Productive Urbanisms
From Runways to Greenways

MASON WHITE[1], LOLA SHEPPARD[2]

[1]University of Toronto, Faculty of Architecture Landscape Design, Toronto, Canada
[2]University of Waterloo School of Architecture, Cambridge, Canada

ABSTRACT: The infrastructures of the twenty-first century, if they are to respond to impending urgencies with respect to resources, will look to efficiencies and symbiotic relationships; to the pairing of infrastructure, landscape, public amenities, and architecture, towards a culturally, economically, and environmentally productive urban realm. A recent masterplan for the expansion of Reykjavik seeks to densify the city and capitalize on its inherent potential for green energy, urban agriculture, and urban nature. By interlocking various modes of production – research, culture, education, agriculture - the project seeks to generate productive urban overlaps and greater environmental efficiency.
Keywords: urbanism, infrastructure, energy, farming, public space

Figure 1: Aerial view of new Vatnsmyri district of Reykjavik.

INTRODUCTION

With its sub-polar oceanic climate, and its island nation status, Iceland would seem to be at the fringes of human settlements. By association, one expects Reykjavik, as the northern-most capital in the world, to be an isolated and potentially globally-dependent outpost. However increasingly, this city of 120,000, is looked to as a model for sustainability. With a territory rich in renewable energy, Reykjavik's potential to realize this model is potent yet unfulfilled [i].

A 2007 international competition organized by the city of Reykjavik invited architects, landscape architects, and planners to consider the future of an unused World War II airfield and its surrounding 150 hectares, located just south of the city center; an area called Vatnsmyri. (Fig.1) The masterplan brief asked for speculations on the spatial, programmatic, economic and cultural future of this northern city. *From Runways to Greenways* proposes a city self-sufficient with respect to energy, agriculture, water, while addressing the development potentials of technological, such as bio-, eco-, and genetic-, enterprises for the region.

POST SPRAWL

Iceland is advanced in terms of green energy and self-sufficiency, due in part to vast geo-thermal reserves. This does not, however, suggest that Iceland has capitalized on its unique and opportunistic geographic positioning. While its ratio of sustainable energy (from geothermal and hydropower) to traditional carbon-emitting modes of energy is higher than any other country in the world, it is also the country that uses the most energy per capita [ii]. In Iceland, there are five major geothermal power plants which produce about 26% (2006) of the country's electricity. In addition, geothermal heating meets the heating and hot water requirements for around 87% of the nation's buildings. Though in contradiction to this great potential for a sustainable city, Reykjavik relies heavily on imported fossil fuel primarily for fishing, transport and heavy industries [iii].

With a population density of approximately 190/km², the Reykjavík metropolitan area has been subject to large-scale urban sprawl. Additionally, per capita car ownership in Iceland is second in the world, with about 630 cars per 1000 inhabitants [iv]. Highways are common in the city of Reykjavik, and public transit remains relatively undeveloped.

The *Runways to Greenways* proposal seeks to use the Vatnsmyri site to densify the city and capitalize on its inherent potential for green energy, urban agriculture,

and urban nature. By interlocking various modes of production – research, culture, education, agriculture - the intention is to generate productive urban overlaps and greater environmental efficiency.

The project positions urban sustainability through five key issues:
- densification of the built fabric,
- leveraging local resources
- the partnering of industries which are energy intensive in such a way that they are spatially and environmentally/energy-wise mutually beneficial and symbiotic
- Provision of environmental infrastructure to sustain diverse ecologies
- creation of varied scales of public space networks, shield by buildings or landscapes to establish environmental micro-climates

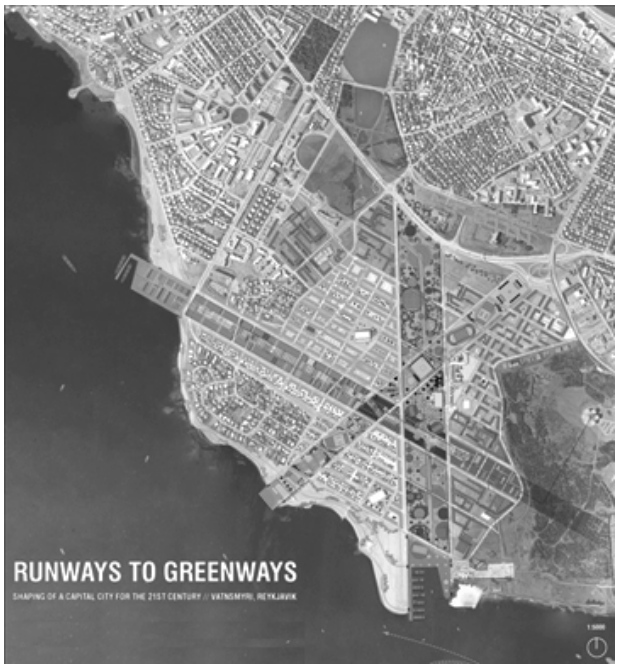


Figure 2: Masterplan of Vatnsmyri district showing three Greenways

NEW ECONOMIES:
PRODUCTIVE LANDSCAPES

Recognizing the potential for social and economic vitality, landscape and exterior programming are employed as catalysts for urban development. The proposal considers exterior space as equally charged with activity as built or interior spaces within the city.

The city is conceived of as a complex of systems: building, open space, infrastructure, ecologies, social amenities (Fig. 3). The proposal capitalizes on the immense potential for renewable energies and sustainable urban processes. For example, abundant geothermal resources are employed to leverage public infrastructure and economic activity through the development of *socially,,ecologically, and economically* productive landscapes embedded within the city. The public is invited to participate and engage in production.

Figure 3: Diagrams of various systems comprising the project. From Left to Right, Top to Bottom:
Roads, Blocks, Energy Production, Transit, Parking, Water Management, Bike and Pedestrian Paths, Green and Public Space, Trees

The Runways proposal for Reykjavik's Vatnsmyri district is initiated by establishing "no-build" zones or public landscapes, marking the strips of the old runways. (Fig. 4) The figure of the runways is used to define three primary urban ecologies. Each former runway is converted into a "greenway" that uses a quality of the city to activate and define the space: nature, recreation, and production. The various greenways each seek to support this notion of self-sufficiency and micro-ecologies – in the broadest sense of the term. By concentrating most of the public infrastructure - of energy, farming, industry, technology, research – within the greenways, the proposal seeks to make this infrastructure salient and participatory to city inhabitants.

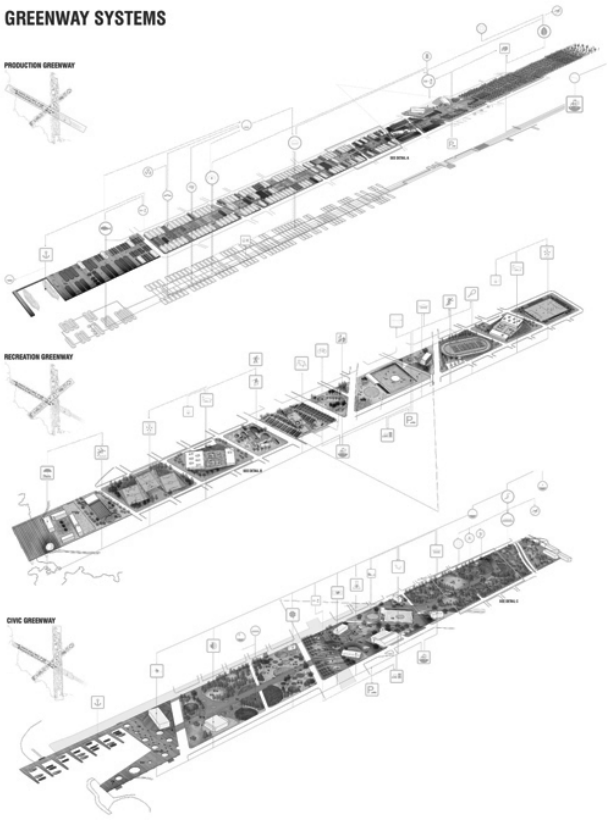


Figure 4: Figure of the three greenways. Top to bottom: Production Greenway, Recreation Greenway, Civic and Ecology Greenway

PARK AND CIVIC GREENWAY

The main north-south greenway establishes a *nature and civic corridor,* (Fig. 5) extending the local ecology of an existing park and lake to the north, which serve as a significant bird sanctuary, to a thermal beach to the south. A series of new micro-ecologies, including wetlands and hills are propagated along this wide public greenway, creating a diversity of tactile and spatial conditions. The manufactured topography also serves to buffer as wind. As the nature of the Park Greenway changes over its length (north to south) – from wetland, to leisure park, to urban square, to botanic garden, to marina - the open space is paired and dotted with corresponding civic institutions: a public library, community centre, aviation museum, multi-modal transportation node, science museum, and aquarium.

Figure 5: View showing main public space of Civic and Ecology Greenway

PRODUCTION GREENWAY

The east-west greenway is a *landscape of production*. It extends the dense forestation of the city's main hill and forest and generates a new connection with the water's edge at the west, terminating in a small port. Along its length is program centered on economies of food and energy production, in a bid to realize Reykjavik's potential as an off-the-grid city. Additionally, the production greenway promotes economic vitality in a time when food and resource production are increasingly strangled.

About 78% of Iceland is agriculturally unproductive, and only about 1% of the land area is actually used for cultivation. Of this amount, 99% is used to cultivate fodder crops [v]. Vegetables, flowers and tropical fruits are cultivated in hot-spring areas for domestic consumption in greenhouses heated with hot water from the springs. Vegetable and flower growing are conducted mostly in greenhouses in the geothermal areas of the south and west. Typically these activities are confined to the rural surroundings. The project capitalizes on the benefits of abundant energy and a tradition of high-tech agriculture, to propose a productive landscape within the 'centre' of the city, both eliminating local transport and putting people in proximate contact with food and energy production.

The greenway is conceived as a barcode of interdependent production activities, with changing densities of fish farming, greenhouses for fruit, vegetable and flower production, allotment gardens, markets and tree farming. These are constructed on a bed of server farms operated on geothermal energy.

The production strip is organized as a closed system of cultivation, yield, and harvest. A network of geothermal pipes runs as a substrate to the runway but emerges through the surface to mark critical spaces. This network densifies to create warm outdoor rooms in select areas during public events, (a strategy already in

place on many of Reykjavik's streets to de-ice sidewalks) and heat the greenhouses or fish farms. Clean water from the ecology runway is coupled with geo-thermally heated water to generate accurate temperatures for each of the specific activities. Meanwhile, ground water runoff from the production strip is channeled into small channels, treated and reused to service the greenhouses. Some greenhouses employ aquaponic cultures merging fish and plant cultivation.

Running below the production runway is an extensive computer server farm. The vast geothermal energy in Iceland makes it ideal for such a development, due to the large cooling and energy requirements of a server farm. The server farms generate large amounts of heat that is used to warm the greenhouses above grade. Major internet companies such as Microsoft, Google, and Yahoo are already considering the potential for server farms in Iceland, which would continue the transformation of this city into a global technology and information hub [vi].

The production strip envisions an intense mixture of various productive strategies: server farm, greenhouse agriculture, fish farms, geothermal energy, water treatment, into a highly symbiotic infrastructure.

RECREATION GREENWAY

The third greenway establishes a *recreation landscape* for the four new Vatnsmyri neighbourhoods created from the bisecting greenways. The recreation greenway is subdivided by the road network into recreation blocks to be shared by the surrounding communities. As the recreation greenway intersects other greenways a hybridized program emerges, such as a national skating rink at the intersection with the civic greenway. Each room has a unique program and figure, and defines spaces for formal and informal activities: fields, tracks, and courts, as well as schools, community centres and playgrounds.

Norman Pressman in *Northern Cityscapes*, stresses that the "provision of high-quality micro-climates in children's play areas" [vii] is crucial in northern cities. A range of strategies, such as the use of trees, land-forming, and geothermal heating, is employed to define these recreation blocks as spatial 'rooms,' serving to buffer against wind and create subtle micro-climates.[viii] Institutions in the recreation zone, which include schools and community centers, are treated as objects both to mark their significance, and to help them act as wind-buffers to the adjacent playspaces.

PERMEABLE URBANISM

The plan of the Vatnsmyri area is divided, by the greenways, into four zones, which correspond to four primary urban block typologies, differentiated in their programming and form [ix]. Each building type is paired with a protected exterior space, whether it be a wind-protected courtyard or roof garden, or a walled garden in the case of the residential fabric, ensuring access to views, light, and green space. All four massing types promote a 'permeable urbanism,' though with varying percentages of porosity and differing ambitions for landscaping. A zoning code is devised for each typology that invites further variation in response to market and development opportunities.

Figure 6: Detail of varied fabric of building and public space

Permeability also operates at the scale of the urban fabric through the network of laneways connecting semi-public courtyards. Some primary and secondary streets include sidewalks that expand and contract to create informal public spaces for activities such as outdoor cafes, kiosks, and benches. (Fig. 7)

Figure 7: View of expanded street to form protected corner square

The zoning code of each typology is calibrated to respond to wind and light issues, which has a dramatic effect on occupation in the public realm. Three out of the four typologies allow for two- to three-storey courtyards, which create protected micro-climates at street level.
The varied orientation and porosity of taller slab buildings mitigates wind tunnel effect in the higher density areas. Sectional shifts in the four block typologies provide a visual porosity, a range of semi-public sub-spaces and maximize light entering into the courtyards and gardens (Fig. 8).

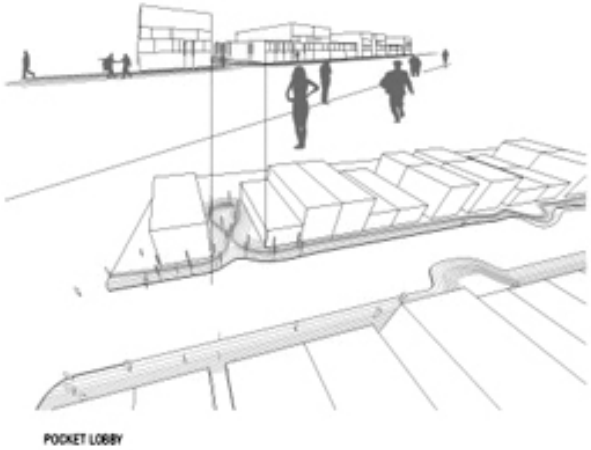


Figure 8: View of sheltered pocket parks in residential neighbourhoods

BUILDING BLOCK TYPOLOGIES

Each of the four typologies is dominant in a different zone of the Vatnsmyri area. Although each zone is mixed use, each zone maintains a dominant programmatic role such as housing, research and education, commercial, or office.

A four to six storey mixed-use *permeable perimeter block* type is developed by breaking apart the typical perimeter. The block develops *porosity from the roof down*; through cuts into the envelope and plays in the roof line, yet keeps the ground level courtyard relatively enclosed and intimate (Fig. 9).

A *porous folded block* is developed by combining a folding plinth with L-shaped slabs of varying heights. The plinth allows for commercial space, and encloses courtyards of varying degrees of public-ness while the slabs above the plinth are either residential or commercial. This block type develops porosity from the street level up. The roofs of both the perimeter block and folded plinth block deflect up and down, creating a roof topography not unlike the Reykjavik vernacular, but also diminishing wind [8] (Fig. 10).

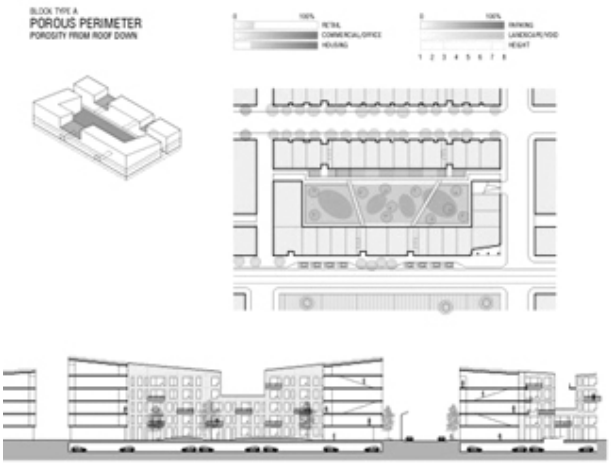


Figure 9: Diagram of mixed-use Permeable Perimeter Block

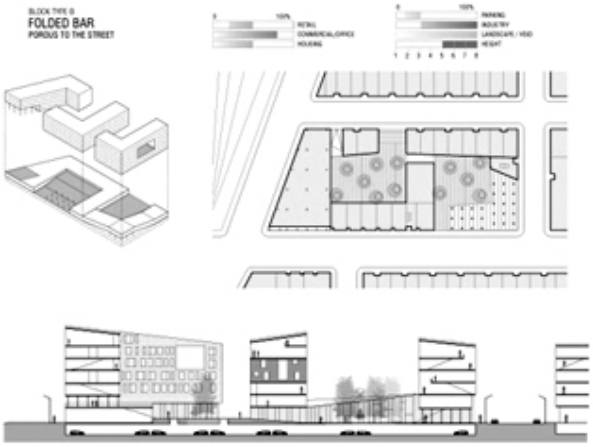


Figure 10: Diagram of mixed-use Folded Porous Block

The third block type is developed for the university areas and technology parks. This type is modelled on the *campus quad*, organized around an open courtyard, with a folding perimeter bar of shared functions above. The intention of this type is to create a sense of interiority and identity, whether for a university faculty or a technology business group, through the creation of permeable courtyards.

Finally, a low-rise semi-detached residential type defines a *pixelated housing* typology using varied lot sizes in order to encourage a mix of social demographics. Building codes establish a preset range of built area and green space required, producing a rich array of possible housing types and garden relationships: low L-courtyard houses, denser enclosed courtyards,

houses with garages or annexes at the back, linear houses, among others. (Fig.11)

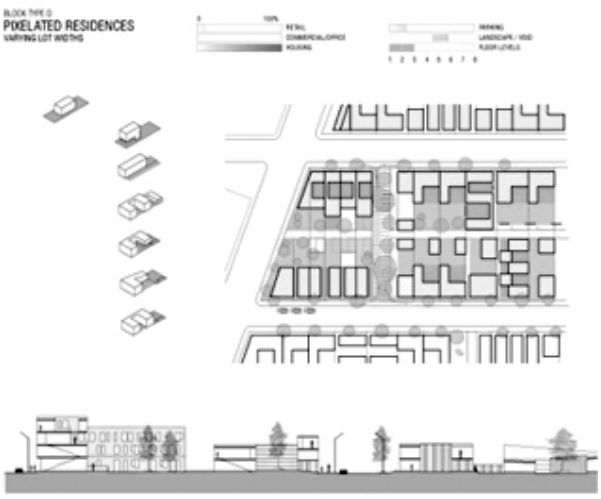
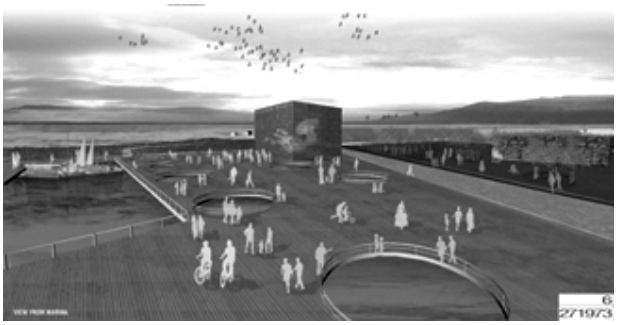


Figure 11: Diagram of 'Pixelated' Housing generating a variety of configurations

PRODUCTIVE URBANISM

From Runways to Greenways positions itself as a prototype for future urban development, one which depends on a strategy of integrative and public infrastructure – those of energy, ecologies, landscape, public space, civic institutions, recreational facilities. It is in this networking that symbiotic relationships emerge between urbanism and nature, between consumption and production.

The physical infrastructures of the twentieth century – those of roads, rail, air, data, sewage, water, among others – have tended to operate as singular and independent systems [9]. The infrastructures of the twenty-first century, if they are to respond to impending urgencies with respect to resources, will look to efficiencies and symbiotic relationships; to the pairing of infrastructure and landscape, infrastructure and public amenities, infrastructure and architecture. This integrative infrastructure calls for the engagement of public and private partners, towards a culturally, economically, and environmentally productive urban realm.



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7. Pressman stresses that the "provision of high-quality micro-climates in children's play areas, especially in neighbourhood planning, is extremely important if the outdoor season is to be extended."
Pressman, N. (1995), *Northern Cityscapes*, Winter Cities Association. Yellowknife, 5. p. 178.
8. Pressman points out that "if buildings can be aerodynamic, the entire urban "envelope" can also adopt this principle – deflecting winds over the town and creating improved conditions within this network of streets and public spaces".
Pressman, N. (1995), *Northern Cityscapes*, Winter Cities Association. Yellowknife, 5. p.133.
9. Easterling defines infrastructures such as the US interstate highway system as "designed as a frozen shape— a dumb network with dumb switches."
Easterling, K. (2001), *Organization Space*, MIT Press, Cambridge. p.77.