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Sustainable: circular, modular, nature-inclusive

"*If the task of architecture continues to be the interpretation of a way of life valid for our period, where do we find the measure of such validity? (..) what kind of dwelling is appropriate to this technological age?*"[1]
Karsten Harries

"*You never change things by fighting the existing reality. To change something, build a new model that makes the existing model obsolete.*"
Richard Buckminster Fuller

In November 2019, the Dutch Government announced the first in a series of – in part radical — measures to reduce CO_2-emissions in the Netherlands; many of them with the accompanying justifying reasoning that it was necessary to ensure that the "much needed" building of housing could be continued as usual. It may very well have escaped my attention, but I cannot remember having heard or read any critical remark at the same time about the process and means of building these houses, given that this practice is, in itself, part of that same CO_2-emission problem. Also, I cannot remember any serious discussion about the reasoning as such; two items were connected where, in fact, there was primarily a reason of overall sustainability.

[1]Harries, K. (1997). *The Ethical Function of Architecture*. MIT Press., p.12

Additionally, recently my mailbox contained a digital newsletter from a Dutch building organization, stating that our commodities run out and therefore we need new ways not to spoil them. This, I believe — in both examples — is the wrong reason as well as the wrong order: we should not spoil our commodities in the first place, not because we have utilized them for decades but because their supply is simply not endless. We should not start thinking circular and/or sustainable alternatives because we believe or conclude that we run out of alternative options.

Numbers and percentages

As argued in a previous chapter, our current process of building housing usually is a linear process; we start again each time by designing a next series of housing, prescribe new materials, use these, and dispose of them at some point in time when a renovation, redesign, or even demolishing occurs. To provide only a few numbers here, the building industry is responsible for 50% of the commodities worldwide, while only 2% of the earth's surface is covered with urban areas. The complete construction and building sector accounts[2] for 25%–30% of all waste in the EU; the worldwide use of concrete is 1.4 m^3 for each civilian, each year[3]. The industry involved is responsible for 5%–8% of the CO_2-emission that makes it one of the biggest polluters. Its use in the – housing — building industry requires a formwork, using plywood that has to be "constructed" in advance to be removed/destroyed after pouring the concrete, causing double work and ultimately waste.

A daily walk on the streets in an average neighborhood and looking at the various contents of a waste container on a building or renovation site seems illustrative enough for the fact that the building sector is responsible for 40% of the waste – about 24 million tons — in the Netherlands (moreover, as well as for 40% of the energy consumption). When an average rented house owned by a corporation is renovated, usually due to a new tenant, we are left behind with an average of some 5 tons of waste. Although the claim is that, by now, the greater part is being recycled, it should be clear that both the system as well as process are in serious need of real change. Like the actual parallel discussion concerning plastics, if it is not really needed, hence, produced in the first place, there is also no need for – too

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[2]https://ec.europa.eu/environment/waste/construction_demolition.htm
[3]http://www.cementenbeton.nl/duurzaam-bouwen/cement-en-co2/co2-top-cement

often expensive — recycling. The problem with the current system of re-use is acknowledged: for a really adequate circular system, the quality of many materials often is not good enough, the variety of materials is too large, and the numbers too small; therefore, the options for re-use elsewhere will be limited. So far, it is a rather poor solution for an obsolete process that in itself is not designed and exercized as a sustainable/circular process.

This is also due to the fact that all projects are different: different in design, in setup, in volume and surface, and in construction and finishing. Each new project starts from a *tabula rasa*; practically, each new project covers a (series of) complete house(s) instead of providing a basic framework or support for further personal/individual infill, be it (in part) standardized and prefabricated or not. Together with the usual practice of having our housing designed by architects, the consequence of this line of producing housing is an ever-present variety and complexity, also due to ever more complicated (technology) regulations. Thus, first, the costs of producing each house anew remain – too – high, and, second, too many materials used because of these costs are often inferior and/or short-lived. In the end, both project developer and builder/contractor have "delivered" and are no longer responsible or accountable for choices made as well as for the ultimate result. Research[4] conducted by the "Dutch Vereniging Eigen Huis" over 2018 concluded that, on average, 21 failures/mistakes occur when the house is to be delivered; they conclude that this is caused by a mixture of limited professionalism, small margins, and shortage of materials.

A recent report[5] by ABN-AMRO illustrates the problem: "If the building structure offers the possibility to adapt to the requirements of the time or to change function, many of the original investments retain their value. Longevity extension of object and product, re-use and re-duce, has a huge impact" (transl.mp). However, a structure that offers the "possibility to adapt" requires a certain flexibility, not a rigid inert system that cannot change functions.

We still do not consider a house as being part of a standardized and industrialized system that supplies the prerequisites for a variable, adaptable living space; we design and build individual housing for individual inhabitants, based on requirements described by (building) regulations and the (commercial) demands

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[4] https://www.eigenhuis.nl/docs/default-source/downloads/actueel/opleveringsgebreken_juni_2019.pdf?sfvrsn=3b9ade96_0
[5] Alles van Waarde ABN-AMRO, Nadia Menkveld et al., juni 2017.

described by the project developer or corporation. Both address only a specific group of inhabitants, i.e., each "market" is defined in terms of what the aimed "target-group" of inhabitants is assumed to prefer, wish, need, and require. However, as illustrated so adequately in John Habraken's words, back in 1967, "The simple truth is that the everyday cannot be created *for* a society, but only originate *from* that society"[6] (transl.mp, ital.orig.). That is, a society in constant change, and that change should also be expressed within the design and realization of the built environment as well as creating/supplying the parameters for changes in the longer term. The longer the lifetime of a building – and that period is still increasing – the more flexible/adaptable it should be.

A system of re-use, in particular, will serve and function at best when utilized in a (geo-located based) system of more or less standardized structures, prefabricated, and registered elements. Also, a standardized – modular – system utilized within a common, flexible framework "guarantees" to a certain extent that what is used will fit at each and every location and can, therefore, be industrially produced in large quantities and – if needed – in a variety that facilitates individual usage and personalized expression. Standardized uniformed systems also provide the basics for a large amount of individualized infills, infrastructural services, personalized layouts, etc. But where there is no urge or need for individualization, systems can be uniform, and, hence, cheap but solid, hence, circular/sustainable. A system like a standardized material passport can register all elements and ensure all are recognizable, traceable, and re-usable. As Thomas Rau argues: "*Never again will a building be built without any thought about how we can dismantle the building materials*" (transl.mp).

When designed and realized as standardized and/or modular system, infrastructure can be incorporated in a likewise way, ensuring an adequate uniform connection when it concerns, e.g., water and electricity instead of the traditional practice of ever-changing connectivity locations, sources, and connections at places where there is no proper use for them (see, e.g., the usual electricity supply in the middle of each room-ceiling, being the exact place where it is not needed). What is thus conceptualized is an open system, a way of providing the framework for housing in such a way that the everyday practice within the home is determined and shaped by those who are "entitled" to do so, i.e., the inhabitant.

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[6]Habraken, N. J. (1967). het Alledaagse , over het ontstaan van de omgeving van alle dag. Lemniscaat.(p.9)

An international platform like BREEAM that aims to cover sustainability issues and provides certificates is, to a large extent, so far focused on utilitarian buildings, not on housing. At the same time, the options for modularity and standardization in that sector are far more promising; after all, housing is, because of its numbers, a substantial part – near 50% in the Netherlands — of what is built. A parallel EC-project like LEVEL(s) is "a voluntary reporting framework to improve the sustainability of buildings. Using existing standards, LEVEL(s) provides a common EU approach to the assessment of environmental performance in the built environment. It will help transform the building sector aiming toward a circular economy." It is now in the registering/inventory phase and due to report in summer 2020.

An EU-funded project like BAMB ("Buildings As Material Banks") aims at "creating ways to increase the value of building materials" and develops a material-passport as "a one-stop shop for material information." The Dutch "Oogstkaart"-project, a "market-place for professional upcyclers," provides a geo-located inventory/overview of (building) materials available.

When it comes to sustainability, the advantages of a large-scale structure seem clear. Recent research shows, e.g., that "Compared to a standard single-family home with an average of an environmental performance of 0.50, the environmental performance can quickly decrease in very small homes. On the other hand, the environmental performance will increase as the gross floor area becomes larger"[7] (transl.mp). The same is true for the component that has the most significant influence: installations add up to a third of the influence on environmental performance; therefore, the result of adapting there will be the most valuable. According to Milieudatabase[8], this can be increased up to 45% for a zero amount.

The conclusion seems obvious: when permanent parts of the building, i.e., construction, façade, and installations are designed and structured in such a way that they are "separated" from the further individual housing/infill and designed to be/remain sustainable, the profit in terms of performance will be substantial. Additionally, the need for complete individual installations — e.g., heating or ventilation – will be reduced as is shown in various cities using common/district-heating systems. Currently, only about a half-million households out of some 8 million are connected to "district-heating" ("Stadsverwarming") systems.

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[7]https://milieudatabase.nl/bijeenkomst-lca-specialisten-januari-2019-2-2-2-5-4-3-2/
[8]https://milieudatabase.nl/woningontwerp-en-milieuprestatie/

New guidelines by the Dutch Government require that by 2030, houses need to be built 50% more environmental-friendly compared to today. In 2050, all building should be fully circular; but the road ahead seems "long and unruly." Curiously, as well as fully incomprehensible new, housing does not have to answer the Paris climate agreements. Recently, the Draft Climate Agreement (Ontwerp Klimaat Akkoord or OKA) was produced in the Netherlands; the Economic Institute of Building (EIB) states in her recent report[9] that the OKA uses "incompatible starting points" by assuming that an ambitious sustainability policy will synchronize with neutral costs for households/citizens. The EIB also concluded that the costs of making the current supply of housing "almost energy-neutral" will amount to €30.000 − per house, i.e., a total of 230 billion euros. Next to that, very recently a Dutch Commission researching the problems with CO_2 stated in a first advice, referring to the building sector: "The Advisory Board is of the opinion that profit can be gained in the construction sector through modular, energy-neutral, circular and nature-inclusive construction and through better use of innovative techniques and materials"[10] (transl.mp). Once again, this is once more a repetition of moves: remember, e.g., the VROM-report dated back in 1994; see Chapter 6 on Housing.

In 2005, Michelangelo Pistoletto's "Third Paradise"[11] project was presented at the Venice Biennale; its "basic idea is the overcoming of the current worldwide existing conflict between the two polarities of nature and artifice." In a series of workshops, its emphasis was recycling and environmental sustainability, architecture being a substantial element in this. It is a continuing project up till today, incorporating the arts and other disciplines involved. In line, I believe it is a serious mistake to assume that problems concerning a more individualized and participatory system of (building) housing, together with issues of connectivity, sustainability, and circularity can be addressed without incorporating the deeper fundamentals of our ways and means of conceptualizing and building this housing. Rephrased and summarized: thinking about these issues cannot be isolated from the building chain as a whole or from society; it is part of the system as a whole. It is much like the current situation concerning climate change and our options/choices for fundamental change: if we limit choices to the less radical, less disruptive, and "easy" options, we may only solve part of the problem and believe we can achieve results without too much discomfort and disruptive consequences for the entire sector involved.

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[9]Klimaatbeleid tegen het licht. (2019). (p.12)
[10]Report 'Niet alles kan', 25 sept.2019
[11]http://terzoparadiso.org/en/what-is

What, however, should be reminded is the fact that it is only a minor percentage of housing that is added to the supply; the vast majority is existing housing that too often is in need of a series of measures, ranging from switching from gas to electrics, adding double-glazing, isolation in roofs, walls, and floors; sometimes though a merging of two houses given their limited size, or even a full demolishing. It raises the recurring questions with regard to social issues vs. sustainability and/or technological issues; i.e., where is the turning point to decide whether it is more socially/economically justified and responsible to renovate or to rebuild. Where — in the example referred to in the introduction — a choice could have been made to extend the existing situation instead of renovating entirely, the "choice" today is made for us and by us: we have a serious environmental problem and as one inescapable but logical consequence, we need to act in line with the "Paris" agreement and its guiding framework, with its ultimate date.

Essential in this is also the fact that, while some 20.000 houses are in need of demolishing, the call for a more social, small-scale participatory approach is heard. Recently, a small group of tenants in Rotterdam celebrated their victory in court over a corporation that planned to demolish their housing and replace it for a mixture of other typologies next to rented ones. This "victory" may well develop in disillusion since, ultimately, this process will repeat itself and the same issue will rise again; the background (social) framework and the entire building chain remains the same. It is illustrative of the complicated situation of our existing housing supply; one that is, in part, due to the — often semantic — discussion concerning the "quality boost" as a main reason for the corporation involved to proceed. It is often the current inhabitant who is excluded from the process and ultimately has to move where a more socially substantiated solution should be preferred, to the benefit of the entire neighborhood as well as keeping valuable social structures intact. As said before, there is no level-playing field. As long as the building chain as a supply system – be it for owners as well as tenants — is steered by commercial and rational (market) arguments, there is no emphasis on, e.g., sustainability and circularity principles first.

It should be obvious that, primarily, the housing that is added to the supply should be subject to the entire range of options available to ensure we build sustainable, circular, and flexible. It is also obvious that given this amount, we will need several decades to re-organize our supply of housing and answer the increasing urge for a more democratic process. At the same time, should we "limit" ourselves to providing the framework, i.e., the basic structure, and concentrate on its durability and flexibility, we most likely end up re-organizing faster, cheaper, as well as more adequate.

Building the structure

As illustrated in Chapter 5 by the text of Dom. van der Laan "*we extract architectural space as an emptiness out of natural space*," i.e., before we start to build, there usually was "nature" of some, maybe artificial, typology. A recent call by a great number of professionals and researchers to build "nature-inclusive" — with reference to the Remkes-report — is signed by a variety of companies and institutions involved primarily in environmental research where it should, in fact, be signed by a great many companies participating in the building sector as well.

This comes with the responsibility of returning/incorporating "nature" before, during, and after building; i.e., to design and build sustainable from the tender on, which so far still is a non-existing – let alone obligatory – (pre)condition. For example, by building one of today's large distribution centers or office buildings, 10.000 m^2 of "nature" is extracted so far without the obligation to include a green roof, often refused because we do not want to hinder (economic) initiatives. If we build any kind of building, including housing, this should go hand-in-hand with the obligation to "return" what is taken from nature.

It is, back to the introduction, an important element within the need expressed by, e.g., Andy van den Dobbelsteen from TU-Delft Climate Design & Sustainability in a recent interview in Cobouw, in which he states that when it comes to sustainable building, we have passed the moment of just desiring, we now have to. He urges for the need to build nature-inclusive, as integrated part of sustainable building and argues as well that we live in a time of change and therefore should stop building without taking risks, support those companies that are innovative and initiate/start a project/test-case in which the housing area of the future can be built. It is therefore all the more remarkable that in a recent plea signed by a number of companies and organizations – "The Housing Alliance, a plea to invest out of the crisis with future-proof housing" (dated June 18th 2020) – there is no articulation on what it is that should be build; it is a plea for "building, building, building." It states that areas should be developed that become climate-adaptive, nature-inclusive, and circular "as much as possible." It strives for "a realistic and very ambitious level of quality" concerning use-value, future value, and amenities, all however without any articulation how to realize this without the much needed paradigm-change.

The next chapter addresses the actual developments in this reorganization and tries to envision a possible future.