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Soft Cities

Urban life and sensuous ecology

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Abstract: This paper presents a project exploring sustainable ways of urban living. The project renders a scenario comprised of an array of simple conversions of existing urban spaces and buildings, in the attempt to tie strategies ranging from urban planning to interior design into a coherent vision of a sustainable future. The project is the result of a joint research study between Denmark and Japan. Taking as its example the city of Kyoto, the project investigates some possible strategies on how cities more generally may be transformed into liveable, healthy and ecologically sensible environments.

Key words: urban ecology, architecture, rainwater, evaporative cooling, natural resources.

1. Introduction

The industrialized world faces only one real problem, which is that the lifestyle it knows, cannot continue. As increasing majorities of the world's population live in cities, we are particularly called upon to rethink and eventually change our ideas of urban life to become more sustainable and ecologically sound (Fry, 2011). This challenge demand us to reconsider how we heat and cool our buildings, how we integrate flora in urban areas, what we do with rain and drain water, how we use and share public space, how we organize public and private transportation, how we produce, distribute and renew food, goods and waste etc.

This complex challenge pertains not only to technology, and cannot be met by creating designs solving only one problem at the time. It pertains to urban life as such. We need to learn how to 'live better with less' and how to live and act as if 'everything is connected'.

1.1 Sensuous living

For hundreds of generations preceding our time, people lead lives connected in numerous ways to the earth, the soil and the forces of nature. Regardless of whether they lived in towns or in the countryside, animals and plants were part and parcel of everyday life. Today, in contrast, big city dwellers may find themselves spending entire weeks walking only paved surfaces, smelling only conditioned air, eating only packaged, processed food and moving through space only assisted by cars, trains, elevators and escalators. They may even forget the physical sensation of opening a door, as, when approached, doors often open by gesture of electric devices.

Exhausting resources while producing exhaust, this 'mediated-by-artefacts' life-world creates well-known problems for the body of our planet. It also affects our individual bodies e.g. in creating the kind of problems we refer to as 'lifestyle-diseases', including physical conditions like overweight and diabetes (Ezzati et al, 2005). Ironically, some industrialized countries (like U.S.A. and Sweden) now offer patients suffering from stress-related and similar breakdowns treatment with 'horticultural therapy' (AHTA, 2012). While horticultural therapy is far more than simple exposure to plants, and indeed offers an array of well-documented health benefits, its very notion paradoxically points to the degree to which modern, urban life has become separated from our 'natural' habitat. According, for one, to philosopher David Abram, it is crucial that we reconnect with our senses to ensure the health of ourselves as well as of the earth (Abram, 2010). Moreover, according to philosopher Yuriko Saito, the "benefits of such sustainable materials as sunlight, fresh air, breeze, rain water, and vegetation" is so that the "degree of healthfulness is commensurate with the way in which our sensory experience is affected" (Saito, 2013).

This project attempts to imagine a less contradictory approach to urban life than what is today the case; a way less disconnected from nature.

1.2 Learning from Japanese tradition

Japanese culture is distinct and affluent in numerous ways—a fact widely acknowledged. That it is also a culture in large part based on ecological principles is less often spoken of. As pointed out by architect Kengo Kuma, however, "Japanese architecture is a treasure-trove of…ideas for surviving an age in which growth has ended" (Kuma, 2010). This project has investigated principles of house building, furnishing and urban metabolism from ancient Japan, and attempted to rethink these principles in contemporary context: to re-vitalize a rich but largely disregarded knowledge. Indeed, to 'live better with less' and to live as if 'everything is connected' are both conceptions intrinsic to Japanese culture

(Saito, 2007, Brown, 2012). The sketches in figure 1 show the project strategy: to refurbish existing urban structures while integrating old knowledge of natural resources.

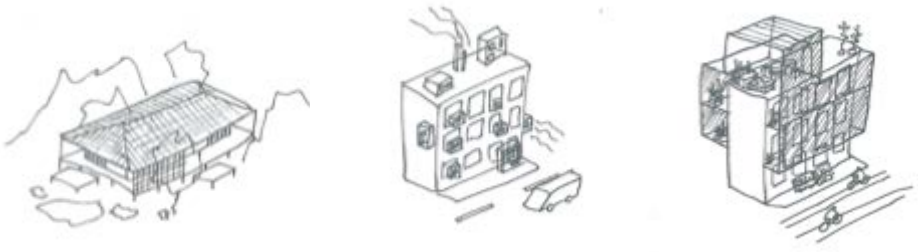

Figure 1: Three phases of development: pre-industrial, industrial and future scenario.

2. The project

The project operates on three levels (or scales): urban, neighborhood and house/interior level respectively. Since sustainability is not about any one problem having any singular solution, but rather a manifold of interconnected, 'wicked' problems (Fry, 2012), the project is concerned with relations and connections between scales and solutions: with how ideas comprise a whole.

2.1 Urban level / traffic

While cars are efficient for city-to-city travel, they are not very efficient inside cities. With increased traffic they take up too much space, traffic congests, and the efficiency of the total system is impaired. This project therefore assumes adaption of a state-of-the-art transportation strategy known from cities similar to Kyoto, such as e.g. Amsterdam, Melbourne and New York: to reduce the number of cars within the city in favor of bicycles and public transportation, which, in combination, provide a more effective system than cars (Sustainable Streets, 2009, Plan Amsterdam, 2014, Bicycle Plan, 2012-16).

Kyoto has an efficient subway system. To complement these existing underground facilities, a tram system with narrow cars is suggested installed in some bigger streets (trams were in fact installed from 1895 until 1978, when they were abolished to provide space for cars). Trams are easily accessed at street level, and provide an alternative to the subway for shorter journeys.

Furthermore, new parking structures are suggested built at various locations at city entry, as well as near main street junctions; i.e. spots with easy access to tram and subway systems. These parking structures provide ample parking space for both cars and bicycles. The main junctions across the city thus become hubs of intermodal change. The perimeter buildings lining new park houses provide areas for shops, offices, hotels, food markets and similar public functions in accordance with their focal locations in the overall cityscape.

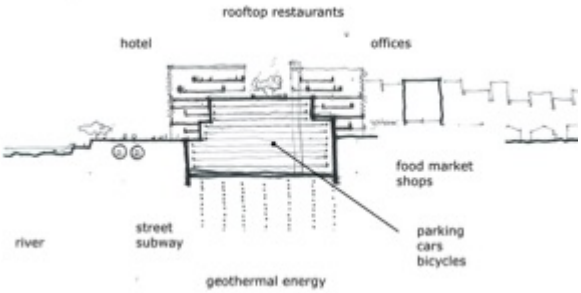

Figure 2: Diagram of Kyoto with proposed facilities. Figure 3: Section, new parking structure.

2.2 The block is a village / a neighborhood free from cars

Japanese cities are structured in nested 'fields', the smallest units of which are blocks of houses served by passageways. A number of such blocks form a larger block (a 'chome'), separated from neighboring blocks by streets, and a number of such larger blocks comprise even larger blocks ('machi's) separated from each other by wider streets. The larger the street, the larger are the houses. This nested structure endows Japanese cities with a 'white-and-yolk' logic: they are comprised of seemingly villages of smaller houses, lined and protected by walls of larger houses (Shelton, 2012).

This project suggests that in daily life, cars are left outside these village-blocks, much like the way Japanese people leave their shoes outside their houses. Resident's cars will no longer take up the whole of first floor of their houses, but stay parked in a new park house nearby. This keeps their neighborhood almost free from cars, making it safe for children to play in the streets. Cars may enter the blocks-cum-villages, but they travel here only slowly, since new street layouts favor bicycles and pedestrians. An occasional ambulance, fire engine or taxi can maneuver in the refurbished streets; however, no permanent parking space is provided. Transport of goods, deliveries and the like is still possible, but, due to the narrow streets, this is often done by means of rickshaw type trolleys and carts anyway.

Figure.4 Specific area comprised of nested 'villages' linked by through-going streets.

Figure 5: Typical street and (in middle) typical post-war house chosen as example.

The specific area chosen for studies at neighborhood level suffers from problems of being 'in-between'—a situation known from other cities worldwide (Sieverts, 2003). This area is not part of the dense city centre where visitors, shops, museums and so on create lively public scenery. On the other hand it does not offer the spacious and convenient lifestyle of suburbia either. Thus it is seemingly unattractive to young families who tend to prefer the motorized comfort of suburban areas. And as a consequence, two schools in the area have been closed, due to the decreasing number of children in the area. It is a languishing area, but it is also an area with a mixture of old '*matchiya*'s (traditional houses) and newer, modern houses; an area with a maze of narrow and intimate streets of a very livable scale; and an area with a population of dedicated (albeit aging) inhabitants who decorate their streets with pots and plants and have created a community house together.

The project illustrates how strategies may simultaneously address various needs: for a healthy urban life, for aesthetic environments, for renewed attractions of the area, and reduction of energy/resource consumption.

2.3 The street is a garden / harvesting rainwater

The asphalt covering the neighborhood streets from facade to facade, together with the closed drainage system, today diverting all rainwater, is suggested removed. Instead, a system of reinforced soil is installed. This system is conceived of as a set of various tracks and tiles of concrete, installed so as to allow rainwater to seep away slowly and naturally. This provides a better climate in the streets, since they are then cooled in summer by the evaporating moisture. It also allows gardening for residents in front of their houses. The presence of vegetation will further help retain moisture and stimulate evaporative cooling.

The tracks and tiles system is laid out in a shifting, non-linear pattern. This slows down eventual car traffic, since drivers must pay attention, and are prompted to adjust direction often, yet subtly. This design strategy can be regarded as similar to that of

stepping-stones in Japanese gardens: to draw attention to the surface in order to slow down and enhance a bodily-oriented spatial experience (Saito 2010).

The new system is designed to contain all necessary wires and pipes (including drain for excessive rain water); so utility poles no longer have to take up space in the street. These are instead mounted with wires for bindweed to grow in, and thus converted (up cycled) to become 'living street poles'.

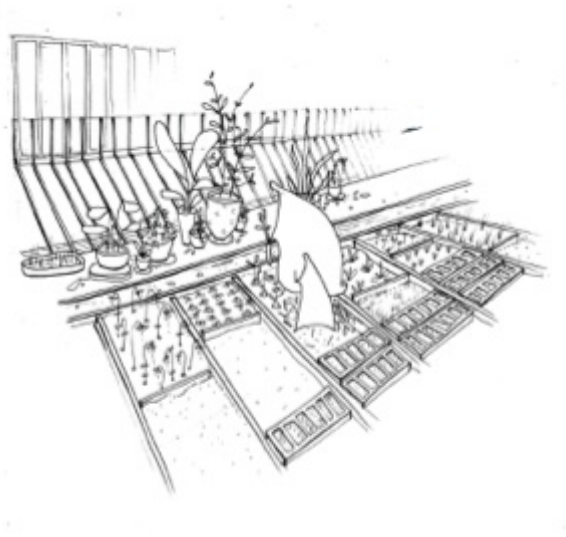

Figure 6: 'Stepping-stone' paving in small streets. Figure 7: Gardening in front of houses.

The project also proposes to turn the neighborhood's closed, now empty school into a collection of supportive local community functions: a kindergarten for the small children from the young families (now hopefully attracted to the neighborhood), a community centre with garden areas for urban farming, a shared laundry (running in part on water pre-used in the shared 'onsen'-bath), shared, accessible and flexible office areas to stimulate local, small businesses and workshops, various community facilities for elderly citizens etc.

The combination of space for vegetables, gardening and kids, instead of space for cars; natural cooling instead of waste of rainwater; free space on ground floors of houses used for shops, workshops or living space, instead of parking; and relevant functions present at neighborhood level, may, all in all, change young people's attitude toward this area. They may here enjoy living close to the city centre of Kyoto, although still only a bicycle or tram ride away from the mountains, in a local community that is both denser and richer than suburban life.

2.4 Existing buildings are skeletons

Buildings in Japan spend a lot of electricity on both cooling (in summer) and heating (in winter). It is, however, thermodynamically inefficient to produce heat from electricity, and the WWF ecological footprint report for Japan (WWF, 2012) states, that "priority should be placed on reducing Japan's carbon footprint by lowering domestic energy consumption" (p. 45). Luckily, sustainable energy sources such as geothermal heat and sunshine are amply available in Japan, and while these sources may not be able to cover today's demands from industry and large scale transport (high speed trains etc.), they may very well cover much of the consumption needed in buildings, provided buildings are changed.

While Japan's many modern, 'hard' buildings were conceived and built in times when excessive use of electricity seemed to be a simple solution, obviating the need for the clever use of natural resources often found in traditional architecture, these buildings do however provide basic, structural frameworks that are not necessarily redundant. Industrial age (post-war) buildings in Japan are structurally similar to traditional (pre-war) constructions in that they are built as structural skeletons, or frameworks (Shelton, 2012). During second half of the 20th century, such frameworks were built as steel skeletons with concrete paneling, rather than the traditional timber skeletons with lattice and clay paneling. Still, however, these open steel frame structures allow easy changes of building parts, such as e.g. facades, making big enhancements of building performances possible by rather simple changes of building. Structures can quite easily be equipped with new skins allowing for utilization of wind and sun to provide a good climate indoors.

A typical post-war house in a typical street was chosen for further studies. It has the narrow street facade (approximately 3,20 metres wide) typical of Japanese cities, a depth of approximately 8 metres, and consists of a garage on the ground floor, 2 main upper floors plus a top floor penthouse with considerable setback. The house is a steel beam framework cladded with cement panels, and cooling and heating is provided by air-condition units in every room.

The existing house is envisioned stripped back to its basic structure: Posts, beams, floor slabs and roof. The volume is kept as it is, but circulation and rooms are rearranged, installations renewed, and facades replaced. A new wall is erected from 1st to 4th floor (see figure 9). This wall arranges circulation, distribution of 'served' and 'serving' rooms, and provides room for vertical installations as well as various built-in storage units etc. The new wall is a unifying architectural element, spatially joining the individual floors, and adding a sense of spaciousness to the in fact small house (approximately 85 sq.m.).

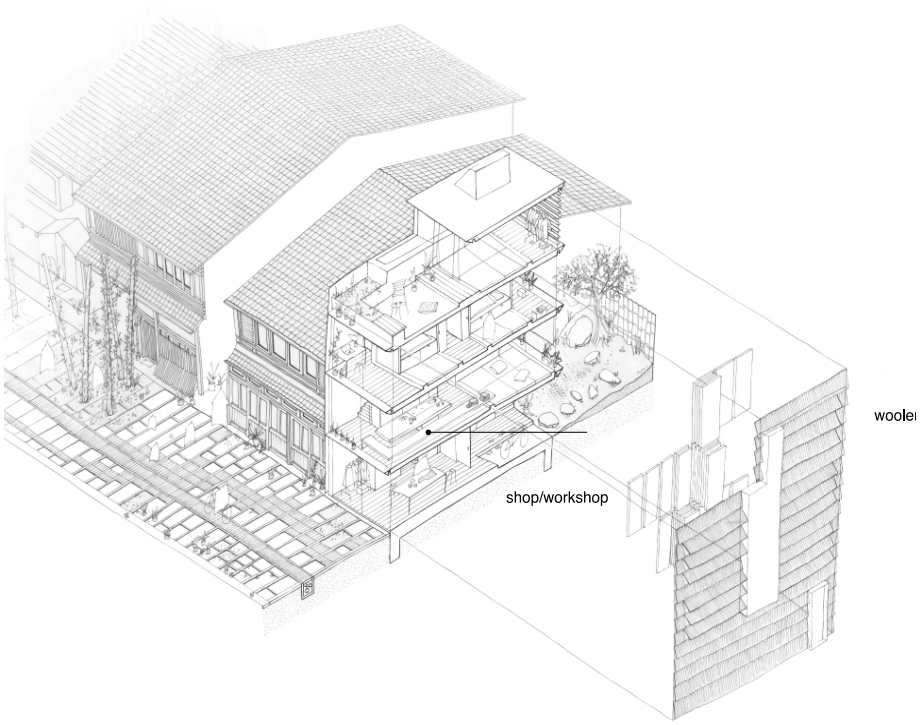

Figure 8: Exploded view of house and street.

Figure 9: Model photos.

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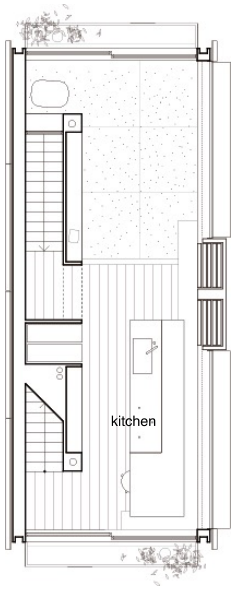

Figure 10: Plans, 1st, 2nd, 3rd and 4th floor

2.5 Breathing houses (open skins)

The tall, narrow facades facing street and garden are sliding glass doors. Narrow balconies provide sun protection and allow for window cleaning and flowerpots. A system of venetian blinds—both in front of and behind the glass—allow for adjustment of sun and wind. The facades proposed for the sides of the house (facing the gaps mandatory in Japanese cities) are built up from horizontal elements designed to tilt open like gills, allowing air to circulate. In the Japanese tradition of building, the warm conditions of summer are given most weight, rather than the cold yet short winter. Similarly, the new gills allow wind to pass through the house, helping to keep a pleasant temperature inside.

The gill elements are made from straw; in itself a sustainable material, and one often found in traditional Japanese architecture. The straw material also helps slowing down rainwater, providing evaporative cooling.

2.6 Thermal mass

The existing steel structure has low thermal mass, making it fluctuate in temperature with changes of season and weather. Improvements of the indoor climate can be obtained by

adding building materials with higher thermal mass (such as concrete) to the building. Adequately positioned, these masses improve the thermal inertia of the building.

In this project, concrete is added to existing floor slabs, improving sound insulation as well as thermal mass. During a winter's day, this thermal mass stores energy from sunlight and gives it back to the room in the night. On a summer's day, on the contrary, masses are blocked from direct sunlight by curtains and screens in order to stay cool through the day. This systems works much like the way a stone having been in the sun all day feels warm on a cool evening, while a stone having been in the shade feels cold on a hot day.

2.7 Insulating shutters

In winter, a set of insulating, woolen shutters running on tracks installed behind the facades can be shut. They afford living and sleeping areas with an insulating lining, minimizing the need for artificial heating. In summer, when not in use, these shutters are stacked and parked in compartments protruding the side facades; somewhat similar to those found in traditional architecture.

2.8 Additional heating and cooling

In Japanese dwelling tradition, heat sources like e.g. containers for burning charcoal ('hibachi') were moved around with dwellers and were in operation only when needed. The modern Japanese custom of moving electrical heaters where they are needed can be regarded as an extension of this strategy (Shelton, 2012).

In this project, a similar, albeit more convenient, solution is suggested: Heat wells are drilled under the house, harvesting geothermal energy. From a depth of approximately 10m, a steady supply of warm water feeds a heat pump. With a small amount of electricity and the difference in temperature of the harvested water and outside air, this pump produces cooling water for summer and hot water for winter.

Warm water can be run through pipes installed under tatami mat areas. Keeping the lower body warm is the most crucial in feeling comfort, and having the heating system installed directly under the sitting area, the system can make do with a low inlet temperature and thus be efficient and simple. Areas are heated only when occupied. Likewise, in summer, cool water can be circulated through pipes installed in the ceilings over tatami areas occupied at the moment and only when natural ventilation and evaporative cooling is insufficient, thus limiting its use. The pipes fit easily in the existing corrugated steel slabs.

The need for artificial heating and cooling is minimized by clever arrangement of various screens and openings. Together with electricity-producing sun panels on the rooftop and a ‘solar chimney’, providing exhaust of hot air in summer, the house is close to self sufficient with energy.

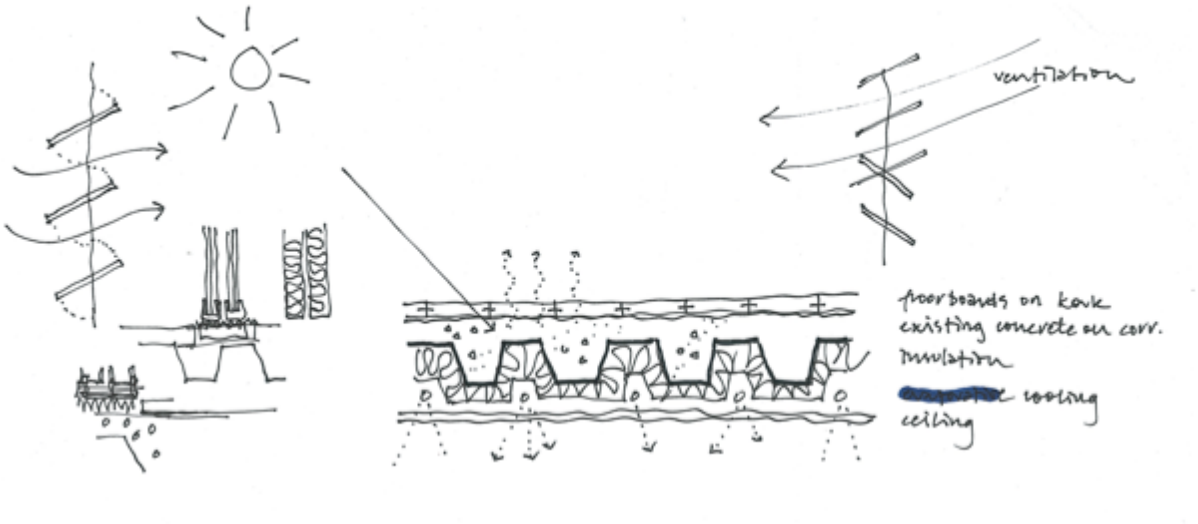

Figure 11: Details; thermal mass, insulation, blinds, heating and cooling pipes etc.

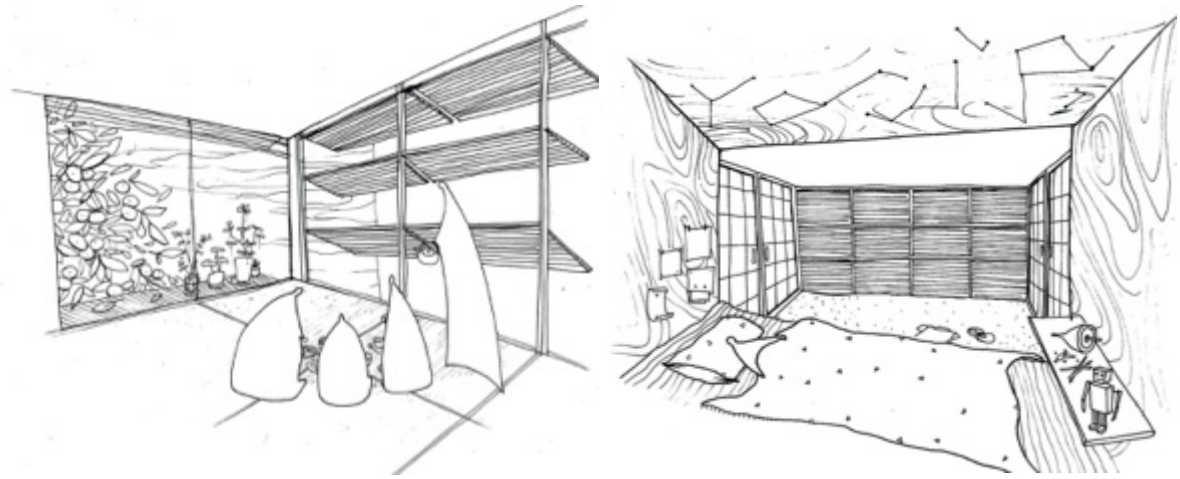

Figure 12: Tatami area/living room + sleeping alcove

3. Discussion

The project renders one potential outline of how urban dwelling can be developed and experienced when combining strategies from different scales. It seems possible that while addressing urgent needs for reduction of consumption, we may in fact be able to find ways of living that are both more healthy, more sustainable and more aesthetically gratifying than what is today the case.

Neighbourhoods and individual houses may be remodelled so as to reduce energy consumption while improving circulation of materials (food, rainwater, waste etc.). The white-yolk logic of Japanese cities may inspire also non-Japanese cities to combine pockets of intimate neighbourhoods with scattered, local centre's–rather than having one, big centre. The spatial qualities of Japanese dwellings, achieved despite of great urban density and very small living spaces, may as well inspire others to live better with less.

Thus, based on re-use of existing urban fabric, the project is a study of possible ways to move realistically toward urban, ecological life. Even though several experts informed the project, it is, however, also rather sketchy, and further research is definitely needed. So far, the project suggests several topics: For one, the transformation of modern (post-war) Japanese houses appear worthy of further investigation, since such houses are as many in number as they are excessive in electricity consumption. As shown, however, luckily they are also fairly easy to remodel and improve. Second, the Japanese custom of flexible, moveable heat sources, heating dwellers rather than space, could be considered applied to western dwelling as well. While in the west it is customary to heat buildings by means of permanent installations, the idea of heating people rather than the whole of space could lead to studies of (slightly) heated furniture, which could in turn be feasible in many existing, inadequately insulated houses of (like e.g. Scandinavian cities).

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