Living Buildings

Then and Now

Weaving our skyscrapers with life is a modern topic.

The expansion of our cities has been a leading factor in deteriorating environmental health, human well-being and climate change (Breuste et al. 16; Müller et al. xv). Even if we can agree to address this, the question remains: **how**? One piece of the solution that has begun the slow and painful climb out of novelty is the 'Living Building' – bringing life into the structure of our buildings.

At their simplest aspiration – living buildings mean taking the forests that once grew in place of our cities and moving them into the sky. In many ways it's perfectly intuitive; use the new land to seed the next generation of forests into. Our cities can continue to grow to support the needs of people **and** the environment, win win.

Despite the clarity of the idea, however, it's an infinitely nuanced task, involving cutting edge technologies, an additional ecological phase of design, and typically an ambitious private fund to back it up. Even with the wealth of research in support of their longevity and practicality (Breuste et al. 165-17; Means 23, 354) living buildings are rarely approved for construction, seen as too new, ambitious and fanciful to spend taxpayer or investor money chasing. Even in relatively 'green cities', there often isn't the legislative and administrative co-operation to support their creation (Gantar et al. 1).

The twist, however, is that living buildings have existed for as long as we've been building homes.

Viking Turf Houses

The Viking Diaspora – Pre-History to Now

An Ancient Response to Scarcity – 786 Words

Top Left: Figure 1 – Norwegian Sod-Roofed House Reconstruction
Top Right: Figure 2 – Icelandic Turf House Reconstruction
Bottom: Figure 3 – Canadian Turf House Reconstruction

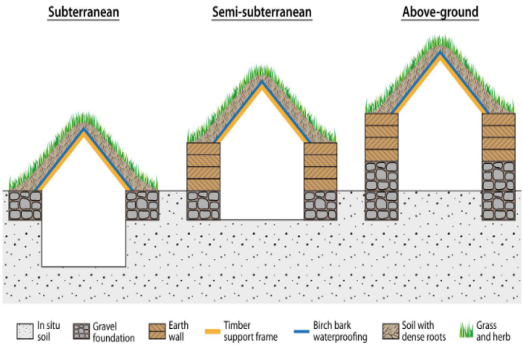
Our earliest ventures into building shelters were plant assisted, albeit somewhat unintentionally. Before concrete, plaster, nails and glue – mud was the dressing of choice for constructing buildings, used to both hold structures together and fill the gaps left by timber (Jim, a 33, 40). Should the structure then survive a few seasons, it would become coated in grasses and other shallow-rooting plants, creating a durable mesh of life that would ensure the longevity of the building, all while improving insulation, water-proofing, and camouflage. With the coming of the bronze age, the convenience of nails and wooden pegs would push this practice out. However, in the arid northern peaks of Scandinavia where wood was scarce, winters brutal, and land-based transportation difficult (Richards 36), the tradition developed into the very first intentional green roofs.

Turf, or more commonly 'sod', roofs involved taking strips of established turf from a field and laying it over a structure of birch bark (Figure 1). While it involved arduous manual labour to pry the very earth from the ground with bronze axes and pitchforks, this avoided the risky bare-earth stage, where erosion could occur before particularly slow-growing arctic plants had time to establish (Jim, a 32). Furthermore it provided insulation far more powerful than wood, stone or clay, and with just a cindering fire for additional warmth and mostly natural upkeep on the structure, they were a perfect solution for scarcity. The intensity of the task and the establishment of permanent footholds in the north set the scene for the establishment of townships, and then Vikings. This tight-knit and wood-preserving culture became crucial leading up to the Viking age, where boats of up to 30 meters long found themselves a top priority for trading and transport, or raiding and war (Richards 47-62). As trade developed throughout the Viking diaspora, imported wood become more accessible and rapid poulation and power growth saw the relatively quick to build wooden longhouses becoming favoured. Turf roofs were still made, but would see a steady decline in popularity.

However, once the Vikings found themselves in Iceland, wood became more valuable than ever.

Upon ariving to Iceland, the Vikings burned most of what little trees had established on the island to rear domestic, imported animals (Richards 105). With widespread deforestation and over-grazing, trees were scarce in the frigid lands of the North Atlantic. Worse still, the island was simply too far away from the mainland for trade to effectively supply it with enough wood (Jim, a 34), and driftwood could only be stretched so thin. Worse, while natural hot-springs allowed the culture of cooking in Iceland to shift away from being fire-based, this left the issue of warmth in the home. Stone, mud, and even wood couldn't keep a house warm enough on its own during the long, windswept, sunless winters of Iceland (Short). Without enough wood to even properly feed hearth-fires, insulation became the only means of survival, and turf roofs developed into the perfect solution – the turf house.

Figure 4: Turf house templates. Note the more common subterranean variant.



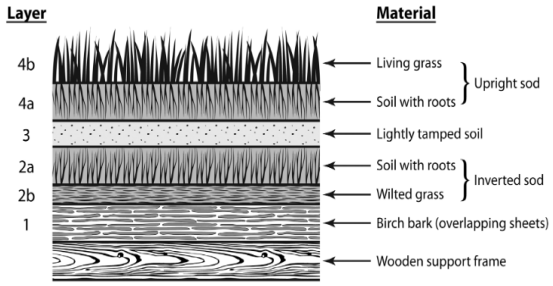


Figure 5: Traditional turf roofing.

Often built submerged in the ground, turf houses expanded the turf roofs of Norway to make completely turf-covered structures. This allowed them to avoid the harsh Arctic winds and hold a great capacity for heat-retention, that would gradually be developed into larger and more impressive structures (Figures 2-4). These structures were unique from turf roofs in that they were solely designed to accommodate the turf, using stone foundations, earthen walls and sparing wood to create a distinct house plan with a new realm of expertise and skill (Jim, a 36, 40; Short; Figures 4-5). The practice even had a restorative effect on the environment, reversing much of the soil degradation brought by the coming of the Vikings (Jim, a 37-39). This considerable time investment in permanent housing and skill development shaped the culture towards even more tight-knit communities that would support each other outside of familial ties in an early form of social welfare (Richards, 103; Stein-Wilkeshuis 343), which eventually grew to become the relatively egalitarian parliament of Medieval Iceland.

When the Vikings continued their travels to Greenland and North America, they brought these structures with them (Figure 3), and although they did not stay long, they had cultural crossings with Inuit, who continue to build similar turf houses to this day (Jim, a 34, 5).

It wasn't until the coming of mass-produced materials that turf houses truly fell out of favour in Iceland, as their uniquely labour intensive design couldn't keep pace with the growing demand for reliable housing (Jim, a 32). However, many of them have continued to survive for centuries as long-term family homes, and the turf roof likewise survives in Norway.

The reciprocal relationship between the Viking Diaspora and turf housing in part gave rise to the Viking Age, Icelandic establishment, egalitarian parliment, and masterful, natural feats of design. Beyond simply being a structure to live in, they shaped the cultures around them into slower, more permanent life. They became structures to live by; a natural solution for scarcity.

Urban Forest

Koichi Takada Architects – Brisbane, Australia – To be Built

A Modern Response to Environmental Disaster – 830 Words

Left: Figure 6 – Urban Forest Long View
Top Right: Figure 7 – Urban Forest Sky View
Middle Right: Figure 8 – Urban Forest Roof View
Bottom Right: Figure 9 – Urban Forest Ground View

Urban Forest represents the antithesis of scarcity, but is no less of a reciprocal response to its environment than turf housing. Designed by Koichi Takada Architects and to be built in South Brisbane, Australia, it presents itself as a somewhat utopian ideal of modern living, almost too good to be true yet planned – optimistically – to be built by 2024.

It is a fundamentally contemporary structure in its conception. It will be created off-site in tree-like columns and pre-fabricated apartments made from green concrete consisting of 40% less Portland cement than conventional concrete (Block). This is a substantial achievement in further reducing the CO_2 emissions of the construction phase while still maintaining the integrity of the material (Block, Mishra). They will then be transported to the site and assembled into a 20 storey, 194 apartment building with 3 bedrooms each, at around 100 times the average Queensland housing density (KTA, QG). Concrete will be supplemented by FSC certified wood and natural stone to further reduce the environmental impact.

With this, the stage will be set, and approximately 550 trees and 25,000 plants will begin to be planted on every surface of the building. All of this flora will be from an array of native species, greatly increasing the biodiversity of the site and helping to strengthen Australia's native ecosystem (Block, KTA). The site will be so densely planted that it will have almost twice the amount of species and greenery in it than the same sized area of Australian rainforest (Rice 129, Wilkes), dwarfing the biodiversity of the cities and suburbs around it. Not only is this incredible for the local environment, it will provide substantial insulation against hot Australian summers and purify the air of the homes. This green cloak will be watered by an automatic irrigation system, taking rain water and grey water from the building so as not to drain local water sources unnecessarily (Block, Wilkes). Much of the power will also be generated on-site, with 1500 square meters of solar panelling installed on the structure. In many ways Urban Forest has more than earned its title as "The World's Greenest Residential Building" (Block), and the benefits to the emotional and physical health of the people within cannot be ignored in its creation of a living, natural home in the sky (Breuste et al. 16, Block). However, it would be a disservice to ignore where it has fallen short.

The apartments within are to be luxurious. Each one has a fully planted "backyard in the sky", their own underground parking spaces, and access to communal roof-top amenities including a pool, cinema and boardroom (Block, KTA, Wilkes). This is possibly the largest area of tension for Urban Forest and modern grown spaces in general, as the $300m construction cost means that each apartment will likely come to at least $2m. It is far from affordable housing, with arguable frivolities, and the 7 basement levels of parking has only 5 electric car spaces per level (KYN, Wilkes). Further, as 'green' as the concrete is, it is still concrete. In this, it seems to follow other ventures into living buildings, creating an expensive and pretty skin for the same tired monoliths. However, its skin runs deeper than most, and Urban Forest has one more feature that genuinely sets it apart from many other buildings.

Figure 10: Urban Forest Ground Floor

Shadowed by the stilts of the building, the ground floor is to be a public park (Figure 10). While this may be among the least technologically impressive aspects, it represents a social and environmental shift in how we think about private spaces. It allows the ground to genuinely become linked with its surroundings instead of a barrier to entry, creating lasting and essential social infrastructure for the area (FitzGerald) and something of a land-bridge for wildlife, all while maintaining the astounding housing density of a city. It also invites those in the area and afar to enjoy the building even if they can't afford to live there, which subtly tilts what 'luxury' can mean.

It's an elegant solution to urban sprawl, building our cities into the canopy of the land and returning the soil below to nature. In a way, the Urban Forest goes beyond the living façades and roofs that have existed for millennia to create a truly urban living floor.

Once completed, Urban Forest will be its very own ecosystem, where people, animals and plants can exist together. It is not without its flaws, however to deny the strides it has made in what green building and public space can mean is to miss the urban forest for the trees. As a pioneering idea of the future of cities it is luxurious and optimistic, likely to be tempered by further iterations into something far more practical and affordable. It sets a bold new precedent and takes us one step closer to living buildings becoming accepted as more than flights of fancy. While impressive by itself, the idea of an entire living city on stilts could be the solution to environmental disaster we have been searching for. It invites one to not only dream of it, but see the roots of such a future.

The Future of living buildings

What could we learn from the past? Where are we going?

What is best left behind? – 1036 Words

So, where are our living cities? If they are more resilient, cost-effective and ethically popular, why isn't every CEO and politician chomping at the bit to build the next one? Is this not the obvious solution to essentially all the physical and environmental troubles of the modern world?

Simply, the common thread of contention for integrating life into our buildings is time.

Regardless of the technology, they take more time to plan, more time to build, and still more time to grow into their stable form. What's worse, a faulty plan or short-cut build could mean it never develops a stable ecosystem, and yet again takes time to fix or entirely restart. This is taken to its extreme in fully living structures such as root bridges, which take generations of painstaking effort to become entirely sound (Ludwig et al.). As exciting as the possibility of living and breathing cities are, it means that the space has to survive, grow, and factor in a certain leniency for the natural changes that come with life. The space has to be fully in tune with its environment, which means still more time spent on research and development on a multitude of fronts. It demands new materials, new mindsets, and a new approach to how we spend our time. This was fine in Iceland, where all they had was time and the need to survive, but it's naturally a poor fit for our fast-paced modern world. It's a complicated matter to invest in a generational project. Even if the project is flawless, as none could be, how can we convince ourselves to work for something we will never fully enjoy?

For all its downsides, concrete is simple. It's simple to put up, it's simple to change, it's simple to take down. Once set, you can be reasonably certain it won't move, and taken to any corner of the world it will still be concrete. Better still we have a wealth of available resources specifically designed for concrete construction. If it breaks in a decade or two? Pour more concrete. In the meantime, the concrete is a wall/roof/floor/artpiece and it's making money. Concrete fits neatly into an individual mindset, where short-term gain is the priority. This is the dominant force in our global culture today, and not easily swayed (Williams). Most difficult of all, most living buildings are built over concrete. When there's a perfectly strong concrete building underneath, why bother spending time and money on dressing it up, let alone anything more radical?

This is the tension of cultural shift. The dominant patterns of cultures have a natural aversion to change, and the power to back it up. They hold the unique strength of defining what is valuable (Williams) and therefore what is worth the effort. With this, any emerging shifts in the culture must justify themsives in terms of that value first, or in terms of an external preassure on value such as scarcity or abundance. In the culture that made turf houses, wood and insulation sharply rose in value, and so the culture spent their abundant time creating a new material culture. It focused on long-term solutions, born from the residual traditions of their people. However, in a culture where short-term gain is valuable, or the only thing of value, sustainablity is a hard sell and a generational project is unheard of. When the continued wellbeing of a system is not valuable, there will be no support in creating it.

This has been the culture for hundreds of years, from the first industrial revolution through to Modernism and the 1930s drive for post-war progress (Greenhalgh 8). It is the core of the issue facing, not only living buildings but, a shift towards an environmental focus. The risks that climate change and environmental damage pose to us are inherently long-term. Loss of diversity in life and widespread climate shifts will not factor into a yearly report on growth, even with decades of change it can be hard to measure. There may be the figurative and literal sea walls around oil plants, but nothing more far thinking.

Living buildings force us to question what we are progressing so tirelessly towards. They ask us if we may be better off going back (Jencks 12). With a history as deep as our own, they are an emergent strain of culture that places itself antithetical to short-term gain and the constant push towards quantity over quality. They pull us back to the dawn of construction, to the slow, deliberate and sustaining ways of communal building that runs decisively against the grain of individualism, to the point where the next generation is who we build for.

Urban Forest represents the tension in this. On the one hand, its level of biodiversity and public service is a stride both forward and back in time, reclaiming the grandeur of nature for our modern world. On the other, it has an especially green skin, but it is a skin nonetheless. There is a pull for living buildings to conform to the dominant concrete mould, to fit within growth and the short-term that often holds them back from realizing a truly radical shift in perspective (Williams). This has been the leading front of environmentally-conscious design, aiming to quantify its value in terms of the dominant, consumerist culture of the modern era. At best, leaps into more bold and experimental constructions are passed off as luxury, as in Urban Forest, meanwhile tower after tower is poured around them. It has not yet formed into the dominant, self-sustaining practice that turf housing and our very first human-made walls became. We can do better, and nurture living cities.

Scarcity and abundance are firmly driving us towards a new material culture. We are running out of fossil fuels and our atmosphere's capacity for CO_2. We are sitting on an abundance of resources ready to be pulled from luxury and invested back into the long-term health of our planet. Through all of this, the framework of individual profit and short-term gain

is failing us, and deserves to be finally laid to rest. It is only when we begin to truly consider the future, and our responsability to each other, that living buildings could once again begin to define themselves in their own terms.

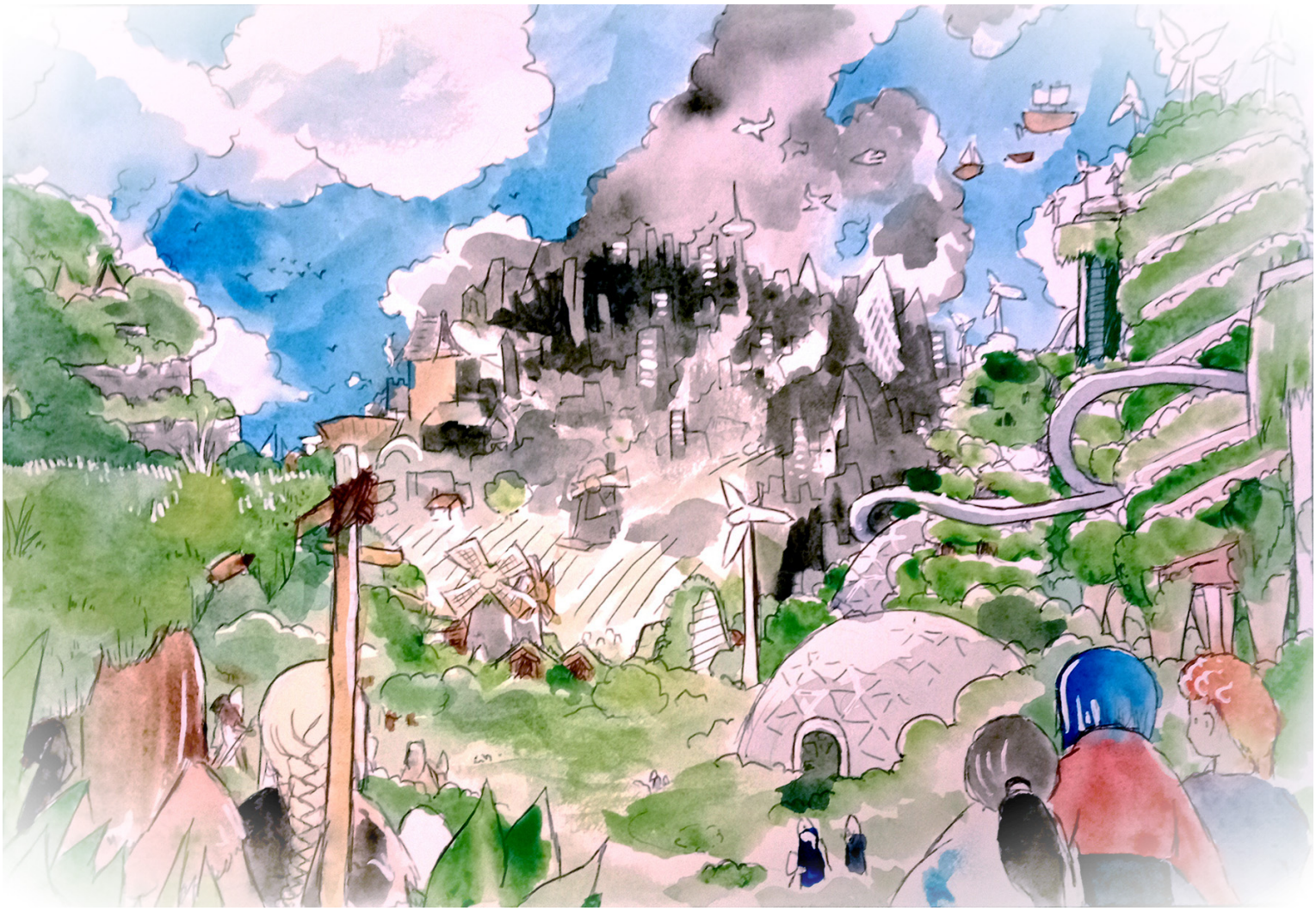


Figure 11: The Residual Emergence of Living Buildings

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List of Figures