolutely nothing to worry about. Tomorrow I will be at an apple party.

Arend van Waart

B_5_QUOTES_1-12

Collected by Piet Vollaard

1.*Change is not merely necessary to life - it is life.*
Alvin Toffler

2. *I want sustainability to mean: an endless chain of change.*
Winy Maas

3. *We're all born geniuses, and we're gradually de-geniused by our parents and teachers.*
Buckminster Fuller as quoted by Pliny Fisk III

4. *Knowledge is the most democratic source of power.*
Alvin Toffler

5. *The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn.*
Alvin Toffler

6. *Close down the school and meet people.*
John Thackara

7. *"Disassembly and reassembly must be the wave of the future."*
Pliny Fisk III

8. *This biennale reveals a fascination with two phenomena: sustainability as an external drive and the pervasiveness of the public domain*
Ole Bouman

9. *Sustainability is a way of expressing a relationship between the present and the future, of understanding that our decisions have consequences. If I could distil it into one basic concept, it would be ensuring that a future is possible. If we don't think about decisions we're making today, we'll have a very short timeline*
Gail Vittori

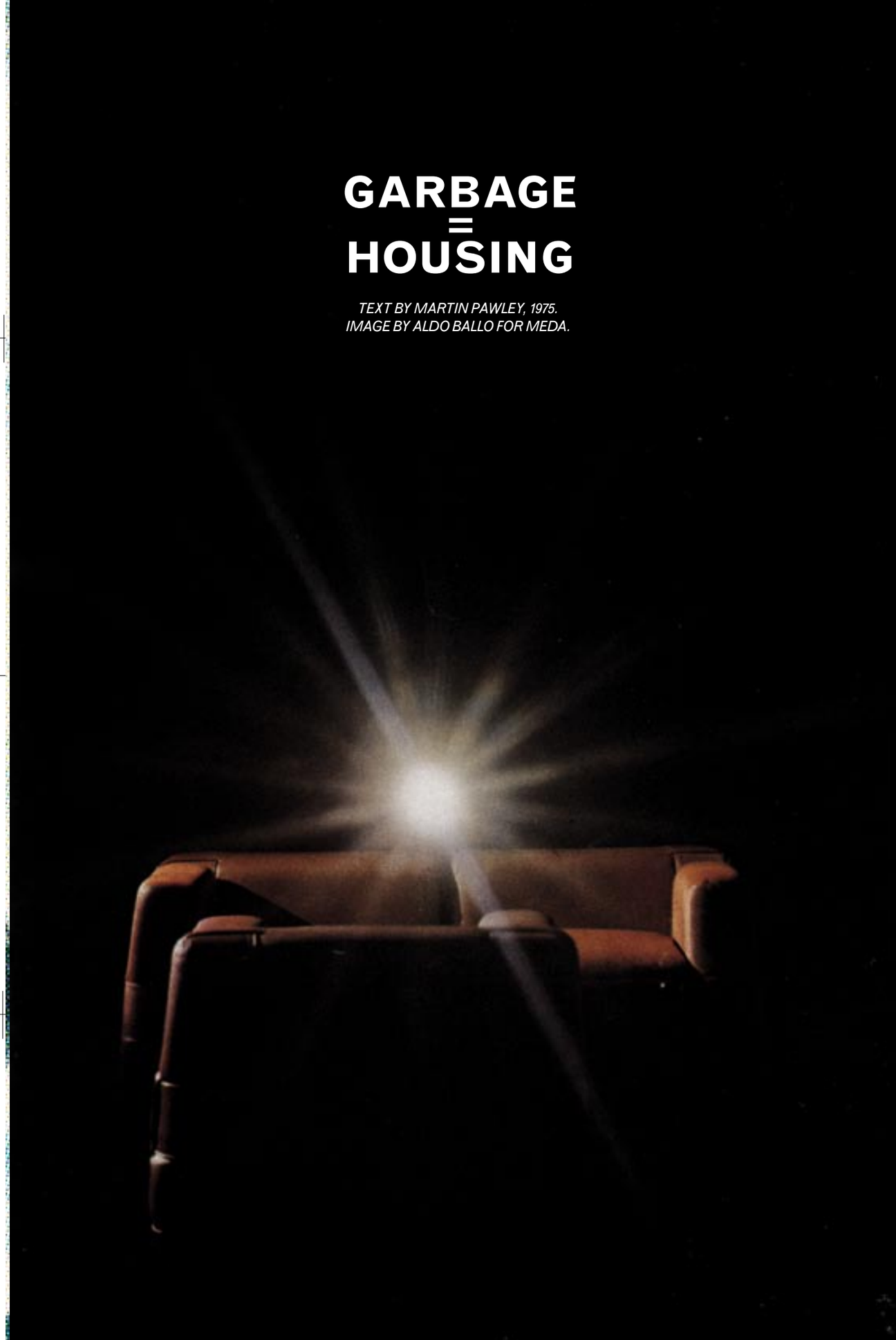
10. *"We construct buildings and, on average, twenty-eight years later we slam them down with a wrecking ball,*
Pliny Fisk III

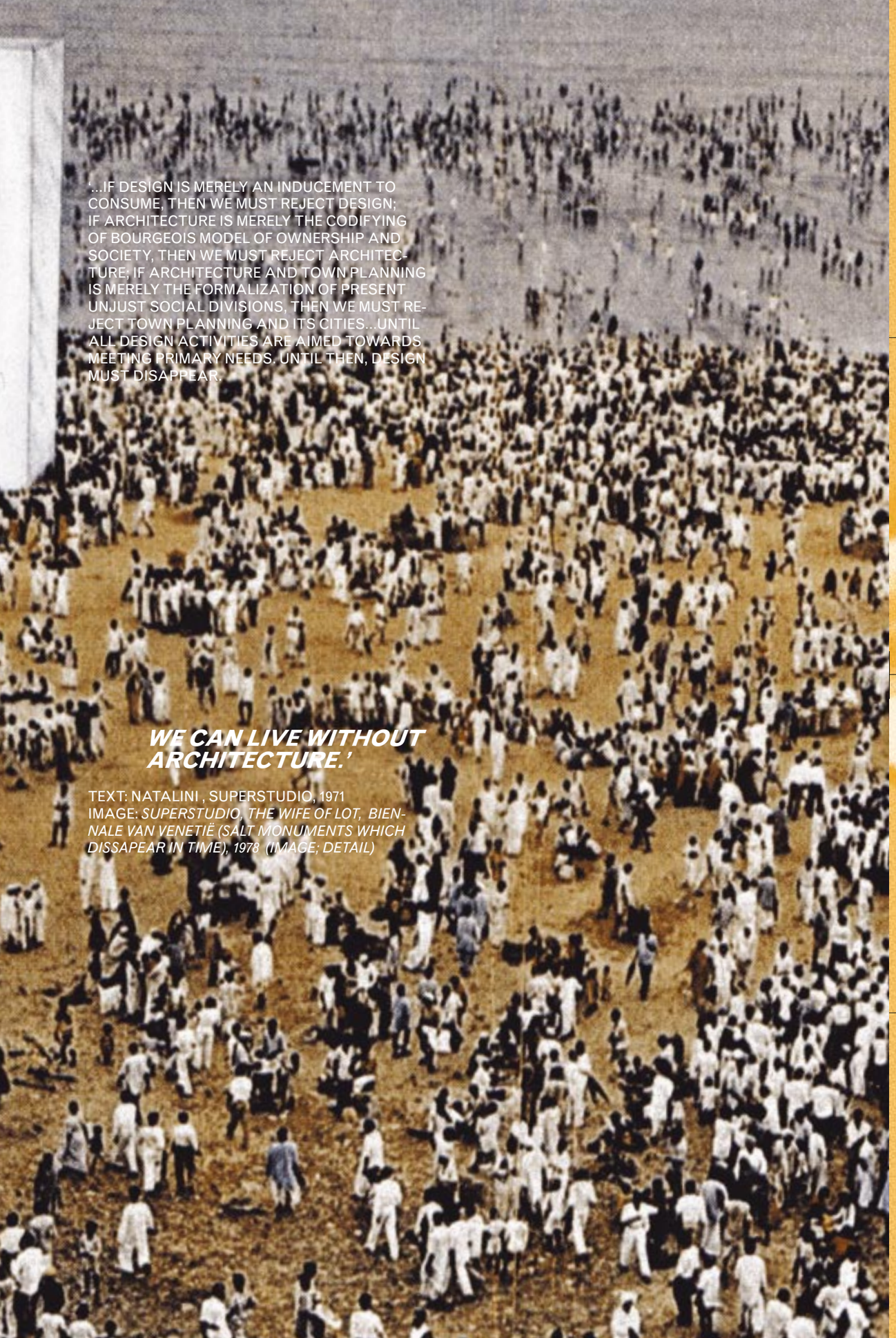
11. *Life cycle balancing on the land and within a building is a fundamentally different concept than a conservation procedure. The latter is a never-ending process towards ultimate failure because boundary is not part of the performance equation. Balance is a never-ending goal that, while never fully achieved, offers a more realistic context within which to measure an ever-evolving learning system.*
Pliny Fisk III

12. *Trains and boats and planes are not in the Kyoto protocol*
John Thackara

GARBAGE = HOUSING

TEXT BY MARTIN PAWLEY, 1975.
IMAGE BY ALDO BALLO FOR MEDA.





TEXT: NATALINI , SUPERSTUDIO, 1971
IMAGE: *SUPERSTUDIO, THE WIFE OF LOT, BIENNALE VAN VENETIË (SALT MONUMENTS WHICH DISSAPEAR IN TIME), 1978 (IMAGE; DETAIL)*

Cities will be the Mines of the Future

13. *In highly developed economies of the future, it is probable that* ***cities will become huge, rich and diverse mines of raw materials.*** *These mines will differ from any now to be found because they will become richer the more and the longer they are exploited. The law of diminishing returns applies to other mining operations: the richest the veins, having been worked out, are gone forever. But in cities, the same materials will be retrieved over and over again. New veins, formerly overlooked, will be continually opened. And just as our present wastes contain ingredients formerly lacking, so will the wastes of the advanced economies of the future yield up ingredients we do not now have.* ***The largest, most prosperous cities will be the richest, the most easily worked and the most inexhaustible mines.*** *Cities that take the lead in reclaiming their own wastes will have high rates of related development work; that is, may local firms will manufacture the necessary gathering and processing equipment and will export it to other cities and to towns.*

Jane Jacobs in The Economy of Cities

TEXT AND IMAGE FROM RADICAL TECHNOLOGY, EDITED BY PETER HARPER, GODFREY BOYLE, AND THE EDITORS OF UNDERCURRENTS, PANTHEON BOOKS, 1976

B5_QUOTES_14-17A

14. *We harvest waste from the city, we are waste farmers. The city grows the waste by itself, we pick the fruit.*
Jan Jongert

15. *The need for reuse is twofold: it prevents both refuse heaps and unnecessary energy consumption. Thirty per cent of the refuse produced in the Netherlands derives from the construction industry. On the whole, this refuse material is not especially polluting; but we cannot endlessly store it in refuse heaps. For this reason, approximately ninety per cent of construction refuse is recycled. In practice, this means the refuse is sorted and shredded or pulverized. This material is then used as raw material for embankments or melted down or compressed into a new material. These methods ignore the unique qualities of the material that existed prior to the recycling process. The surplus value that is added to the basic raw materials during the production of the construction material is largely lost again in the recycling process. Energy is required to cut or pulverize in order to produce a material that has, at best the same, but in most cases fewer, valuable qualities than before. Moreover, many materials are simply unsuitable for such recycling because they are composites and therefore cannot (or only by using lots of energy) be broken down into separate raw materials.*

A portion of this construction refuse is absorbed by the second-hand market, recycling stores and antiquarian dealers. The great benefit of using second-hand goods is that the high-grade characteristics of the composite products are preserved instead of being reduced to low-grade materials. Yet the use of second-hand materials is rare in the construction industry.
Jan Jongert

16. *However, ecological considerations [for using second-hand, founds building products] were not our ¨(2012 architects´) prime motivation. More important, in our view, is the creative inspiration they draw from the potentialities of recovered objects. The 'history' that is inherent in used products and materials - and which is absent in unused new materials - offers potential added-value when incorporated in new products and compositions: the ready-made principle of art applied to architecture.*
Jan Jongert

17. Three Steps of the Reuse design process.

In a reuse design process it is necessary to get an idea of which refuse qualifies for reuse at an early stage. The design therefore begins with two simultaneous, ***inventorying activities****. On the basis of the building programme, a rough spatial plan is made with a general overview of the materials required. These are not named as such, rather their quantities and performance requirements are listed. At the same time, the available refuse must be located and indexed according to its possible uses. In principle, there are no limits on the type and quantity of usable refuse.*

Refuse need not originate exclusively from buildings. In addition to construction materials and half-finished products, mechanical and electrical systems, whole and partial buildings and residual urban spaces are all eligible for reuse. Indeed, recognition of the construction potential of waste products that do not originate in the construction industry constitutes an important new 'design task'. It requires thorough research, creativity and an understanding of the performance capabilities required of building products to be able to see that a refrigerator's sidewall can be used as insulating facade material or that porthole doors from washing machines make tightly closing windows. In listing the performance capabilities of waste materials, economic factors may also be taken into account. Many products already entail a 'waste disposal fee' paid at the time of purchase. Some products can therefore be purchased for 'negative material costs'; they earn money. These disposal costs are expected to rise in the future, creating an extra economic stimulus for reuse. In fact, it may not be long before disposing of something is more expensive than repairing it.

In the next stage of the design process, the inventoried ***potentialities*** *of the recovered refuse must be repeatedly weighed against the spatial, structural and physical performance requirements arising from the building programme. The form is thus the outcome of an optimal combination of the required function and the possible performance of the waste product in question. In principle, this assessment process begins with an inventory of the site, where the first task is to assess the potential of what is already there. This might lead to the conclusion - on spatial/functional, economic or cultural-historic grounds, or because of creative insight into unexpected potentialities - that it is not necessary to build at all and that adaptation of the existing structure will suffice. But if this is impossible or unfeasible, the next thing is to see whether refuse from the site itself and the immediate surroundings can be rendered usable. It is important to keep the distance between the reusable product and the actual construction site as short as possible, since transport accounts for a portion of the energy use in the recycling processes. In principle, a product's reuse value should be correlated to its distance from the site;* ***the further away the product is, the more high-grade it should be****. The concept of 'regional-specific construction' is intensified by Recyclicity and in the process stripped of sentiment and nostalgia, in that it is not confined to the 'reuse' of local building traditions, but extends to all the available material and non-material, including junk, at or near the site.*
Jan Jongert in *Radical reuse*

B5_QUOTES_17B-20

18_A *The habitable structure is the result of an ongoing movement. It is an adaptive landscape, a biotropism based on local growth procedures which are themselves in a constant state of evolution. This is a general principle.*

18_B *The primary function of the biostructure is to serve as a dwelling place. Its secondary function is to be reactive rather than pro-active.*

18_C *The mere fact of being present in the biostructure confers citizenship rights. This is a general principle.*

18_D *Citizens of the biosphere agree that their requests (for growth, transformation, repairs, etc.) be submitted to the influence of the chemical stimuli of the multitude.*

18_E *The protocol for exchanges between citizens and the biostructure is freely renewable. It is cancelled if the citizen leaves.*

18_F *All citizens are ipso facto owners.*

18_G *Creative individualism is a general principle.*
(fragments from the generative schemas of 'Ive heard about',
Francois Roche

19. Biotropism*, n. (from the Greek tropos, direction) -1. Spatially-oriented growth among stationary plants and animals under the influence of exterior stimulus (biological, organic or chemical). -2. Intrinsic characteristic of "I've heard about."*

20. *My practice is situated somewhere between object-design, society-shape, ecological city planning and artist-activism' exploring 'the small Utopias and interruptions of daily life' and 'connections between traditional countryside living and contemporary mega-city lifestyle'.*
Ton Matton

1 Regenerative Design

What would architects design, if they did not design buildings?

My question is not a rhetorical one. The inputs and outputs of industrial society are wildly out of balance - and that includes its buildings and infrastructure. If we do not change, and radically, our growing economy will degrade its resource base and overshoot its carrying capacity.

The difference between where we are now, and where we were in the last ice age, 10-12,000 years, ago is five degrees centigrade. Those five degrees transformed the physical geography of the world, and created the conditions under the human species has flourished.

Our present path – business as usual – architecture as usual - commits us to a temperature rise of four degrees, at least. There's disagreement about that this might mean in detail - but nobody thinks the changes will be benign.
Remember: these changes are non-linear. The change does not approach in a steady and incremental way- like a bend in the road a long way in the distance. On the contrary: The closer we get to that bend in the road, the faster we will approach it. It's like those fast-zoom shots in cinema when the viewer's point-of-view suddenly lurches forwards towards the horizon. That's what overshoot means – only we're talking about the biosphere, not about a film.
And that's where we are now.

By the way this is not my forecast; it's not even Al Gore's forecast. it's the forecast of a former chairman of the World Bank, Sir Nicholas Stern. He wrote the Stern Review mainly because the insurance industry wanted to know whether it should be freaking out. Stern's answer was yes, you probably should.

The challenge we face is not just that one system - for example, climate - is out of balance. Multiple systems are interacting with each other: Energy, climate, food, money, culture. The American writer John Michael Greer describes as catabolic collapse what happens when relationships among life-supporting systems get out of balance, and lose their capacity to renew themselves.

When civilizations die, they do not necessarily fall apart suddenly in a great crash. The pattern through history, when civilizations die, is more one in which a series of crises interspersed among periods of incomplete recovery.
Greer compares our situation today, in 2008, to the summer of 1929. "Nobody then predicted unparalleled economic disaster followed by the rise of fascism and the outbreak of the bloodiest war in human history," he recalls, "so why is it unreasonable to suggest that something not unlike that may be brewing now?".
Why indeed.

The apocalyptic view is that our energy problems will not be solved, and industrial civilization is doomed to crash. The best course of action, say these 'doomers', is to head for the hills in a truck filled with guns and peanut butter. At the other extreme are technology optimists. These guys are sunnily confident that new sources of energy will emerge as human ingenuity responds to market demand.
Somewhere in-between the 'head-for-the-hills' brigade, and the 'tech-will-fix-it' brigade, is a third position occupied by people called soft-landers.
Soft-landers accept that that today's always-on, ever-faster economy will not persist for much longer. But they are hopeful that an eco-technic economy will emerge that less intense than the one we have now, but still forward moving.

My own expectation is that we will experience elements of all three scenarios. We will experience elements of catabolic collapse. But bursts of transformative innovation, and a lot of muddling through, are also possible.
Some kind of soft-landing is feasible on condition that if daily life as we know it now is radically transformed - by our own actions. These actions are the focus of the rest of my talk.

The good news is that we know what we have to do. It's stated quite clearly in Oliver Tickell's book, Kyoto 2. We have keep the great bulk of our fossil fuel reserves, or at least the carbon they contain, in the ground where nature put them. We have to redesign the global economy to achieve climate neutrality by around 2050.

We have to protect and restore forests, woodlands, grasslands, peatlands, soils and other biological carbon stores and sinks. And we have to prepare for the unavoidable human and environmental impacts of the climate change which will happen in any case.

This transformation will happen by a combination of top-down and bottom up change. Top-down, some pretty serious changes are building in momentum: Command and control measures such as emission standards, product regulations, licensing, certification and labels schemes are growing in strength.

New ways to measure economic value and to account for eco-system services in national and company accounts, are finally becoming mainstream.

Bottom-up, too, there's an incredible upsurge of activity. Paul Hawken reckons there are a million grassroots projects in developed countries doju g their thing, but below the radar. His website, Wiser Earth, lists more than 100,000 of them.

'Sustainability' s not some distant, hard-to-reach goal. It's already emerging. Many of the elements of a sustainable world already exist. A few elements are technological solutions. Some are to be found in the natural world, thanks to millions of years of natural evolution. The majority of solutions are social practices - some of them very old ones that have evolved in other societies and at other times.

Regenerative Design

Where does that leave design? Well, to be candid, we've been pretty slow on the uptake. Last night I hear a bunch of architects talking about the "ground breaking" idea they'd seen here at the biennial. Is ""ground breaking" " creating the conditions for life? I don't think so. But we are catching up. The notion of regenerative design, in particular, shifts our focus to actions that protects and creates the conditions for life.

We need to re-imagine the built world not as a landscape of frozen objects, but as a complex of interacting ecologies: energy, water, mobility, food.

Regenerative design necessarily operates in ways that are sensitive to context, to relationships, and to consequences. Regenerative design will often mean the adaptive or more intense of existing infrastructure. The need for new buildings is rare. Sometimes the design choice will be to nothing.Our life-sustaining ecologies, especially, need to be nurtured, not swept away, or ignored.

So let me give some examples of all the work that regenerative urban design will involve. I hope to persuade you that we'll all be so busy that we won't even think any more about that old paradigm ambition, designing new buildings.

There is much work for architects to do, even as they stop designing buildings. The architect's understanding of space, time, and process will be valuable as our focus shifts to closed-loop systems and services and that meet the needs of daily life in new ways. We need to re-imagine the design space – the biosphere - not as a tabula rasa, but as itself an complex of ecologies each of which has the potential to support us. Ecologies of:

- ***energy***
- ***mobility***
- ***food systems,***
- ***water; and***
- ***resources***

Energy is at the heart of architecture. Every building that enters our lives has a hidden history—an un-documented inventory of wasted or lost materials, and energy, used in its production, its use, and in the patterns of daily life that are shaped by its very existence. The second principle of thermodynamics states that: ”all creation, all generation, and even all information, must be paid for in entropy. No system – and no being - can maintain or regenerate itself in isolation”. Seen through the lens of thermodynamics, buildings are open and therefore *dissipative structures*.

Until recently, the energy and resource performance of buildings remained out of sight - and therefore out out of mind. But the material flows of industrial society, its “metabolism,” are now being measured with increasing precision. A technique called *Materials Flow Analysishas* given us the concept of *embodied energy* (sometimes called *embergy*) - which refers to the quantity of energy required to manufacture, and supply to the point of use, a product, material or service.
We do not yet have a comprehensive global embergy database - but we’re getting there. We now know, for example, that the amount of matter and energy needed to support the lifestyle of a North American citizen is roughly one million pounds weight a year - a “million-pound backpack.”

A million pounds of weight is an big backpack to carry around. It’s the same as ten thousand one-hundred-pound bags of cement. I once had the idea, before a lecture, of piling that number of cement bags on the stage of the lecture theatre to illustrate this point. But the venue’s manager worked out that this would result in a pile of cement the area of a tennis court, sixty feet high - and called off my stunt. He said the stage would collapse.

All the world’s a stage, I told him.

In his book *Heat* George Monbiot estimates that in order to avoid the two-to-four degrees of warming that I mentioned at the beginning, we need to cut global emissions by 60 percent per capita between by 2030.

If everyone on the planet were to be allocated the same carbon emitting ration, this translates into an 90 percent cut for people in rich countries. That’s a much stiffer target than the numbers agreed as part of the Kyoto treaty. But Kyotyo-2 is in preparation, and as I said, it’s rather clear what we have to do:

> We have keep the great bulk of our fossil fuel reserves, or at least the carbon they contain, in the ground where nature put them.
>
> We have to redesign the global economy to achieve climate neutrality by around 2050.
>
> We have to protect and restore forests, woodlands, grasslands, peatlands, soils and other biological carbon stores and sinks.

It’s in this context – of their the total embergy footprint - that the case for new buildings will get harder and harder to make. The same warning applies to high-tech green buildings, to ecovillages, and to eco cities like Dongtan and the Foster one in Abu Dhabi.

They are barely justifiable as prototypes, but the far bigger priority is to adapt the massive stocks of buildings that already exist. Ezo Manzini compares this operation to “changing the engines of an aircraft while in flight.”

It may appear a difficult task, but he reminds us that during two centuries of industrial innovation, until now, we have reduced the role of labour in production by even larger proportions.

The authors in Natural Capitalism are also confident that 90 to 95 percent reductions in material and energy flows are possible in developed nations without diminishing the quality of the services people want. But we’re not going to get there via a tabula raza.

Use, not own

A first step along this road is re-design for use, not for ownership. Many of us already lease, rather than purchase, a device as part of a service contract—a car, a refrigerator, an answering machine, a photocopier. In so doing, we purchase performance—moving, cooling, message taking, or copying—rather than the product itself.
Power tools are another good example. The average consumer power tool is used for ten minutes in its entire life—but it takes hundreds of times its own weight to manufacture such an object. Why own one, if I can get hold of one when I need it? A *product-service system* provides me with access to the products, tools, opportunities, and capabilities I need to get the job done—namely, power tools for me to use, but not own.

Sustainable service design helps people who need things done, connect to other people, and equipment,—on an as- and when-needed basis. The technical term, which comes from the logistics industry, is “dynamic resource allocation in real time.”

And that includes spaces.

★

Modern mobility comes with a price, but the price tag is not visible, so we don't pay it; the biosphere pays.

Aviation alone is responsible for a huge proportion - between four and nine per cent - of climate change impacts attributable to human activity. It has by the greatest per kilometer climate impact of any transport mode, with explosive growth planned into the system.

The high growth scenario published by the Intergovernmental Panel on Climate Change includes an estimate that 1,300 new international airports will be required by 2050, built at the rate of two a month, to deliver anticipated capacity.

A lot of work for architects?

My own personal mobility impacts are horrendous. Last year I took 78 flights. Two of those flights on their own - a return trip to New York - generated emissions equivalent to my total annual emission entitlement for all activities were I to share fairly with my fellow eartrh dwellers in the absorptive capacity of the biosphere.

Taking the TGV is not the answer. Europeans believe that high-speed trains are environmentally far more friendly than aircraft - but they're not. When researchers at Martin Luther University studied the construction, use, and disposal of the high-speed rail infrastructure, they found that forty-eight kilograms (about a hundred pounds) of solid primary resources is needed for one passenger to travel one hundred kilometers by Germany's high-speed train.

Could I go by banana boat? Not really. The world's merchant fleet contributes reached nearly 4.5 percent of all global emissions - a huge amount up there with cars, housing, agriculture, and industry. Like aviation, shipping emissions are omitted from European targets for cutting global warming .

Reducing the movement of matter - whether goods, or people - is a main challenge in the transition to sustainability. Current thinking on mobility is *predict and provide*. This approach promises more travel of people and goods, forever, using new technologies and integrated systems to make them more efficient.

The British government is spending seven times as much money on widening a single road – the M25 London orbital – as it is currently spending every year tackling climate change.

A second design strategy is *mobility substitution*—communicating virtually rather than moving in person to meet.

The optimal design strategy is to ***design away the need to move*** - and change our cultural ambition in favor duration over distance, and closer over faster.

Time theft

We don't just squander matter and energy on mobility. We also squander time. We spend the same amount of time traveling today as we did 50 years ago - but we use that time to travel longer distances. The average German citizen today drives fifteen thousand kilometers a year; in 1950, she covered just two thousand.

A lot of our travel time is commuting time and work-related travel that we believe we cannot avoid. We also spend a lot of time traveling in order to shop, and to take our kids to distant schools. The faster we go the less time we feel we have. Sociologists have coined term "social speed" to signify the average speed of a vehicle (and its passengers) after all sorts of hidden time costs are factored in.

So in addition to "getting to the airport" time—and waiting time once you get there - we need also to count the time spent earning the money to go on the journey in the first place.

The movement of stuff is as much a burden on the planet as the movement of people. Throughout the world, 300 million containers full of stuff are moving around, or standing in yards, at any one time. Their contents account for about 90 percent of the world's traded cargo by value.
In other words, 85 percent of all the goods and materials in the world are not in factories, warehouses, or shops - but moving, or waiting to move, on roads, in the air, or at sea

Think More, Move Less

Making mobility more integrated and efficient will not resolve our core dilemma. If today's growth trends persist, the social, economic, and environmental costs worldwide will be unacceptably high.

From Faster, to Closer

We once hoped that the Internet would replace trips to the mall; that air travel would give way to teleconferencing; and that digital transmission would replace the physical delivery of books and videos.
In the event, technology has indeed enabled some of these new kinds of mobility - but in addition to, not as replacements for, the old kinds.

Just as roads built to relieve congestion increase total traffic, the Internet has increased transport intensity in the economy as a whole.

Rhetorics of a "weightless" economy, the "death of distance," and the "displacement of matter by mind" sound ridiculous, in retrospect.

There is an alternative way: reduce the movement of matter - whether goods, or people - by changing the word faster, to closer. The speed-obsessed computer world, in which network designers rail against delays measured in milliseconds, are years ahead of the rest of us in rethinking space-time issues.

They can teach us how to rethink relationships between place and time in the real world, too.

Embedded on microchips, computer operations entail carefully accounting for the speed of light. The problem geeks struggle constantly with is called latency—the delay caused by the time it takes for a remote request to be serviced, or for a message to travel between two processing nodes.

Another key-word, *attenuation*, describes the loss of transmitted signal strength as a result of interference—a weakening of the signal as it travels farther from its source - much as the taste of strawberries grown in Spain weakens as they are trucked to faraway places.

The brick walls of latency and attenuation prompt computer designers to talk of a "light-speed crisis" in microprocessor design.

The clever design solution to the light speed crisis is to move processors moving closer to the data. Network designers, striving to reduce geodesic distance, have developed the so-called storewidth paradigm or "cache and carry". They focus on copying, replicating, and storing web pages as close as possible to their final destination, at content access points.
Thus, if you go online to retrieve a large software update from an online file library, you are often given a choice of countries from which to download it. This technique is called "load balancing"—even though the loads in question, packets of information, don't actually weight anything in real-world terms.

Cache-and-carry companies maintain tens of thousand such caches around the world. By monitoring demand for each item downloaded and making more copies available in its caches when demand rises, and fewer when demand falls, operators can help to smooth out huge fluctuations in traffic.

Other companies combine the cache-and-carry approach with smart file sharing, or "portable shared memory parallel programming". Users' own computers, anywhere on the Internet, are used as shared memory systems so that recently accessed content can be delivered quickly when needed to other users nearby on the network.

The law of locality

The fundamental problem with the car and the plane is not that it burns too much of the wrong kind of fuel. The problem is that they enable, and perpetuate, patterns of land use, transport intensity, and the separation of functions in space and time, that render the whole way we live unsupportable.

Rather than tinkering with symptoms - such as inventing hydrogen-powered vehicles, or turning gas stations into battery stations - the more interesting design task is to re-think the way we use time and space.

Distributed computing is an inspiration, I believe, because it's the information equivalent of sending the acorn, not the tree.

My favorite example of decentralization of production concerns drinks. Export the recipe, and sometimes the production equipment, but source raw material and distribute locally.

People and information want to be closer. When planning where to put capacity, network designers are guided by the law of locality; this law states that network traffic is at least 80 percent local, 95 percent continental, and only 5 percent intercontinental. This is not the "death of distance" once promised by internet pioneers. Communication network designers use another rule that we can learn from in the analogue world: "The less the space, the more the room." So, too, in the analogue world: radically decentralized architectures of production and distribution can radically reduce the material costs of production.

We need build systems that take advantage of the power of networks - but that do so in ways that optimize localness.

This design principle—***"the less the space, the more the room"***—is nowhere better demonstrated than in the human brain. The brain, in Edward O. Wilson's words, is "like one hundred billion squids linked together... an intricately-wired system of a nerve cells, each a few millionths of a meter wide, that are connected to other nerve cells by hundreds of thousands of endings. The human brain is the most complicated thing in the known universe—known, that is, to itself."

Information transfer in brains is improved when neuron circuits, filling specialized functions, are placed together in clusters. Neurobiologists have discovered an extraordinary array of such funtions: sensory relay stations, integrative centers, memory modules, emotional control centers, among others. The ideal brain case is spherical, or close to it, Wilson observes, because a sphere has the smallest surface relative to volume of any geometric form. A sphere also allows more circuits to be placed close together; the average length of circuits can thus be minimised, which raises the speed of transmission while lowering the energy cost for their construction and maintenance.

The mobiity dilemma is not as hard as it looks. I have tried in this chapter to look at the issue through a fresh lens and to borrow from other domains such microprocessor design, network topography, and the geodesy of the human brain.

The biosphere itself is the result of 3.8 billion years of iterative, trial-and-error design—so we can safely assume it's an optimized solution.

As Janine Benyus explains in her wonderful book Biomimicry, biological communities, by and large, are localized or relatively closely connected in time and space. Their energy flux is low, distances covered are proximate. With the exception of a few high-flying species, in other words, ***"nature does not commute to work."***

A core principle of regenerative design is that it creates conditions for life. Our food systems today are going in the opposite direction. Many civilizations, from the Summerian to the Maya, declined when the scale, complexity and attenuation of their food production systems became unsupportable.

Now look at us.

On American farms in the early 1800s, the balance between calories expended, and calories eaten as food, was about even. Today, the global food system consumes ten calories for every calorie we eat. According to Toronto's Food Policy Council – the fist of its kind in the world - up to 40 percent of the ecological impact of a modern city can be attributed to its food systems. Transport is a big element. Thanks to cheap fuel, food materials now account for nearly 30 percent of goods transported on Europe's roads.

We also ship bottles of water around – an action 600 times more impactful than water drawn from a tap. The location of supermarkets generate much wasteful mobility; in the UK, 25 percent of car journeys are to get food.

But it's not just about food miles. The packaging of processed foods accounts for 70- 80 percent of the overall emissions of the food industry. Food retailers also spend insanely on energy - seven times more than in an ordinary office. In some food stores up to a quarter of their energy budget goes on lighting – to make the food look good, not for it to be good.

A single open-fronted chiller cabinet costs 20,000 euros per year to run in energy bills alone - and that does not include the embodied energy involved in each unit's manufacture. And once home, our reliance on processed food stimulates energy use in fridges and freezers, stoves, ovens, and microwaves .

When food is forced into the formal economy, and industrialized, indirect costs also skyrocket. Poor diet accounts for 35 percent of avoidable causes of deaths in the US. The on-costs of obesity alone amount to 10 percent of total health costs.

Processed food does not just clog our bodies' arteries. Two geographers, Simon Marvin and Will Medd, found that fat deposits from fast food outlets and homes was the cause of fast-increasing sewer blockages in cities right across America.

Food madness is not confined to the North. 29 percent of school-age children in Delhi are obese. This is because the sugar content of their diet has risen 40 percent years, and its fat content by 20 percent, within a generation.

The financial pressure to industrialize food is immense. In a Western food shop, for every ten dollars you or I spend at the checkout, only 60c ends up with the farmer. The remaining euros 9.40 - the "added value" – is turnover and profit for the industries involved.

Formal retail remains small; most food shopping is still done through roadside vendors, and open-air markets. But Delhi's authorities want to ban the city's 300,000 street food vendors - (few of whom use much sugar or fat) - in the name of "hygiene" and "modernization".

Urban farming.

So the food situation is totally mad. But when the civic and business leaders of thirty world cities convened in New York last year for the Large Cities Climate Summit, food did not figure on the agenda. Delegates discussed Congestion, Energy, Water, Buildings, Business, Urban Transit, and Waste - but not food systems. The mind-set seemed to be that cities are for people to live and work in - and the countryside is for growing food.

But things are changing fast. The unlikely success of a book called *Continuous Productive Urban Landscapes*, by Andre

Viljoen and Katrin Bohn, is one sign that planners and architects are starting to accord food systems the same priority as transport, or housing. Worldwide, some 800 million people are involved in urban agriculture – in cities as diverse as Rosario, Argentinia, the South Bronx, Portland, Curitiba, Freiburg Mexico City and Barcelona – and Middlesbrough.

A curious side-effect is the attention now paid to Cuba as a laboratory for sustainable development - with urban agriculture food systems as its core competence.

Urban farming is a misnomer: the sustainable scale is that of a city region. The ecosystem planning approach includes the whole food system, not just parts of it, while focusing on the interrelationships among natural elements.
It understands that humans are part of nature, not separate from it, recognizes the dynamic nature of the ecosystem and incorporates the concepts of carrying capacity, resilience and sustainability.
The design challenge is to enable and connect diverse resources and elements of a food system:

Production - scale (city-region) and diversity
Distribution - alternative trade networks
Storage (that is low energy)
Preparation - community-level
Composting – S, M, L

A tremendous level of coordination is needed to disintermediate the wasteful layers that now sit between producers and consumers.

If we are to re-localize food, a new generation of open information systems will be needed as support. Many of today's food systems rely on closed networks in which access to information is controlled by entities (such as supermarkets) that are not keen on cooperatives and localization.

Urban farming, in this sense, is more about the design of coordination infrastructures than it is about stand-alone artefacts.

New services and infrastructures are needed to support food co-ops, collective kitchens and dining rooms, community gardens, and other enhancements of community food systems.

It costs 200 euros per square meter to build a road - 50 to open up the space for a farm

Regenerative design re-imagines the urban landscape as an ecology with the potential to support us. In terms of perception and culture, we need to re-connect city dwellers with soils, trees, animals, landscapes, energy systems – and, especially, water.

Urban waterways, often the historic core of our cities' economies, have the potential once again to be rich sources of biological diversity that contribute to the quality and economy of urban life. Since Roman times, we have designed rapid-transit water conveyance systems that keep land relatively dry, provided a supply of potable water, and carried away human waste for disposal.

The traditional goals of urban water management have been to provide a safe and adequate water supply, environmentally acceptable disposal of treated wastewater, and flood control. These systems have been integrated into the built environment of buildings and streets.

However, over centuries, original water systems have been misused and damaged. We discharged pollutants into them, changed their direction to suit development needs – and more often than not physically obscured them from sight.

Despite billions of dollars spent on costly hard solutions like sewers and treatment plants, the hard systems we have put in place are now an impediment to managing water as a vital ecological asset.

With increasingly extreme change, droughts and floods, a more erratic climate with more extremes, even the hard infrastructure is outdated. The size of water storage we have put in place does not reflect the extremes that are likely to occur. Rainfall is becoming more intense, but less frequent; reservoirs are not sized to hold the extra water, and downstream flooding is more likely to occur. We have to re-visit thousands of storage facilities and reassess their design parameters to see how proof they are against climate change.

We've also created an urban landscape that makes pollution worse, not better: a preference for impervious over porous surfaces; fast "hard" conveyance infrastructure rather than "softer" approaches like ponds and vegetation; and rigid stream channelization instead of natural stream courses, and development in floodplains.

Traditionally, the water industry has tended to focus its innovation on the search for technological improvements - such as, these days, advances in membranes. Resources have been allocated to projects that add new functionality to existing engineered urban systems.

But hard, machine-model approach to infrastructure is longer appropriate for water management.
The new paradigm in water management – so-called *Water Sensitive Urban Design* – features a return to the hydrology of a city as it was before the conveyor system metaphor took hold.

The new approach integrates watershed and water cycle management into urban planning and design.

The focus shifts from high entropy engineered solutions, such as reservoirs and sewer networks, to ecological systems that give priority to rain gardens, surface wetlands, restored ponds and daylighted streams.

Rainwater, especially, is now treated as a resource. High efficiency decentralised treatment plants can provide reclaimed water for re-use in buildings toilets heat recovery and cooling, irrigation,

Starting right now, urban landscape and drainage systems need to be designed to mimic the natural hydrological cycle – recharging aquifers with reclaimed rainwater, and returning the base and flood flows of streams to their predevelopment levels. So called *soft water engineering* means controlling these waters as close to their sources as possible. At a small scale, therefore, the introduction of Sustainable Urban

Drainage Systems (SUDS) means we need to re-design roofs, pavements, streets and parking spaces.

At a regional level, too, the tide is turning against dams. For the last 150 years, dams were thought to meant to create energy and clean water. But al too often, but the poorest communities were the losers in the race for rewards.

The Katse Dam in Lesotho is Africa's highest dam and the first in the massive Lesotho Highlands Water project. But the fragile mountain environment has been degraded, native fish and animal species are being pushed towards extinction, and at least 27,000 people have lost their homes, fields and other vital resources. A further 150,000 people downstream have had their drinking water, farming and fish affected by reduced river flows. Promised compensation schemes have not been effective and livelihoods have not been restored.

In Mozambique, China and Brazil may cooperate to build a new dam on the Zambezi River. This would undermine a plan to restore the Zambezi Delta and its rich fisheries areas.

The worlds biggest dam project is three $80-bn Grand Inga dam in the Republic of Congo. Mining timber and other extraction industries will be the main beneficiaries, whilst poor farmers and fishers will be the losers.

When I talked about mobility just now, I told you about the law of locality used by telecommunications network designers to allocate capacity. Local conditions, local trading patterns, local networks, local skills, and local culture remain a critical success factor for the majority of economic activity in the world.

A key feature of sustainability is resource efficiency. In the radically lighter economy that awaits us we will share all resources - such as energy, matter, time, skill, software, space, or food.
We will use social systems to do so - and sometimes we will use networked communications. The most important potential impact of wireless communications, for example, will be on the resource ecologies of cities.

Connecting people, resources, and places to each other in new combinations, on a real-time basis, delivers *demand-responsive services* that, when combined with location awareness and dynamic resource allocation, have the potential to reduce drastically the amount of hardware—from gadgets to buildings—that we need to function effectively.

Most of us are potentially both users and suppliers of resources. The principle of use, not own can apply to all kinds of hardware: buildings, roads, vehicles, offices—and above all, people. For more or less anything heavy and fixed, we don't have to own them – just know how and where to find them.

Our design task is to replace physical resources with information.

The information part is knowing where a resource that you need to use, is to be found. If you can locate a thing, and access it easily, you don't have to own it - and the biosphere does not have to support it. Think of cars: Most of them are used less than 5 per cent of the time; otherwise they sit empty, un-used, consuming space. The same goes for many buildings.

Many resource-sharing systems already exist, especially in poor countries where people cannot afford to waste resources like rich people do. Local systems of barter and non-monetary exchange, such as Jogjami, have existed in India for 500 years. A co-operative distribution system called Angadia, or "many little fingers", enables people to send goods over sometimes vast distances, without paying.

Sustainability, in my book, is about a world based on less stuff, and more people. Sustainability therefore means designing people back into control of situations rather than replacing them with technology.

A key concept is that of enabling solutions - solutions that re-assert human agency in our systems-filled world.

Radical resource efficiency means ***that products - stuff - are a means to an end, not an end in themselves.***

A narrow focus on objects and appearances (especially among designers) is replaced by a focus on closed-loop 'product service systems' that meet needs in all aspects of daily life: washing clothes on the roof of apartment blocks, looking after children, communal kitchens and gardens, communal workshops for maintenance activities, tool and equipment sharing, networks and clubs for health care and prevention.

Especially if we steer them in that direction, mediascapes can improve the resource efficiency of the places we live in.

The most important impact of wireless communications will be on the resource ecologies of cities. A central design task is to connect people, resources, and places to one another in new combinations, on a real-time basis. Demand-responsive services, location awareness, and dynamic resource allocation, have the potential to

reduce drastically the amount of hardware—from gadgets to buildings—that we need to function effectively in a city. Free broadband municipal wireless is a key par of the necessary infrastructure.

Low-cost wireless networking enables ordinary people have the means to create a network independent of any physical constraint except distance. Big business is already using mediascapes to shape the evolution of localities.

Locational data and demographic models are used by Starbucks and McDonald's to site new stories. Huge volumes of point-of-sale information are mined to help firms like WalMart tune the placement of wares, even inside stores.

My proposition is this: ***The same software and data that enable WalMart to locate its huge stores can be repurposed to optimize local-area service ecologies.***

Flows of resources can be shaped that minimize the movement of people and goods. New parameters can be introduced into open planning systems—for example, that 50 percent of produce in a shop or railway station should be local or have traveled no more than fifty kilometers from where it was grown.

Thinking local and thinking small is not a parochial approach, and it is not an abdication of responsibility for the bigger picture. On the contrary, we will get from here to there by a series of small, but carefully considered, steps.

Proximity and locality are natural features of the economy. Most of the world's gross domestic product (GDP) is highly localized. Around the world, the vast majority of small and medium-sized companies operate within a radius of fifty kilometres of their headquarters location. Local conditions, local trading patterns, local networks, local skills, and local culture are critical success factors for the majority of organizations.

The economist Manuel Castells describes the modern world as a "space of flows"—flows of people, capital, information, technology, images, sounds, and symbols. "Flows are the expression of the processes dominating our economic, social and symbolic life,"[1] says Castells.

Flows sound soft, and smooth, and benign—but flows also wash things away and damage things - sometimes unexpectedly. Climate change is a good example of a change that we seem to have caused, but was not our intention. We face a variety so-called rebound effects, such as the increased traffic that the Internet has stimulated, or the additional use of paper it has generated, rather than replaced.

We sometimes feel helpless in the face of this type of change. Economists describe as "exogenous"—arising from outside society—the seismic forces, such as technology, or financial flows, that are changing the world.

But they are wrong. Neither technology nor financial markets have come from "outside society"—they are the outcome of human decisions and actions. These actions may have been misguided or based on assumptions that we are now beginning to question—but they were not an accident.

We have to operate now in ways that are sensitive to context, to relationships, and to consequences. Having suffused the world with complex technical systems—on top of the natural and social systems that were already here - the transition to a one planet economy is a transition from mindless development to *design mindfulness*.

So what should architects design, if they do not design buildings?

Traditional design thinking focuses on form and structure. Problems are "decomposed" into smaller steps, and these are prioritized in lists. Actions and inputs are described in a blueprint or plan—and other people produce or implement it. This is a top-down, outside-in approach. It doesn't work well now because complex systems, especially human-centered ones, won't sit still while we re-design them.
A sense-and-respond kind of design works better: Desired outcomes are described, but not the detailed means of getting to those outcomes.

Sense and respond means being responsive to events in a context—such as a city or a region—and being able to respond quickly and appropriately when reality changes. This approach implies that we develop an understanding and sensitivity to the morphology of systems, their dynamics, their "intelligence"—how they work and what stimulates them.

This means we need to think of designing more as steering than as shaping. From thinking of ourselves as the authors of a finished work, we had better evolve toward thinking of ourselves as facilitators whose job is to help people act more intelligently, in a more design-minded way, in the systems we all live in. Design in such a framework becomes a process of continuous observation, measurement and feedback.

From High Concept to Deep Context

Hippocrates said twenty-five hundred years ago, in Airs, Waters, Places, that in order to understand the disorders in any subject, we must study its environment. "The greater part of the soul lies outside the body," said the sage; "treatment of the inner requires treatment of the outer." Peter Drucker, a modern business sage, taught businesspeople a similar lesson: "Innovation is a system's adjustment to its surroundings—and sometimes this is best accomplished by adjusting the surroundings."[2] Now what Drucker described innocuously as an "adjustment," others might experience as cultural imperialism, global domination, or ecological devastation—but the basic point is clear enough: When designing in the space of flows, context is key.

The more diverse an ecological system is—be it a swamp, or a city—the richer it is. Sprawling monocultural suburbs, multilane highways, golf courses, airports, and the like are impoverished contexts. Large grids, global hubs, and the massive flows of people and matter in between them, suck energy and vitality out the close, the complex, and the slow.

Context matters, says Malcolm Gladwell, because specific and relatively small changes in the environment can serve as tipping points that transform the bigger picture. Small changes to interconnecting subsystems can make things better, but they can make things worse. This is why the application of "high-concept" design, to contexts we barely understand, is irresponsible and usually destructive of value.

From Top-Down to Edge-In

Biologists describe as "the edge effect" the tendency for a greater variety and density of organisms to cluster in the boundaries between communities. In complexity theory, too, there is an "edge of chaos" paradigm in which a system twill evolve most rapidly, in as Edward O. Wilson's words, when it is "on the edge, of chaos—possessing order, but with the parts connected loosely enough to be easily altered either singly or in small groups." [3]

As in biology, so too in a networked economy: Variety, density, and interaction are success factors. But the way we organize things now, the benefits of edge effects are designed out, not in. Most of us live and work in silos: a company, a university, a profession. We work *within* communities, not between them. Our organizations perpetuate silo society and, perversely, isolate knowledge from the contexts in which it is to be used.

The idea of edge effects is not new. Aristotle criticized the division between disciplines. But the problem has now become acute: Specialization is like grit in the wheels of the sustainable society we're building now.

The design lesson is this: we need to look in new places for inspiration, and cultivate the habit of looking for the people, places, organizations, projects, and ideas that do not appear on the radar screens used by our captains up there on the bridge.

Susantha Goonatilake describes these untapped resources as civilizational knowledge. "The Renaissance, the Scientific Revolution, the Enlightenment and the great discoveries in the 19th and 20th centuries were the result of recombining, not just discovering, ideas," says Goonatilake. "The rediscovery of Asian thought, is a second renaissance in the cultural history of the West, with the potential to be equally important as the rediscovery of Greek thought in the European renaissance." [4]

Designers are needlessly constrained by the myth that everything they do has to be a unique and creative act.

Rather than expect to design everything from scratch, we should search far and wide for tried-and-tested solutions that others have already created. We need to become hunter-gatherers of ideas and tools: How have other societies lived in the past? How do societies live in other parts of the world today? Has this question been answered somewhere else already?

When edge people, edge ideas, and edge organizations are brought together, something interesting and valuable usually happens. What management consultants refer to as "strategy creation" - and I call "design" - involves the creation new combinations of knowledge, resources, and capabilities—many or most of which may already exist.

Putting old knowledge into a new context creates new knowledge.

From Science Fiction to Social Fiction

I have described an approach to innovation that looks for ways to enhance the kinds of daily life that we experience - here, and now. I have mentioned a variety of new technologies that enable new and lighter ways of living - but emphasized that if a technology does not enable people to do things better, it should be rejected.

Many innovation agendas are driven by futurist fictions, many made by designers, that fuel our desire for new technology. A better innovation approach is to switch attention from science-dominated futures to *social fictions*. These are stories in which imagined new contexts enrich an otherwise familiar world.

Design scenarios are powerful innovation tools because they make a possible future familiar and enable the *participation* of potential users in conceiving and shaping what they want. The important point when envisioning scenarios of human activity is to distinguish explicitly between what Ezio Manzini calls ***disabling and enabling solutions***

Many of the frustrating and stress-inducing encounters we have with service providers have been given an anodyne name in recent times: the "self-service economy. The hallmark of such services is that they take place with little or no human contact; the customer does the work once done by an employee. This arrangement saves the service supplier a ton of money but simply loads work onto - and steals time from—the user." Nine out of ten people would rather talk to a person when searching for advice or service on the Internet—so we need to demand of providers that they put a person at the other end of the line.

From Designing For to Designing With

Anyone using a system—responding to it, interacting with it, feeding back into it—changes it. Human, natural, and industrial systems are irrevocably interpenetrated. So where does this leave our relationship with complex systems—as designers and as citizens?

Having spent twelve years of my life in the Netherlands , I learned that the ways the Dutch look after their dikes is good example of the way our relationships with biosphere may be headed. The famous Delta Works, the biggest Dutch public project ever, are a system of giant pumping stations, dikes, and modern tidal protection systems that protect the land from the sea and the rivers. Behind these impressive achievements are a select cadre of engineers and planners[5] whom writer A. den Doolaard called the "water wizards.
A sense of civic duty and solidarity motivates the Dutch citizenry to take care of the dikes collectively—with the *dike warden* as a key figure to this day. The tradition of the dike warden and his approach to managing the water lies behind the Dutch "polder model" of shared responsibility, consensus, and a degree of skill at living together in a small space.[6]

A similar sense of responsibility for a shared infrastructure is evident in the open-source movement in software. A collaborative approach, uniquely adapted to the Internet, has enabled the development of high-quality software architectures. This collaborative approach found increasingly in other domains: Biologists have embraced open-source methods in genomics and informatics, NASA has adopted open-source principles as part of its Mars mission, calling on volunteer "clickworkers" to identify millions of craters and help draw a map of the Red Planet. Astronomy, too, has been transformed by the growth of collaborative networks.

These phenomena are symptoms of a widespread cultural shift in which groups of individuals are coming together to collaborate on large-scale projects. This profound social changes is enabled by a variety of new tools and infrastructures that transform the ways people collaborate - from the free software to Facebook.

Open, networked collaboration has been

celebrated as an internet craze, but works best in the real world and face to face. The most advanced software designers, who call themselves "extreme programmers," now value individual activity over abstract processes and tools.

A new design paradigm is embodied in the Agile Alliance. "We embrace modelling, but not in order to file some diagram in a dusty corporate repository" says the alliance's "Manifesto for Agile Software Development"; "we plan, but recognize the limits of planning in a turbulent environment."
This new approach to creative work values interactions between people over processes and tools, working software over comprehensive documentation, customer collaboration over contract negotiation, [and] responding to change over following a plan.[7]

From Design as Project to Design as Utility

If this kind of collaborative, open, and continuous design is to flourish, business models also have to change.

In the past, design was about the form and function of things. These features, which were limited in space and time, could be delivered in a fixed form, such as a blueprint. In today's ultra-networked world, it makes more sense to think of design as a process that continuously defines a system's rules rather than its outcomes. In logistics and manufacturing, the elements of a light economy are already being prepared—although their designers are not always aware of it. A growing number of companies that once sold only products now think of themselves as service providers. Think of Xerox - formerly in photocopiers. now in 'document services'.

For the fast-growing cohort of companies that are now taking sustainability seriously, a product-service system approach enables them to focus on demand-responsive services and dynamic resource allocation.

These new ways to create value are transforming the ways companies account for matter and energy flowing through their systems.

Against this backdrop - of situations in which systems don't stop changing - the idea of "signing off" on a design when it is finished makes no sense. It's as a water company delivered a bucket of water to your door and pronounced its mission accomplished.

I don't know how design as a utility should be paid for or by whom. But demand for it is clear enough, so new business models will surely emerge. I can foresee a design economy that is based on rolling service contracts a bit like those already used by big management consultancy firms.

The Dance of the Big and the Small

"What do I see when I think of History? I see the dance of the Big and the Small."

Eugenio Barba, who runs the Odin Theatre in Denmark, describes our situation beautifully. There are moments during this dance when we are swept along by events, he says, and others when we ourselves influence the course of time.
Says Barba: "Children who build a small dam on the margins of the current of a great river, who make a tiny pool in which to bathe and splash around, do not play in the rushing current, yet neither are they separated from the water flowing in the centre of the river. They create, along its banks, small inlets and unexpected habitats, thus passing to the future the marks of their difference."

We've wallowed too long the idea that the world is "out of control"—be it our cities, technology, or the biosphere. We've filled the world with complex systems and technologies that are indeed hard to understand, let alone shape or redirect.

But we're people, not ants. We have a culture, and language, and the ability to understand and share knowledge about abstract phenomena. Ants don't have that. Neither do they have a tool, design, with which to shape them. We do.

The dance of the big and the small entails a new kind of design. It involves a new relationship between subject and object and a commitment to think about the consequences of design actions before we take them in a state of mind—design mindfulness—that values place, time, and cultural difference.[8]

This text will have done its job if it provokes you think about one or two small design steps you might take on Monday morning.

Design a way to monitor the natural and industrial systems around you and make them knowable to you and your colleagues.

Design a way to close loops in the flows of matter and energy in your immediate surroundings.

Design things to be closer together, in webs rather than in drawn-out chains, in daily-life situations.

Design connections between you and new people, knowledge, and disciplines.

Design a new way to collaborate and do projects.

Whatever you choose to do, don't try to do it alone. We are all designers now.

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3.
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4.
Goonatilake, "The Shift to Asia."
5.
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6 .
Michiel Schwarz, "Expo 2000 Netherlands Story Line" (request for proposal, Netherlands Pavilion at Expo 2000 Hannover, Foundation Holland World Fairs, 1998); Michiel Schwarz, Holland schept ruimte: Het Nederlands paviljoen op de wereldtentoonstelling EXPO 2000 te Hannover (Blaricum/Den Haag: V+K Publishing/Inmerc, SNW, 1999).
7 .
"Manifesto for Agile Software Development," available on the manifesto's website (http://www.agilemanifesto.org).
8 .
Eugenio Barba, address to the Institute Superior de Artes on the occasion of its awarding him an honorary doctorate, Havana, February 6, 2002, available at http://www.odinteatret.dk/general_information/pdf_filer/havanaenglish.pdf.

John Thackara

B5_QUOTES_21-25A

21. *Take what already exists and use it as a virus. I call them biomes (natures memes)*
Pliny Fisk III

22. *I think we should strive for a dirty, polluted ecology. It could be incredibly moral, but it would also include the immoral, like a virus.*
Francois Roche

23. The story of the worm, the rat and the cat.
About the control an architect has. Think of the story of the worm toxoplasma. The only way to reproduce for this worm is in the stomach of a cat. The problem of the worm is to reach the stomach of the cat. The cat itself won't eat him. So what he does is to be in the food of a rat. The rat is eating this worm as a kind of virus. So once the worm is eaten by the rat immediately he runs up to the back of the neck of the rat (because that is where the cat will bite the rat in order to kill it). From that moment the worm is in the central nerve system of the rat, and in fact he drives the rat. He drives the rat, who still thinks he is in control, but he is not. He drives the rat in front of the cat. All the while the rat is waiting to be

24. *I do trendy pragmatisms as a way of survival*
Ton Matton

25. *About this Beyond theme here at the Biennale. I makes me think of Buzz Lightyear, the robot from the Pixar Movie Toy Story. Buzz's battle cry was 'To infinity and beyond. And then he tries to fly, but it*

'...WOODEN MODELS OF EXPERIMENTAL HEINEKEN BEER BOTTLES AS AN ATTEMPT TO DEVELOP SECONDARY USE CAPABILITY FOR THE AFRICAN MARKET. THREE SETS OF PROTOTYPES IN GLASS WERE PRODUCED, THE BOTTLES BONDED EITHER VERTICALLY OR HORIZONTALLY. TWO OF THE MODELS - INCLUDING THE ON ILLUSTRATED - COULD BE JOINED WITHOUT MORTAR.'

'...THE PROJECT, INITIATED BY THE CHAIRMAN OF HEINEKEN BREWERIES WHO VISITED AFRICA AND SAW IMMENSE DUMPS OF BOTTLES SIDE BY SIDE WITH HOMELESS FAMILIES - LAPSED BECAUSE MARKETING EXPERTS FORSAW AFRICAN RESISTANCE TO SECOND CLASS HOUSING. AS JOHN HABRAKEN (WHO WAS CONSULTED BY HEINEKEN AT THE TIME) OBSERVED "WE SHOULD HAVE TRIED HERE, NOT THERE."'

IMAGE AND TEXT FROM CASABELLA, 1973.
BOTTLES PRODUCED IN 1961.

B5_R.T_DISCUSSION _1

B5_R.T_DISCUSSION _2

B5_R.T_DISCUSSION _3

B5_QUOTES_25B-30

is crash...bang!!!
To Infinity...aaand BBeeeyoooond!!!!! (crash!!! – baaaaang!!!)
Like Buzz Lightyear we architects think we can fly... but it will be a big CRASH-BANG if we really try.
Francois Roche

26. We are confronted by thousands of problems. We all know them. We are all aware, but that's not enough!. It's not about awareness. It's not enough to be aware. We must act! I want to do something. But we all know since the sixties that it makes no sense to do something. It doesn't work! I want to do something.
Ton Matton

27. *If I planted an apple tree today, then I could say to myself that at least one time today I managed to be what I want to be. But planting apple trees is easy, it's never enough. Everything is wrong. The plastic bags at the biennale are wrong! Empty plastic bags they hand out to everybody at the entrance. It's wrong. We all know it's wrong. Why don't we act?*
Ton Matton

28. *We cut our society in pieces. We also cut ourselves in pieces. We need to become whole again.*
Ton Matton

29. *You've got to think about big things while you're doing small things, so that all the small things go in the right direction.*
Alvin Toffler

30. *Small gestures don't change the world! We've had small successes enough. We all know the stories from earlier days and we keep telling and retelling them. By doing that we withdraw from our own real responsibilities in the here and now. We are all hiding behind our profession.*
But ***I don't want to hide anymore. I WANT TO DO SOMETHING!***
Ton Matton

'..THE COSTS OF THINKING BIG; THE EXPENDITURE OF ENERGY AND EFFORT THAT GOES INTO THE MAKING OF OUR BUILDINGS AND CITIES IS OFTEN INCREASED MANYFOLD BY THE CONTEXT IN WHICH WE BUILD ..'

TEXT FROM 'ENVIRONMENTAL DESIGN PRIMER', SCHOCKEN BOOKS, TOM BENDER, 1973.
IMAGE: DETAIL FRP, 'FRAGMENTS OF A PERSONAL MUSEUM', SUPERSTUDIO. (DETAIL), 1969.

The Faculty of Un-Building (related to: The Faculty for Creative Laziness

"In every block of marble I see a statue as plain as though it stood before me, shaped and perfect in attitude and action. I have only to hew away the rough walls that imprison the lovely apparition to reveal it to the other eyes as mine see it." (Michelangelo)

Where there is nothing, everything is possible. Where there is architecture, nothing (else) is possible. (Rem Koolhaas)

In the future Un-Doing (subtraction) as a creative act may become just as important as Doing (addition), and thus Un-Building just as important as Building.

In almost all the 'Primitive Hut' myths about the origins of architecture subtraction is the goal and addition the means to reach that goal. A specific space is subtracted from endless space. By addition (of materials, pediment, columns, roof, walls etc.) this space can be identified and is thus given meaning (function). Although the ultimate goal of architecture may be to create space (void, emptiness), architects are very much trained to think in the adding, stacking and connecting of material substance where there is nothing (yet). The idea that you could create space by subtraction is therefore almost a blasphemy. Subtraction (to un-do, to demolish) is seen as a negative architectural act; the demolisher as the demon, the great annihilator of architecture.

But there is another, lesser known origins myth, which is the cave. In this case subtraction (of stuff) is the means and addition (of meaningful, functional space to emptiness) the goal. Here the 'architect' takes away, undoes what is there, in order to create a space that is not there (yet). In this case he/she uses the method of the sculptor Michelangelo. Not to create a substantial, meaningful 'thing' like he did, but to create an un-substantial, though meaningful, 'no-thing'.

Maybe to create such a 'no-thing' is the real goal of architecture. At least un-building can be considered the yin to the yang of building. To create some thing is to destroy another thing. Always. So why deny this creative un-doing in architectural practice?

Although the act of un-building (demolishment) is very much part of the building process, it is not considered to be part of architectural practice. And because of that it is not part of architectural education. This is a serious omission. The world is starting to be filled up with architectural substance. There will come a moment in time when we cannot afford to take away any more 'meaningless space' (whether 'natural space' or not) and add materials to it in order to create new built stuff to the growing substance mountain. An important design task of the future will be to rearrange (re-use) the stuff that is already there, not to add new stuff. To hew away from existing substance, to take apart and to re-arrange in order to open up new possibilities. Un-building will liberate space from it's entrapment in meaningless and useless substance. Or to paraphrase Rem Koolhaas: Where there is Un-Building, everything is possible, where there is Building northing (else) is possible.

✶

Piet Vollaard

B5_R.T_DISCUSSION _5

B5_4B

Afterthought:

The Faculty of Creative Laziness Both Building and Un-Building are acts of architecture, of creating something that is not already there. But sometimes the best solution to a given architectural design task - as Cedric Price once stated, when he advised his client to get a divorce instead of building a house to save his marriage - may not be an act of either building or un-building at all. Sometimes Not Doing anything architectural may even be better than Doing or Un-Doing architecture. Maybe to learn when deliberately not to do architecture, to understand when to abstain from any architectural act, should therefore also be part of architectural education. It would teach a certain kind of modesty as to the limits of what architecture can achieve. Maybe the Faculty for Creative Laziness is the most difficult, but also the most liberating faculty of architecture.

B_5_QUOTES_31

unsichtbare architektur

unsichtbare architektur

unsichtbare architektur

unsichtbare

31. *Do More With Less*
Buckminster Fuller

Bio's round table

Pliny Fisk III

Co- Director and Founder
The Center for Maximum Potential Building Systems Austin Texas, Fellow Center for Housing and Urban Development, Fellow Sustainable Urbanism, Fellow Health Systems Design Joint appointment Architecture, Landscape Architecture and Planning, Texas A & M University, College Station Texas.

Pliny is considered one of the originators of the Sustainable Architecture and Planning movement in the U.S. His work is influential at a number of levels; from helping formulate local and national policy in green building to creating design and engineering criteria for flexible building systems.

In research and teaching, Pliny covers an equally wide range of subject matter. His work is considered by some to be a continuation of the legacy set by Ian McHarg, while incorporating a distinctly new approach related to current environmental conditions. His resource balancing technique - a life cycle based planning method called EcoBalance Planning – has been incorporated professionally in both large and small scale master plans, and is now included in design curriculums in two major universities. Additionally, Pliny has been instrumental in the development of alternative building materials, low impact building systems, and a life cycle based approach to biophilic design.

Pliny has received numerous national and international awards and acclaim. Recently, the General Services Administration appointed him to the national peer review committee for federally funded buildings. He has also been featured in Metropolis Magazine's 2006 'visionaries' issue, and Texas Monthly Magazine commended him in their 2008 thirty-fifth anniversary issue as one of 35 people shaping our future. Pliny has written many papers on his theories and practices, and lectures on a regular basis both in this country and abroad. He teaches undergraduate, graduate and PhD students at Texas A & M University and serves as Co-Director.

Jan Jongert, 2012 Architects

2012Architects was founded in 1997 and has three partners; Césare Peeren, Jeroen Bergsma and Jan Jongert. All are deeply committed to recycling or 'reuse' as an 'integral design strategy'. Their activities are not just limited to architecture, but also extend into other fields of design and art.

Jan Jongert (Amsterdam, 1971) was educated at TU-Delft and Academy of Architecture in Rotterdam. Together with Césare Peeren and Jeroen Bergsma he founded 2012Architecten and the Recyclicity foundation in 2003. He worked on various projects ranging from the whitegoods-house (1999), the Miele Space station II (2003) up to a wastestream Villa which is under construction in Enschede. Jan Jongert frequently lectures for architects, students and general public both in the Netherlands and abroad. In 2007 he coedited the book Superuse and launched the accompanying website superuse.org,

Ton Matton _ Matton Office

Tom Matton describes his practice as situated 'somewhere between object-design, society-shape, ecological city planning and artist-activism' exploring 'the small Utopias and interruptions of daily life' and 'connections between traditional countryside living and contemporary mega-city lifestyle.'
He founded MattonOffice in 2000 in Rotterdam as what he called a 'free range office' based in a mobile, self sufficient shed. Since 2001 he has been based in Germany (together with partner, the writer Ellie Smolenaars) in the former GDR village-school of Wendorf between Hamburg and Berlin. Matton has previously worked on projects with Atelier van Lieshout MVRDV, Rem Koolhaas/OMA (Rotterdam), feld72 (Wien) and Raumlabor (Berlin) amongst others. He has participated in Archilab (Orléans); Biennale Sao Paulo; Manifesta 2 (Ljubljana) and the Architekturbiennale (Rotterdam)

Francois Roche, R&Sie.

"Making with…" is the way of describing the research of R&Sie into a critical experience of architecture through a mutation of contextual parameters. Scenarios of hybridization, grafting, cloning, morphing give rise to perpetual transformation of architecture which strives to break down the antinomies of object/subject or object/territory. Experimental and inventive, the architecture of R&Sie (n)… seeks to be profoundly critical; an architecture which is articulated as multiple narrative apparatus and relationship strategy made of substances from each situation...

R&Sie

R&Sie(n) is an architectural office sey up in 1989 and lead by François Roche (1961, France), Stéphanie Lavaux (1966, France), based in Paris. The organic, oppositional architectural projects of their practice is concerned with the bond between building, context and human relations. Roche explains his concept of "spoiled climate" chameleon architecture, which links and hybrids the human body to the body of architecture by a re-scenarization on the rules of all the natures, even artificial. They use speculations and fictions as process to dis-alienate the post-capitalism subjectivities, in the pursuit of Toni Negri. R&Sie(n) consider architectural identity as an unstable concept, defined through temporary forms in which the vegetal and biological become a dynamic element. R&Sie(n) are currently undertaking a critical experiment with new warping technologies to prompt architectural "scenarios" of cartographic distortion, substitution, and genetic territorial mutations. This kind of attitude and works is not fully understood in France where R&Sie(n) is mainly maintain on the side of the production. They adopt since several years a political status of immigrant in their own native culture.

R&Sie(n) held(s) several professorships with François Roche, in London at Bartlett School, in Vienna at TU, in Barcelona at ESARQ, in Paris at ESA, in Philadelphia at UPenn, and is teaching now in advanced studio at Columbia NY, USA. with speeches at MIT, Havard, AA School, UCLA, Sci-Arch...
Their projects have been exhibited at the Tate Modern (London 2006), Columbia University (New-York, 1999-2000), UCLA (Los Angeles, 1999-2000), ICA (London, 2001), Mori Art Museum (Tokyo, 2004), Pompidou Center (Paris, 2004), MAM / Musee d'Art Moderne (Paris, 2005, 2006), MIT's Media Lab (Cambridge 2006), Orléans/ArchiLab International Architectural Conference (1999, 2001, 2003). R&Sie(n) were among the architects selected by France for the 1990, 1996, 2000 and 2002 (refused) Venice Architectural Biennale, and were also featured in the 2000, 2004 international selection. R&Sie(n) will be in the next cession, next September 2008, in Italian-international pavilion.

Bio keynote lecture

John Thackara

is Director of Doors of Perception. Founded as a conference in Amsterdam in 1993, Doors of Perception now operates more like a film production company – only its outputs are festivals and projects. A worldwide network of designers, media artists, technology innovators, and grassroots innovators, participate in Doors of Perception events in order to imagine sustainable futures - and take design steps to realize them.

In addition to festival production, John Thackara also helps cities and regions build next-generation institutions.

A former London bus driver, and later a book and magazine editor, John was the first Director (1993-1999) of the Netherlands Design Institute. He was programme director in 2007 of Designs of the time (Dott 07) a new biennial in North East England. In 2008 he is commissioner of City Eco Lab at Cite du Design in St Etienne, the French design biennial. John is an Associate of The Young Foundation, and is senior advisor on sustainability to the UK Design Council. His most recent book, In The Bubble: Designing In A Complex World (MIT Press) will be published this year in Italian, French, Japanese, Chinese and Portuguese.

Colophon

Beyond the sustainable: challenging the flow of resources, materials and people.
What it takes to make (and un-make)

This publication has been made as an on-site written, edited and printed edition of ***Archiphoenix - Faculties for Architecture*** at the Dutch Pavilion, 11th International Architecture Exhibition in Venice, September 2008

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Archiphoenix - Faculties for Architecture turned the Dutch Pavilion, at the 2008 Architecture Biennale in Venice, from 9 - 14 September into a weeklong stage for research and exploration and a debate platform focusing on the capacities and capabilities of architecture - beyond building.

The project puts to the foreground five questions each architect encounters: ***Why we make*** - beyond the profitable simplicity into the social sustainability, ***What we make*** - beyond the artifact, ***How we work*** - beyond the singular into the collaborative, ***For whom we make*** - beyond power to empowerment, and finally ***What it takes to make (and un-make)*** - beyond the sustainable: challenging the flow of resources, materials and people. These five seemingly simple questions, when put to face the future challenges ahead, have been the base for the set of publications.

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Download all six publications from www.facultiesforarchitecture.org