THE UNIVERSITY of EDINBURGH
Edinburgh College of Art

UOA C13

ARCHITECTURE, BUILT ENVIRONMENT AND PLANNING

RESEARCHER

Miguel Paredes Maldonado

OUTPUT TITLE

Strip Horizon

OUTPUT TYPE

Architectural Design

DATE

June 2016

FIG. 1
Cover of the submission *Strip Horizon* to the second stage of the Nordic Built Cities Challenge competition. Image Miguel Paredes Maldonado.

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01 / STATEMENT

Strip Horizon is an architectural and urban design for a flexible, scalable residential neighbourhood in the municipality of Runavík in the Faroe Islands. The work was shortlisted in an open, two-stage international competition. The final entry was presented to the jury and Faroese stakeholders in June 2016.

The project developed multi-dimensional perspectives on architectural sustainability. The design incorporated environmental, economic and place-making components. It provided a theoretical reflection, a method of enquiry, and a case study. Critically, the design proposal experimented with a customised linear building typology unprecedented in the regional context of the Faroe Islands and the Nordic Countries.

The design enquiry was repeatable and scalable in the Faroese context, but also in the broader context of the Nordic Countries. The stage 1 competition submission was amongst the top 4 finalists and received international press coverage (see Appendix, page 26).

Relevant stakeholders in the Nordic Countries contributed to stage 2 development via public presentations (see Appendix, page 26).

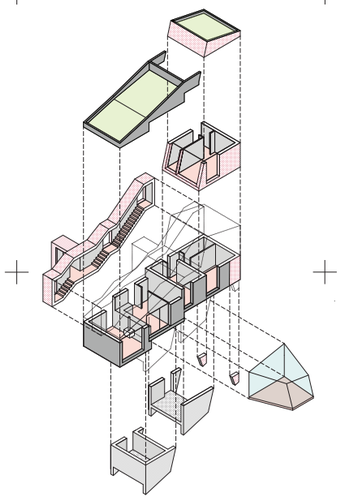
The project contributed to design debate within the regional context in co-operation with the other 3 finalist teams via workshops (see Appendix, page 26).

The reflective critique initiated in stage 2 was further extended and redeployed in academic debate through the development of peer-reviewed conference papers.

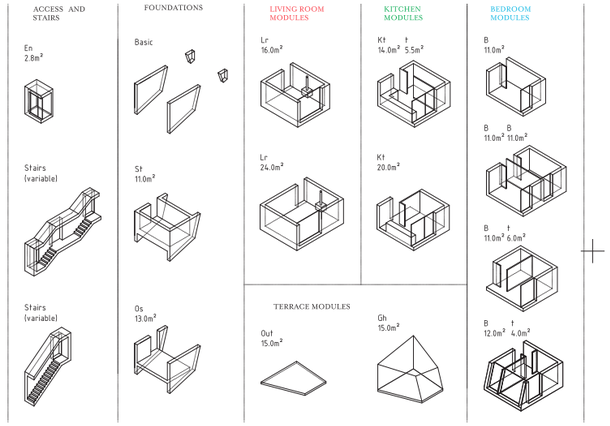
The project constituted substantial research incorporating multi-dimensional sustainability indicators synthesised in the form of an Urban Strategies Diagram (see page 22) that provided a novel methodological analysis tool that was both reflective and projective. Peer-review assessment was carried out twice during the competition process through an international jury in stages 1 and 2, with feedback from the jury following both stages. Academic publication provided further peer-review assessment (see Appendix, page 26).

STRIP HORIZON

Nordic Built Cities Challenge Runavik



Assembly of modules, Axonometric view
1:300



Catalogue of Prefabricated System Modules
1:300

Modularity and flexibility

We propose a system that enables the mass customization of housing units. On the one hand, this approach raises construction quality and lowers development costs thanks to its focus on large scale and serialised production. On the other hand, it also enables multiple levels of personalisation for each individual unit, hence satisfying the unique requirements of every potential household and creating a strong sense of variety and personal differentiation within the scheme. Our integrated proposal provides both a comprehensive rule set for generating customised designs, and a streamlined prefab building system for physically implementing these designs in a systematic manner.

Colour Key:

Lr = Living room
B = Bedroom
Kt = Kitchen
t = toilet

Urbanity

Habitation

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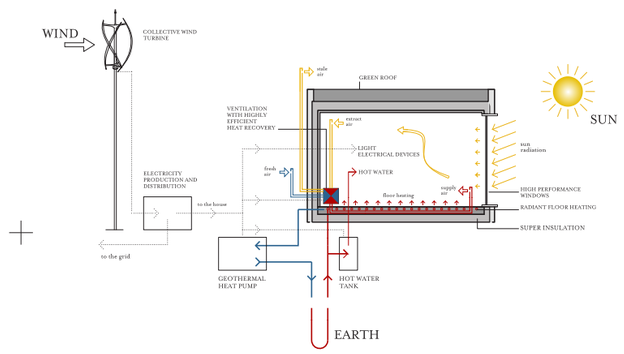
FIG. 2
Page from the submission to the competition showing catalogue of modular construction components and assembly combinations. Image Miguel Paredes Maldonado.

STRIP HORIZON

Nordic Built Cities Challenge Runavik



Active Design Strategies

We also propose a number of active strategies to unleash the potential of our design to become independent of fossil fuels for covering the energy needs for heating, hot water, electricity, ventilation and dehumidification. The proposed scenario will fulfil the energy needs of the new neighbourhood through a combination of geothermal heat and wind power (the latter via connection to the existing wind-powered grid).

- Geothermal energy utilizes the relatively stable temperature of the earth that is buried and stored a few feet under its surface. A ground source heat pump will take advantage of the naturally occurring difference between the air temperature above ground and the subsurface soil temperature, moving heat in support of end uses such as space heating, space cooling and even water heating. The water temperature that can be locally achieved through the geothermic energy will be studied to determine if it is appropriate for using in space and water heating. The heating system of the houses will be floor-based and included in the concrete slabs (TABS), making the most of their material inertia.

- Water heating temperature can also be achieved with the electric energy produced by wind turbines, which are electric generators that use the energy of the wind to produce clean, emissions-free power for individual homes. The design of the house with passive strategies will minimise the use of electricity, reducing it to that of lighting, powering small electrical devices and supplementing water heating when needed.

- Ventilation with highly efficient heat or energy recovery. The ventilation system provides for high quality indoor air, automatically extracting moisture and thereby clearly improving comfort. The result is a building with no draughts, no cold corners, and a constant supply of fresh air. Fine filters keep dust, pollen, and other particulate materials out, an invaluable advantage for people who suffer from asthma or allergies.

Urbanity

Habitation

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FIG. 3
Page from the submission to the competition showing active environmental design strategies. Image Miguel Paredes Maldonado.

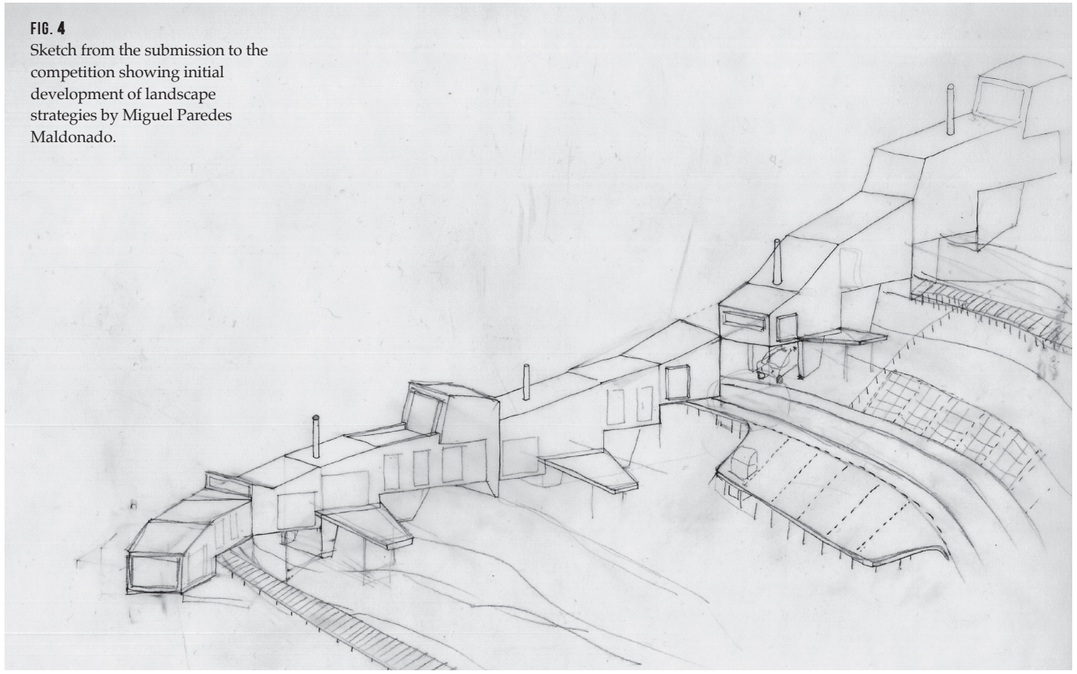

FIG. 4
Sketch from the submission to the competition showing initial development of landscape strategies by Miguel Paredes Maldonado.

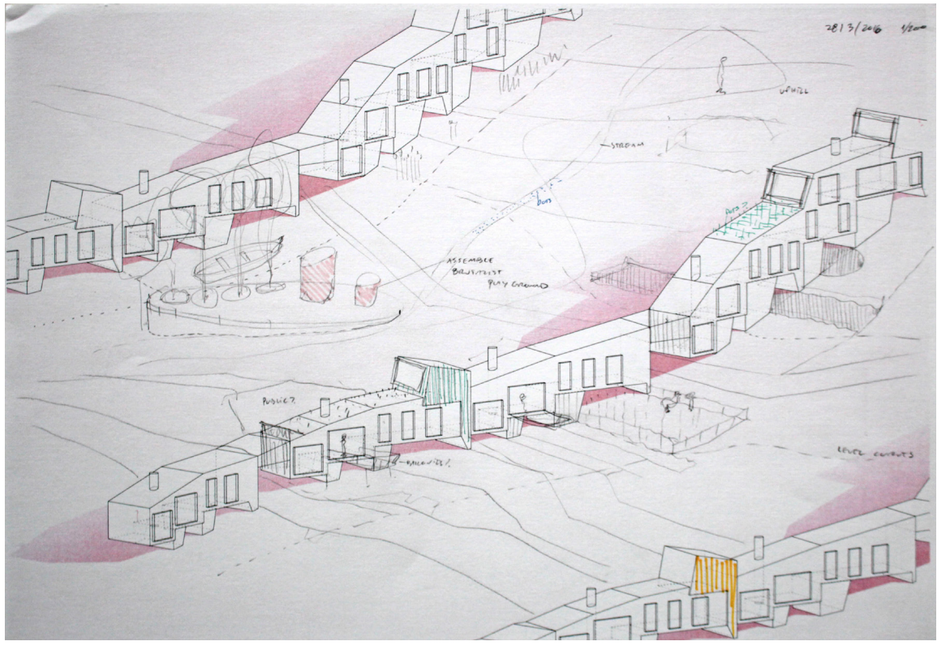

FIG. 5
Sketch from the submission to the competition showing development of architectural and peri-urban placemaking strategies by Miguel Paredes Maldonado.

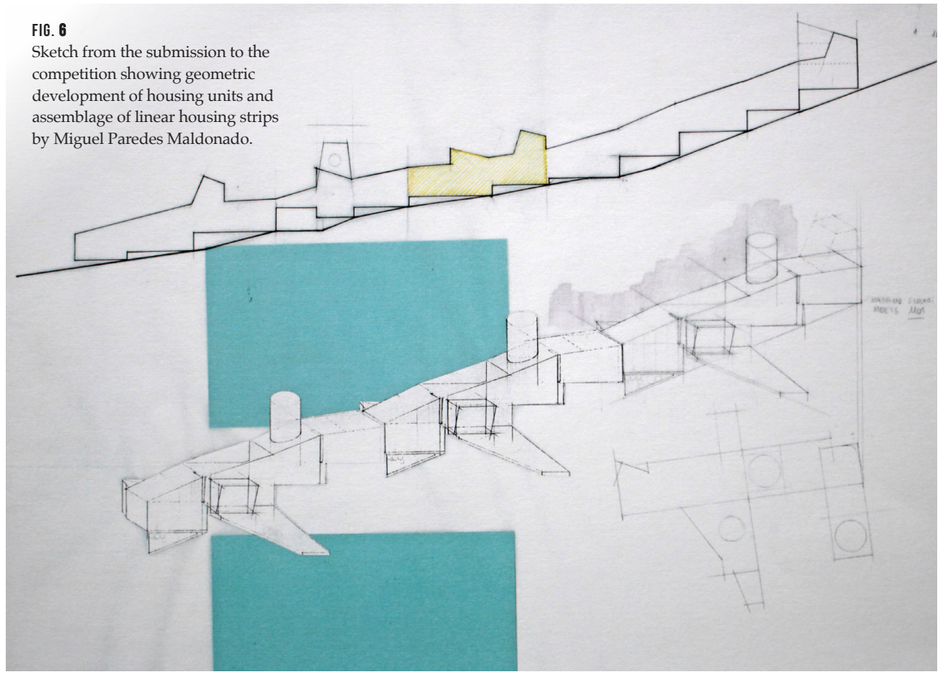

FIG. 6
Sketch from the submission to the competition showing geometric development of housing units and assemblage of linear housing strips by Miguel Paredes Maldonado.

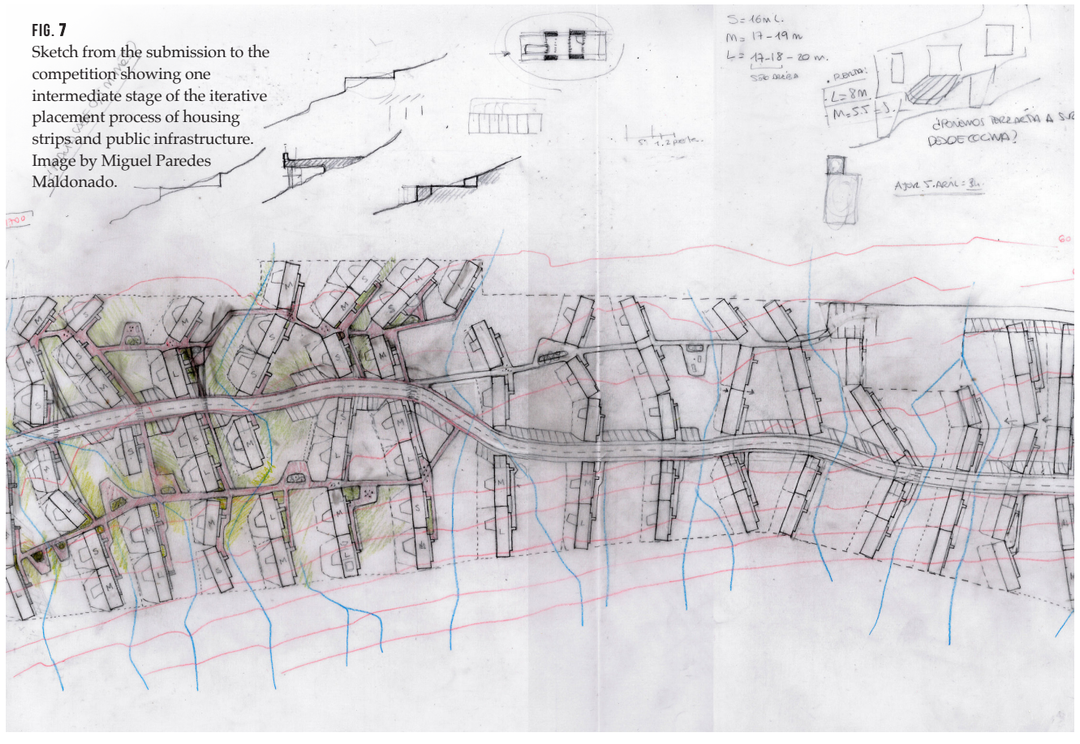

FIG. 7
Sketch from the submission to the competition showing one intermediate stage of the iterative placement process of housing strips and public infrastructure. Image by Miguel Paredes Maldonado.

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FIG. 8
Model from the submission to the competition showing the final iteration of the site layout. Image by Miguel Paredes Maldonado.

FIG. 9
An assembled housing strip and its adjoining public and domestic landscapes. Image by Miguel Paredes Maldonado.

02 / RESEARCH DIMENSIONS

Strip Horizon is a hybrid architectural and urban proposal for a flexible, scalable residential neighbourhood in the municipality of Runavík, Faroe Islands.

The portfolio of architectural design work included here was submitted to an open, two-stage international competition at the Nordic Built Cities Challenge, Runavík site:

http://www.nordicinnovation.org/programs/nordic-built-cities-challenge

Following the first stage of the competition the entry was shortlisted to the top four submissions, and was developed further during the second stage for public presentations to the jury and Faroese stakeholders in June 2016.

FIG. 10
Image showing the proposed new neighbourhood, and expressing its territorial continuity with the sloped landscape. Image by Miguel Paredes Maldonado.

Miguel Paredes Maldonado, *Strip Horizon* | **EDINBURGH COLLEGE OF ART**

FIG. 11
The proposed new neighbourhood, and expressing its territorial continuity with the sloped landscape. Image by Miguel Paredes Maldonado.

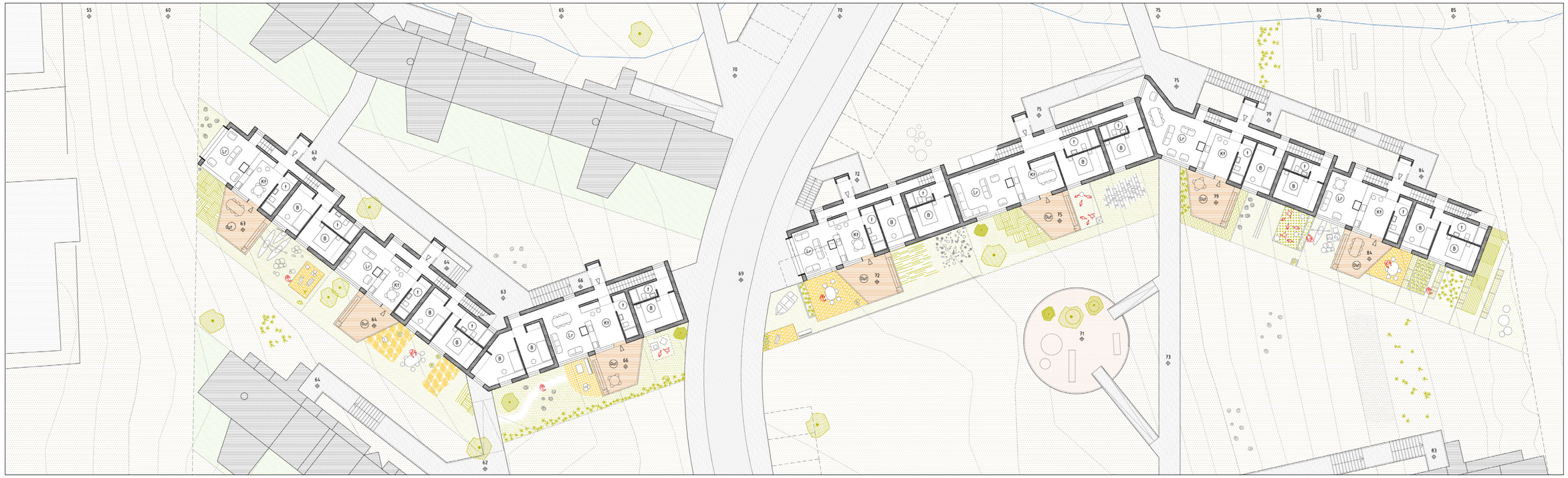

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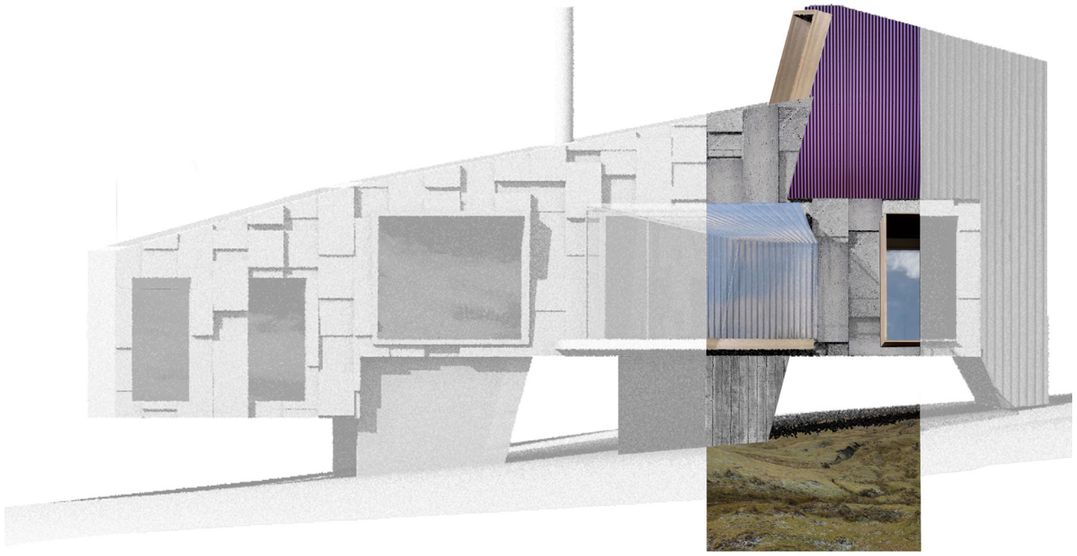
FIG. 12
Interior view of a housing unit, overlooking the inlet fjord landscape. Image by Miguel Paredes Maldonado.

FIG. 13
The textural and material palette of a finished housing unit. Image by Miguel Paredes Maldonado.



03 / ORIGINALITY

This design-led research project filled a gap in the development of multi-dimensional perspectives on architectural sustainability. The design proposal incorporated environmental, economic and place-making components.

It synthesised theoretical reflection with a methodology of design-led enquiry, that resolved ultimately in a design exemplar: a residential neighbourhood of 95 modular dwellings in curvilinear strip formations that cascaded across the contours of the site. Critically, the design proposal delivered a custom linear building typology – adjusted via collective online input from future tenants and homeowners – that addressed the local climatic, topographical, access and community conditions of the site, as well as the availability of materials locally. The repeated linear volumes acted as a barrier against the prevalent transversal winds entering the fjord in which the site is located. The positioning of the strips minimised self-shading and maximised solar insolation. Furthermore, strip permeability minimised disruptions to the natural spread of local flora and fauna. Unbuilt spaces between strips received minimal treatment, and were instead framed as spatial linkages between the downhill urban core and the uphill landscape of common municipal grounds. Importantly, this strategy of uphill spatial continuity leveraged traditional Faroese social and legal customs in regards to collective land management.

The resulting configuration was unprecedented in the regional context of the Faroe Islands and the Nordic Countries, introducing a new, sustainable building type. This design-led research demonstrated that it is possible to provide a compact, walkable neighbourhood in a peri-urban setting, supporting a diverse, balanced community with potential for mutual support, security, diversity and learning. The configuration shows the benefits of public strips of safe open space with access to sun and views for play, socialising and urban farming. The modular terraced architecture minimises cut-and-fill and supports controlled expansion and contraction of individual units according to changes in personal circumstances.

FIG. 14
Partial axonometric of scheme, detailing material and landscape strategies by Miguel Paredes Maldonado.

FIG. 15
Drawing showing the integration of the proposed strip layout in the sloping landscape. Image by Miguel Paredes Maldonado.

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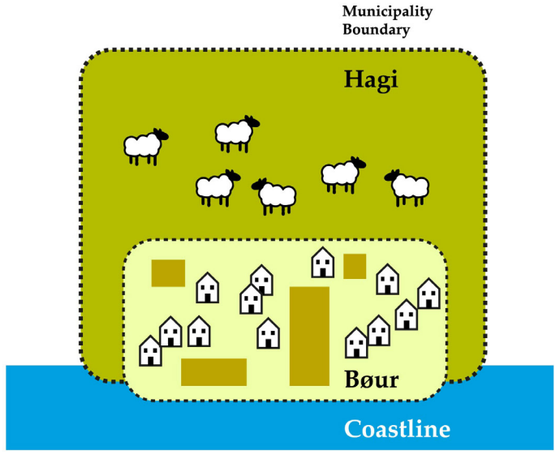
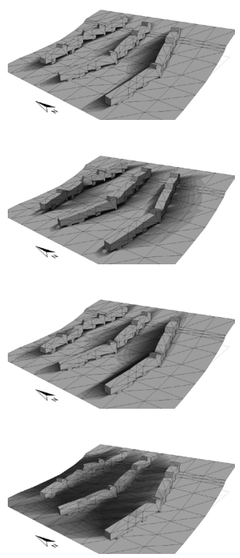


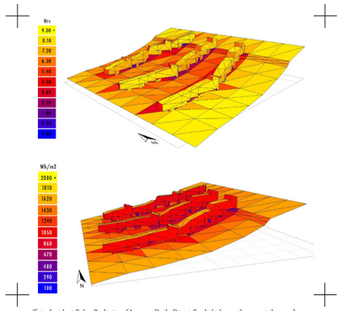
FIG. 16
Page from the submission to the competition showing the traditional division of Faroese municipalities into an 'infield' and an 'outfield' by Miguel Paredes Maldonado.

FIG. 17
Page from the submission to the competition showing various environmental strategies deployed at the scale of the site (shading, insolation and wind) by Miguel Paredes Maldonado.

STRIP HORIZON
Nordic Built Cities Challenge Runavik

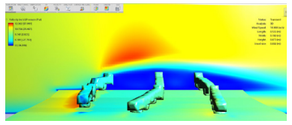
Right:
Shadow Incidence Diagrams
From Top to Bottom:
April (10am to 5pm)
July (10am to 8pm)
October (10am to 8pm)
December (10am to 4pm)





Top: Incident Solar Radiation (Average Daily Direct Sunlight hours througout the year)
Middle: Incident Solar Radiation (Average Daily Solar Gains througout the year in Wh/m2)

Bottom: Wind Flow Simulation. Northern wind and barrier effect along site.



Strip layout as environmental strategy

The east-west oriented strip configuration of our proposed masterplan proves to be particularly advantageous as an environmental strategy:

- The array of strips acts as an efficient wind barrier that shelters private plots and common grounds from the prevailing northern winds.

- All 95 dwellings enjoy a south-facing main aspect. Full direct sunlight penetration from south facade openings into all rooms is guaranteed, thanks to the comparatively narrow form factor of the strips (5 metres in width).

- Strips are carefully spread apart and follow the landscape sectional profile, hence avoiding casting shadows over one another -even in the worst case scenario of winter months-

Thanks to this extremely efficient arrangement, according to environmental simulations throughout a whole year all 95 dwellings will enjoy a daily average of 9 hours of direct sunlight on their southern facades.

Community

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FIG. 18
Page from the submission to the competition showing a mock-up of the proposed online system allowing users to customise the layout and appearance of their housing units by Miguel Paredes Maldonado.

STRIP HORIZON
Nordic Built Cities Challenge Runavik

The system is based on three housing typologies (Small, Medium and Large) that result from the combination of a catalogue of prefabricated functional modules. Different housing unit designs are generated by combining modules of different sizes and subsequently adapting their joint profile to the steepness of the chosen plot. The slope of the terrain determines the relative height of each module with regards to the rest, so that excavation is minimised or avoided altogether. All modules belonging to a dwelling unit are internally connected by a custom -built staircase module that negotiates their specific differences in height.

The personalised combination of functional modules and profile arrangements yields a potentially infinite number of design solutions within the basic typological framework of small, medium and large units. Additional bedroom modules can be plugged- in at later stages, enabling additional levels of resilience via spatial expansion in cases of changing personal or family circumstances.

This technical system can also be deployed as a community engagement tool at both regional and local levels. An open, public process can be set up for prospective residents to actively participate in the design and customisation of their own housing units, which in turn will influence the global implementation of the scheme on site. This approach also has the potential to be redeployed in similar sites throughout the Faroe Islands, hence expanding the scope of the design scheme.

Urbanity
Community
Habitation

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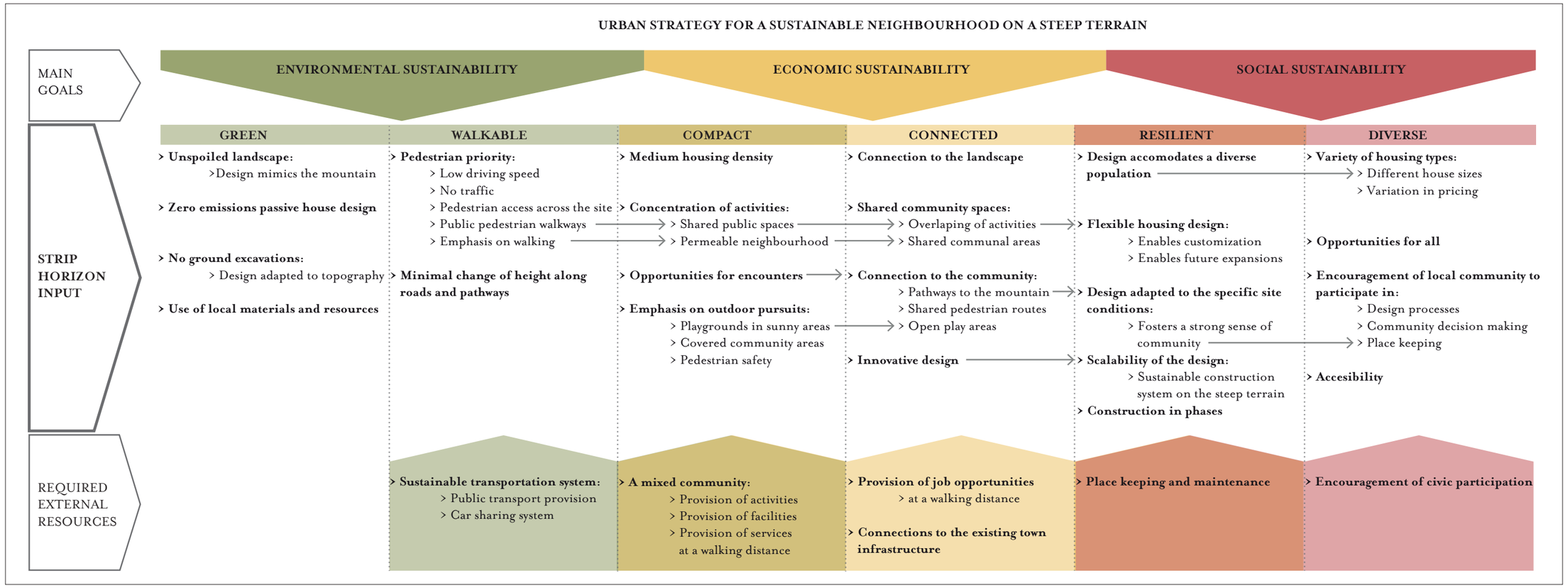
FIG. 19
The methodological diagram of interrelated urban strategies used to develop the competition proposal in Stage 2. Image by Miguel Paredes Maldonado.

04 / RIGOUR

Substantial research on multi-dimensional sustainability indicators was synthesised in the form of an Urban Strategies Diagram that addressed dimensions of environmental, economic and social sustainability.

The diagram **(FIG. 20)** provided a novel methodological analysis tool that was both reflective and generative – as demonstrated through the design exemplar submitted for the competition. The team created computer models to visualise the shading and solar insolation of different spatial configurations before arriving at the final design.

Peer-review assessment was carried out twice during the competition process through an international jury (stages 1 and 2, with feedback from the jury following both stages). In addition to this, further peer-review assessment resulted from the submission of an academic article for publication.



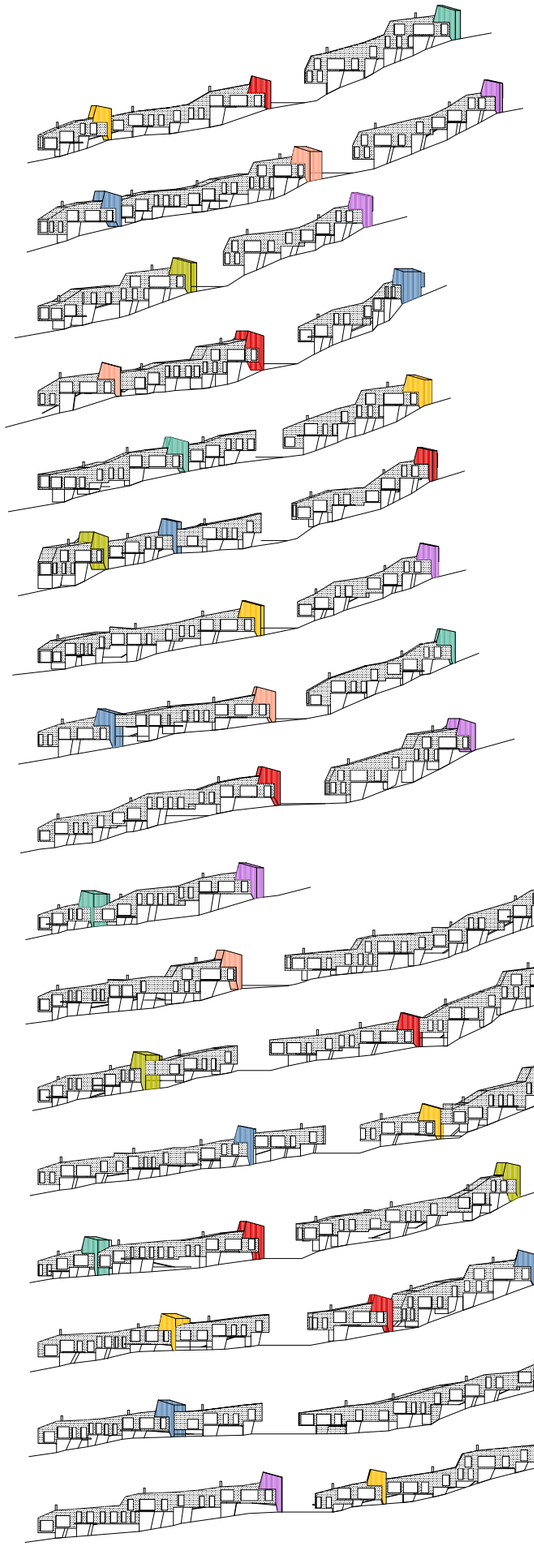


FIG. 20
Repetition and variation potentials in the elevations of all housing strips as submitted to the final stage of the competition. Image by Miguel Paredes Maldonado.

05 / SIGNIFICANCE

The design enquiry aimed for a design proposal that was both repeatable and scalable in the Faroese context, but also in the broader context of the Nordic Countries.

The stage 1 competition submission was shortlisted to the top four and received international press coverage (see Appendix, page 26). The development of stage 2 allowed for involvement with relevant stakeholders in the Nordic Countries (via public presentations) and contribution to the design debate within the regional context in co-operation with the other three finalist teams (via workshops).

The reflective critique initiated in stage 2 was further extended and redeployed in the format of academic debate through the development of peer-reviewed conference articles.

Living and Sustainability: An Environmental Critique of Design and Building Practices, Locally and Globally. AMPS, Architecture_MPS; London South Bank University, 09–10 February, 2017 (see Appendix, page 26).

EESAP8: CICA1 Conference. Universidad del País Vasco – Euskal Herriko; Unibertsitatea, San Sebastián, 05–07 July 2017.

06 / APPENDIX

Competiton submission
Architectural design portfolio, as submitted to the Nordic Built Cities Challenge competition (June 2016): *Strip Horizon*. (Sustainable housing and urban place making in extreme climatic conditions: Case study in Runavík, Faroe Islands) by Paredes Maldonado, M., Miret García, A. & Vega Clemente, R.

Press
Eleven Magazine, Architecture and Design online journal

Bókasavnið við Løkin, Faroese Newspaper

Føroyski Portalurin, Faroese News Portal

Runavíkar Kommuna, official Facebook account, Runavik Council.

Edinburgh College of Art news.

Papers
Vega Clemente, R., Paredes Maldonado, M., & Miret García, A. (2018). Sustainable housing and urban place making in extreme environments: Case Study in Runavík, Faroe Islands. In R. J. Hernández Minguillón (Ed.), Estrategia para la Construcción Inteligente y Sostenible: 8th European Conference on Energy Efficiency and Sustainability in Architecture and Planning Universidad del País Vasco - Euskal Herriko Unibertsitatea.

Communications
Relevant email communications.

27/01/2016

Dear Miguel,

First of all, thank you for the contribution of "44375 - Strip Horizon".

The jury has chosen your proposal as one of the four finalists to continue in the second stage of the NBCC Runavík competition.

The announcement of the outcome of the first stage will be on the 3rd of February and further details regarding the announcement will come in the coming days.

Also, comments from the jury will be forwarded, which clarifies what to work on, in the second stage.

Have a nice day!

Vinarliga/ Med venlig hilsen/ Best regards

Janus Trúgvason
Verkfrøðingur

The team
The project development team consisted of three academic staff who are also practising architects (Miguel Paredes Maldonado, Ana Miret García and Ruth Vega Clemente), and two graduate assistants (Eneko Saez de Lafuente and Anastasia Leonovich). The team was led by Miguel Paredes Maldonado, who oversaw the production of all the materials shown in this portfolio.

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