Configuring The Energy Layer:

Landscape's Role in the Energy Transition

CELA – March 28, 2025

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H+N+S Landscape Architects

Hood Design Studio: “Solar Strand,” University of Buffalo

Photos: Douglas Levere

Hood Design Studio: “Solar Strand,” University at Buffalo

Middelgrunden Offshore Wind Farm, Denmark


BUT WHAT IS THE ROLE OF DESIGN?

MODES OF DESIGN'S ENGAGEMENT WITH ENERGY INFRASTRUCTURE

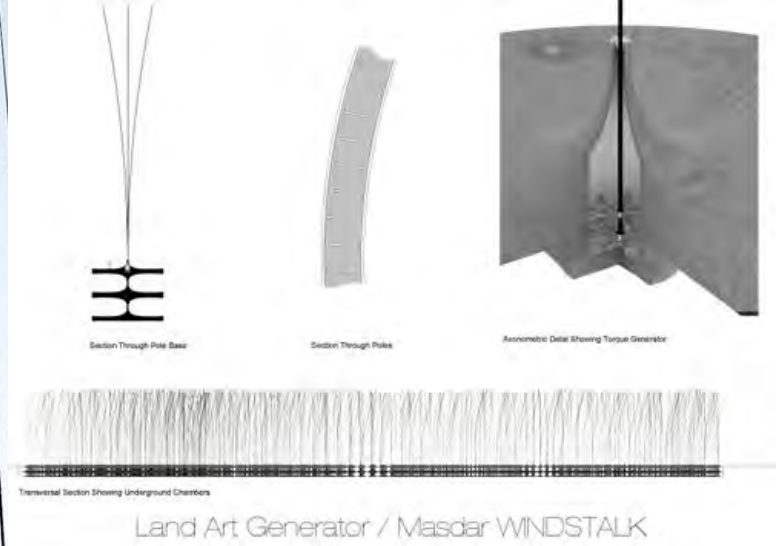
- AS SPECULATIVE TECHNOLOGY
- AS SPATIAL ORGANIZER
- AS COMMUNICATION & INTERPRETATION
- VIA NARRATIVE / CHOREOGRAPHY
- VIA MONUMENTALITY
- AS SCREENING OR CAMOUFLAGE
- AS SPATIALLY ANALYTIC
- AS AN EXPERIENTIAL INNOVATION

SPECULATIVE TECHNOLOGY

Martin Heide, Dean Boothroyd, Emily Van Monger, David Allouf, Takasumi Inoue, Liam Oxlade, Michael Strack, Richard Le (NH Architecture);
Mike Rainbow, Jan Talacko (Ark Resources); John Bahoric (John Bahoric Design); Bryan Chung, Chea Yuen Yeow Chong,
Anna Lee, Amelie Noren (RMIT Architecture Students)

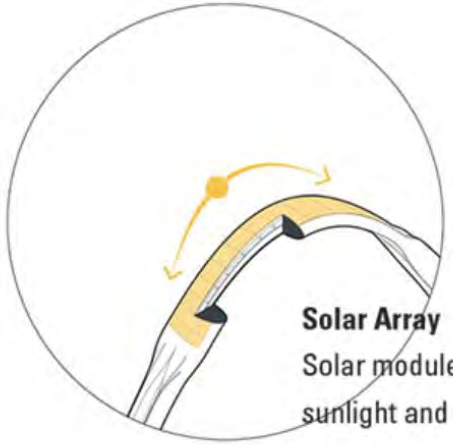
LAND ART GENERATOR INITIATIVE
Light Up, 1st Place Winner, LAGI 2018 Melbourne

SPECULATIVE TECHNOLOGY



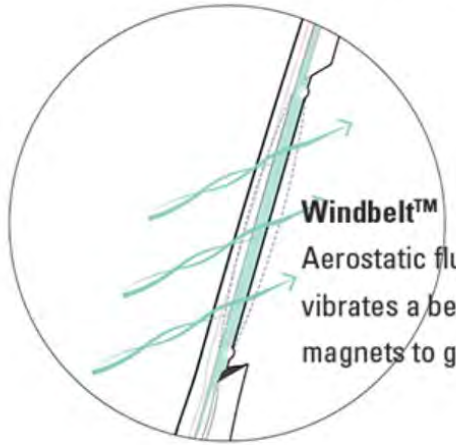
Concept and Design: Darío Núñez Ameni and Thomas Siegl, with Atelier dna
Narrative and Poetics: Gabrielle Jesiolowski
Structure and Engineering: Radhi Majmudar PE, with ISSE Innovative Structural and Specialty Engineering
Ecology and Renewable Energy Strategy: Ian Lipsky, with eDesign Dynamics

LAND ART GENERATOR INITIATIVE
Windstalk, 2nd Place, LAGI 2010 United Arab Emirates



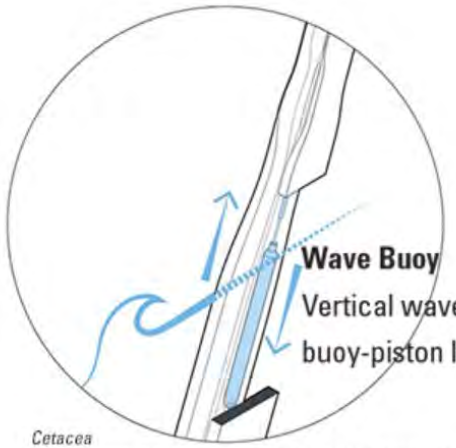
Solar Array

Solar modules capture energy from sunlight and convert it into electricity.



Windbelt™

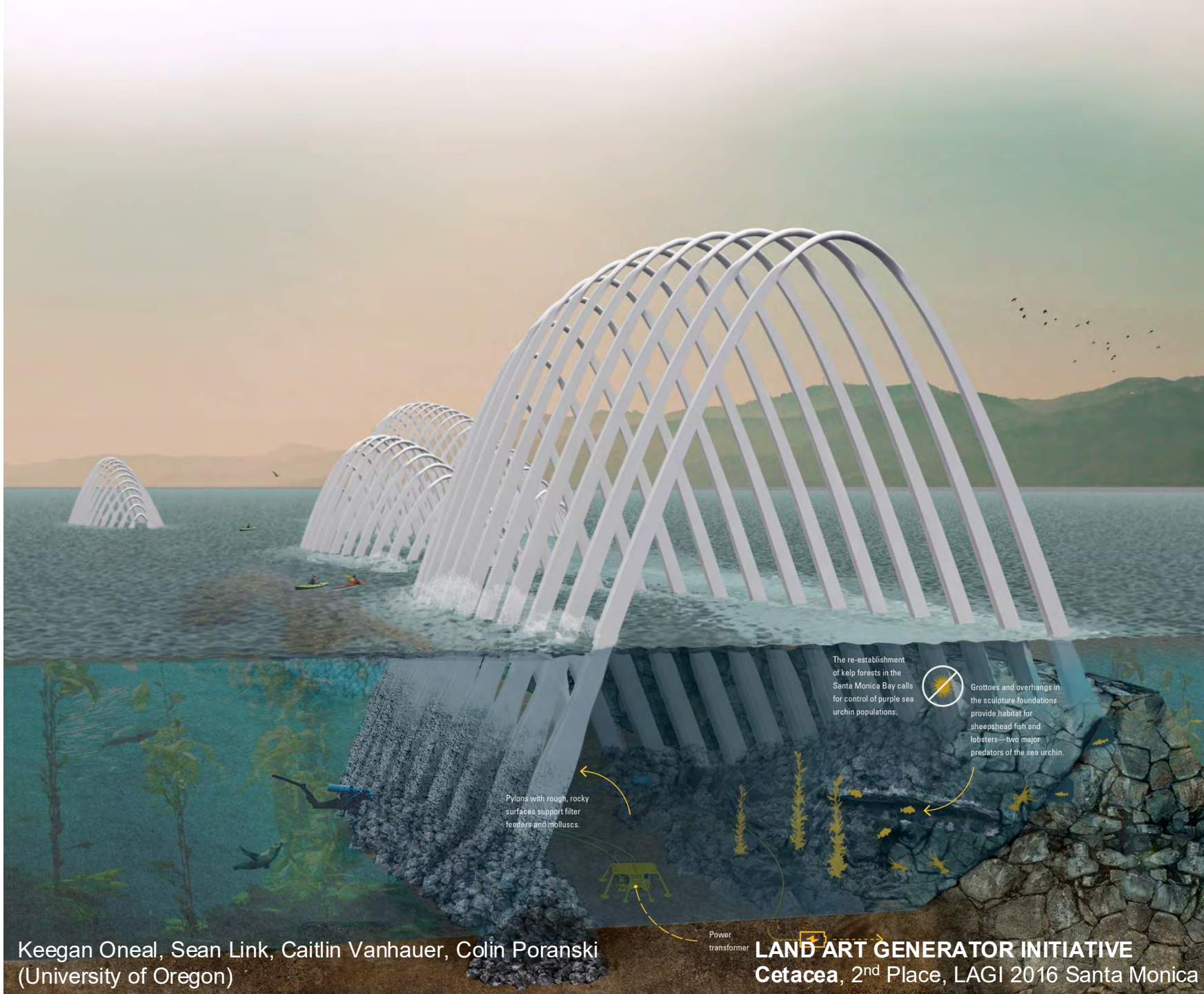
Aerostatic flutter caused by the wind vibrates a belt that oscillates between magnets to generate electricity.



Wave Buoy

Vertical wave movement drives the buoy-piston linear alternator system.

Cetacea
Keegan Oneal, Sean Link, Caitlin Vanhauer, Colin Poranski
2nd Place Winner, 2016 Land Art Generator Initiative competition for Santa Monica

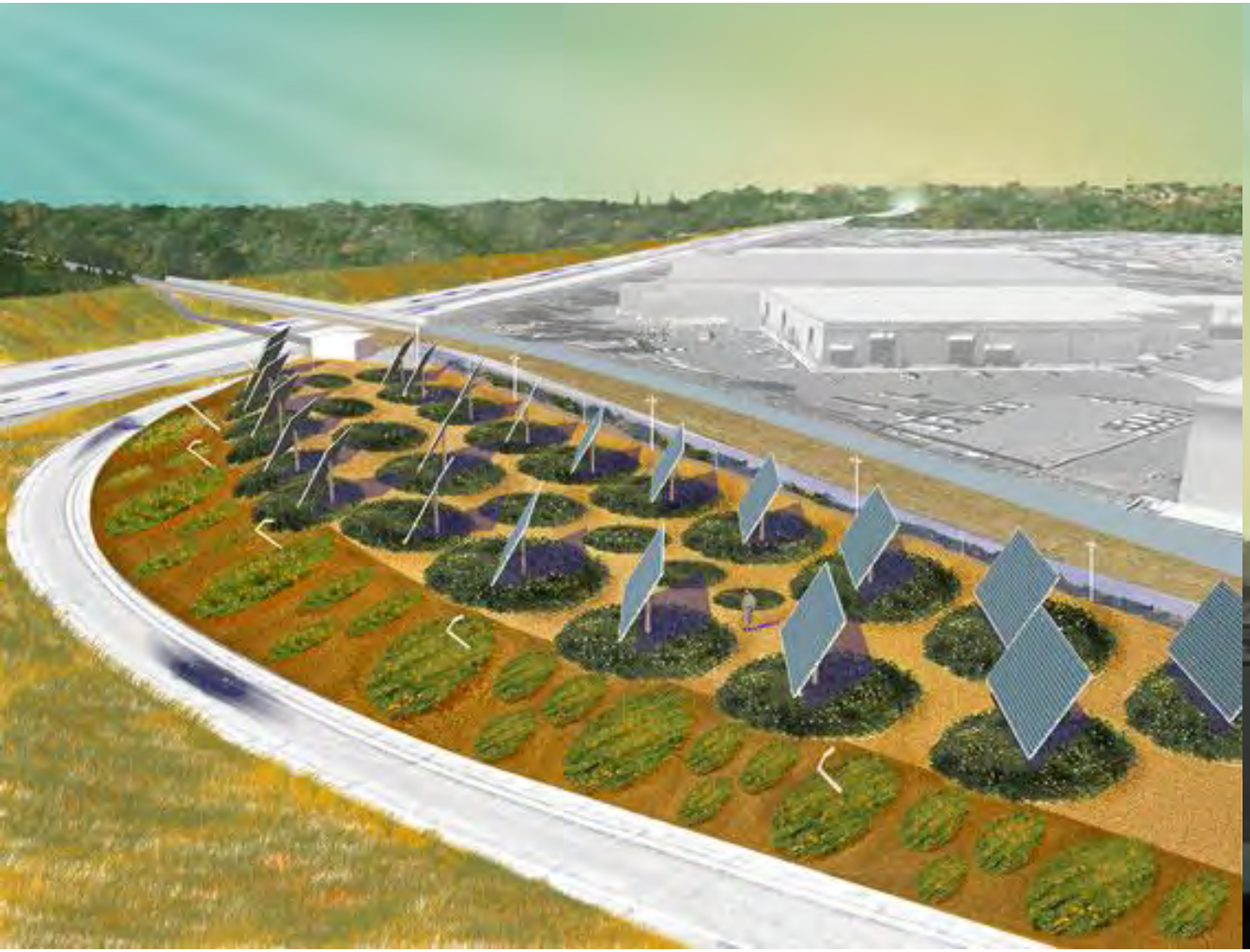


Keegan Oneal, Sean Link, Caitlin Vanhauer, Colin Poranski
(University of Oregon)

LAND ART GENERATOR INITIATIVE
Cetacea, 2nd Place, LAGI 2016 Santa Monica

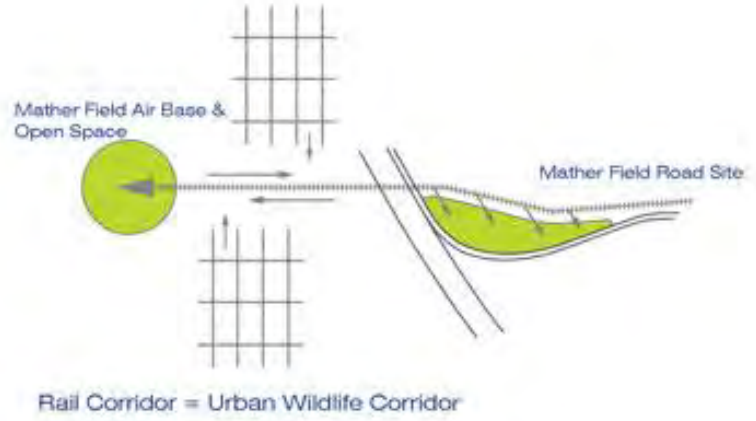
SPATIALLY ORGANIZATIONAL

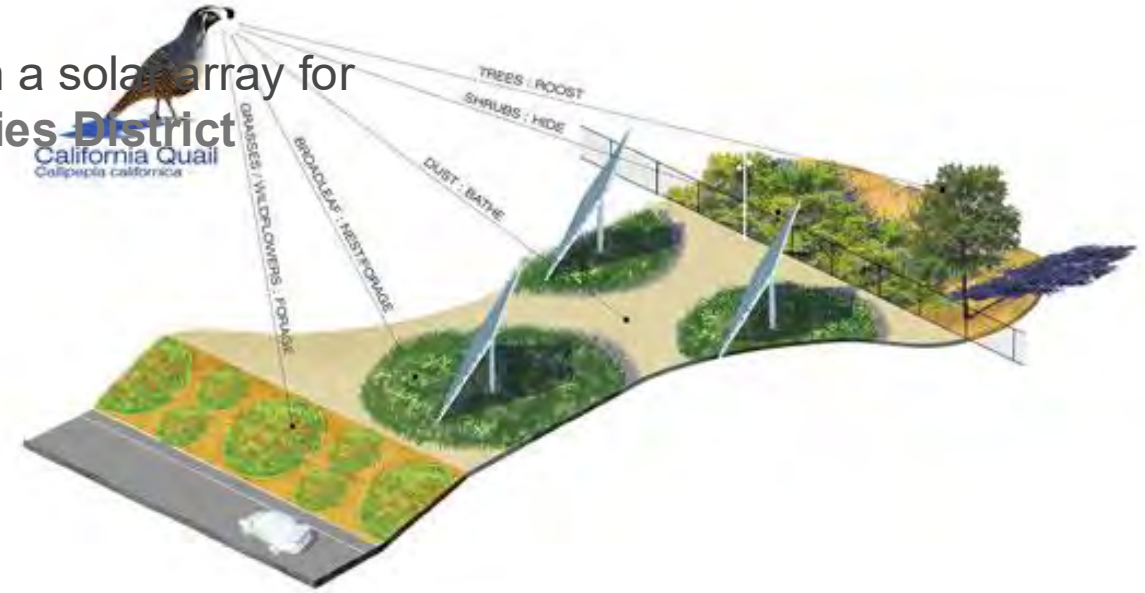
image credits: Ro&Ad architecten



Bionic
Sacramento Solar Highways, 2017
Sacramento Municipal Utility District

Bionic was commission to design a solar array for the Sacramento Municipal Utilities District





Bionic
Sacramento Solar Highways, 2017
Sacramento Municipal Utility District

COMMUNICATION & INTERPRETATION

Bionic
Sacramento Solar Highways, 2017
Sacramento Municipal Utility District

COMMUNICATION & INTERPRETATION

NARRATIVE / CHOREOGRAPHIC

Norris Dam (Photo: Library of Congress)


image credit: H+N+S Landscape Architects

James Corner Field Operations
Lifescape: Fresh Kills Landfill Park Master Plan, 2006

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IN THIS STORY

50%

increase in the amount of solar energy produced in NYC

10

megawatts of power will be generated to power more than 2,000 homes

1,500

otal NYC acres

EN ESPAÑOL

Mayor Bloomberg Announces City's Largest Solar Energy Installation to Be Built at Freshkills Park in Staten Island

November 25, 2013

State-of-the-Art Solar Power Station at Freshkills Park Will Produce Enough Energy to Power More Than 2,000 Homes – Increasing City's Renewable Energy Capacity by Half

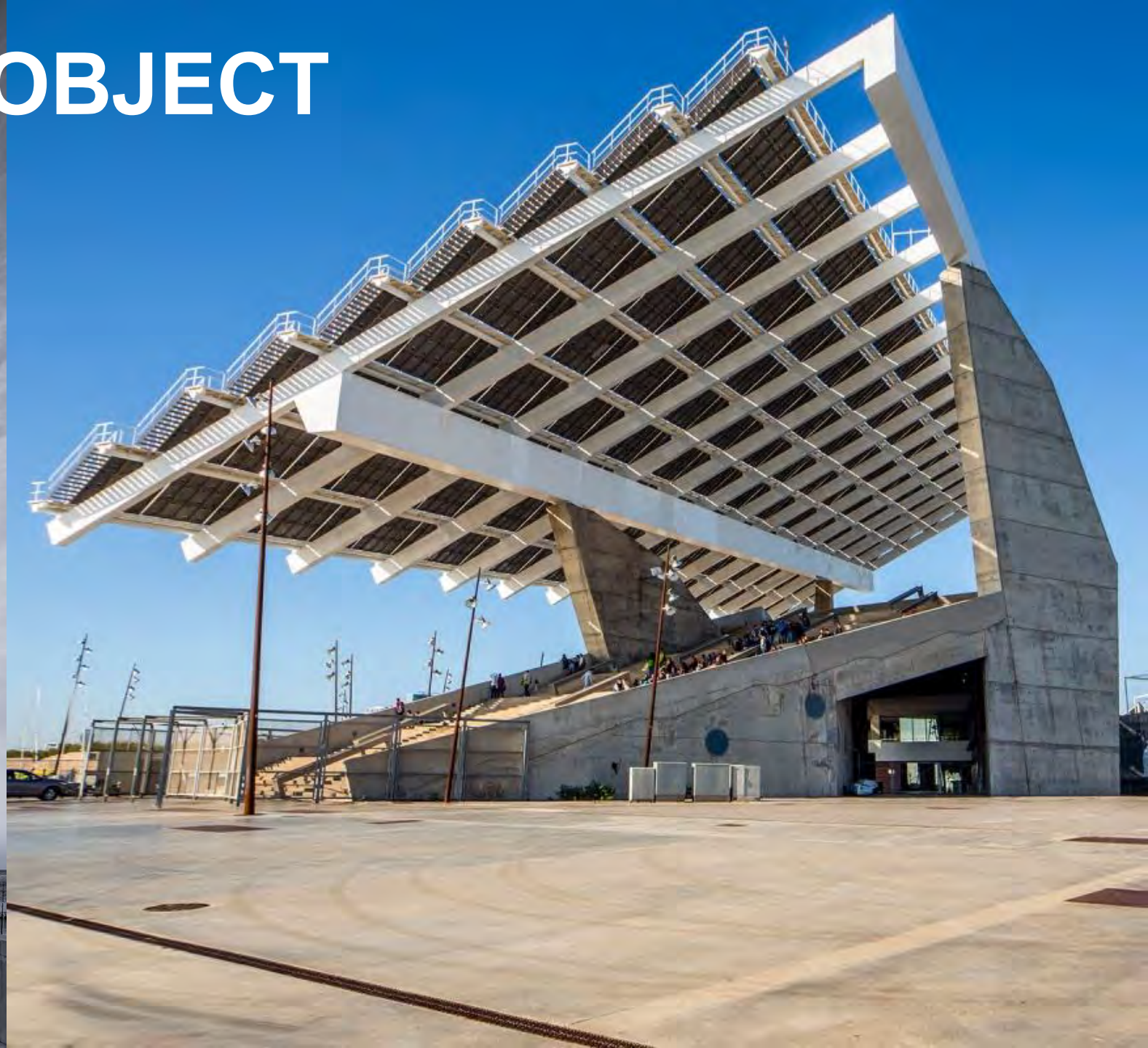
Mapping of Freshkills Park Would Bring City Total to 30,000 Acres of Parkland

Mayor Michael R. Bloomberg, Parks Commissioner Veronica M. White, Sanitation Commissioner John Doherty and Director of the Mayor's Office of Long-Term Planning and Sustainability Sergej Mahnovski today announced the largest solar energy installation in New York City will be installed at Freshkills Parks on Staten Island.

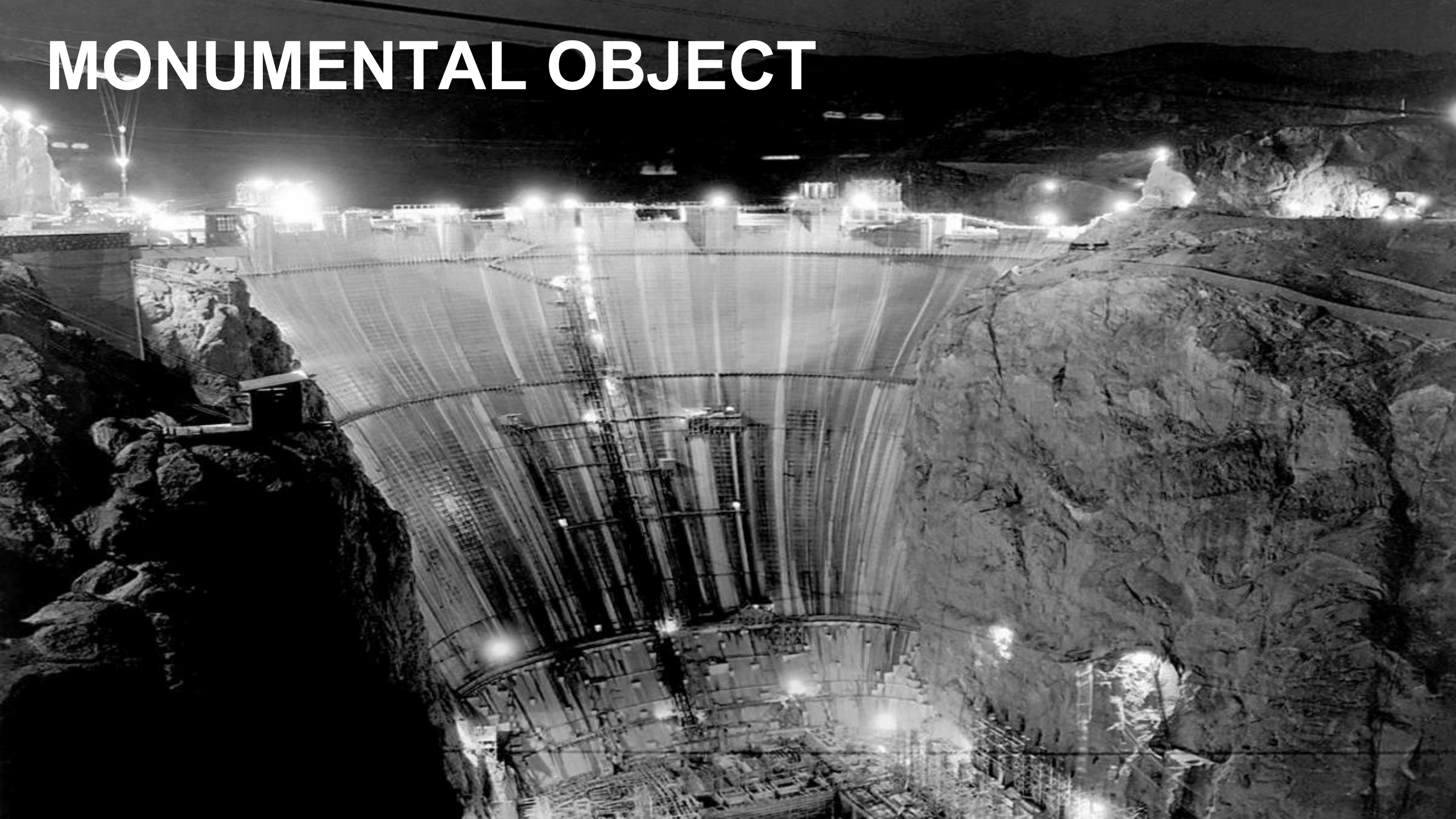
James Corner Field Operations
2013 Update


40

MONUMENTAL OBJECT

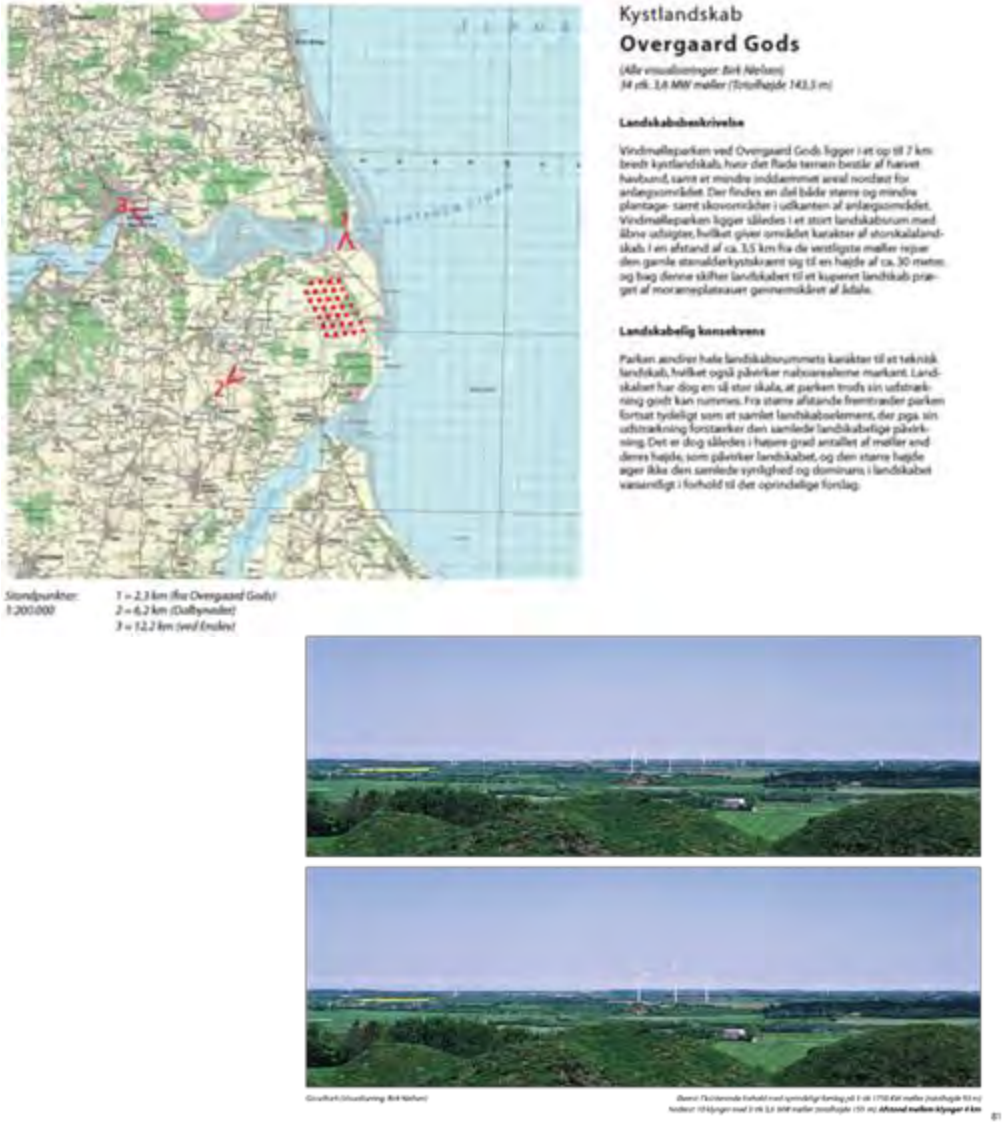


MONUMENTAL OBJECT



MONUMENTAL OBJECT?

CAMOUFLAGE / SCREENING



Danish Ministry of Environment and Food - Nature Agency (2007)
"Store vindmøller i det åbne land [Large wind turbines in the open country]."

"Getting Beyond Visual Impact: Designing Renewable Energy as a Positive Landscape Addition"

Hanna Szumilas-Kowalczyk &
Nicholas Pevzner (2019)

Getting Beyond Visual Impact: Designing Renewable Energy as a Positive Landscape Addition

Hanna K. Szumilas-Kowalczyk[1], Nicholas Pevzner[2]

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[2] University of Pennsylvania, School of Design, 210 S 34th St, 19104 Philadelphia, United States

Abstract

The critical necessity of scaling up renewable energy to meet the challenge of climate change implicates vast swaths of American landscape. Renewable energy infrastructure has long concerned itself with minimizing its visual impact, in order to decrease opposition from local landowners and users of the landscape. As energy facilities proliferate across the landscape, their visual impact can be expected to grow as well—both in terms of the scale of installations, as well as the amount of territory affected.

On public lands, renewable energy infrastructure has had to compete with alternate public uses of the land, including scenic and recreational values. Managers of public landscapes have developed specific procedures for describing the visual impact of landscapes stemming from energy development, and specific methodologies for evaluating whether a particular project should proceed.

In most contemporary energy planning processes that include landscape design professionals, these designers' scope is limited to comparing the visual impacts of discrete energy installations: the spacing, height, and alignment of wind turbines or solar panels, for example. We argue for a more inclusive approach to incorporating spatial design considerations, earlier in the planning process, as a way of incorporating public aspirations and opinions about the energy landscape, expanding the field of potential planning outcomes, and identifying synergies for co-locating multiple positive elements. How can energy infrastructure actively participate in the shaping of a positive landscape experience, and not just try to minimize its impact on the landscape?

This paper will present several examples of infrastructure-driven landscape transformations that actively incorporated public input and visual assessment considerations, at the municipal and regional scales, in order to develop energy planning frameworks with high social acceptance. One case study looks at the spatial planning around wind turbine installations in the Wieringermeer polder in the Netherlands, which used design to develop a consistent image for wind installations, and create a "recognizable new layer in the cultural landscape" that reflects the qualities, scale, and character of the underlying landscape (H+N+S Landschapsarchitecten, 2014). One other European example demonstrates the

how the legal basis behind them impacted the different approaches toward the renewable energy infrastructure's planning and design.

The case studies were compared to current attempts in California for the consolidation of spatial management practices for streamlining that state's transition to renewable energy.

Case studies

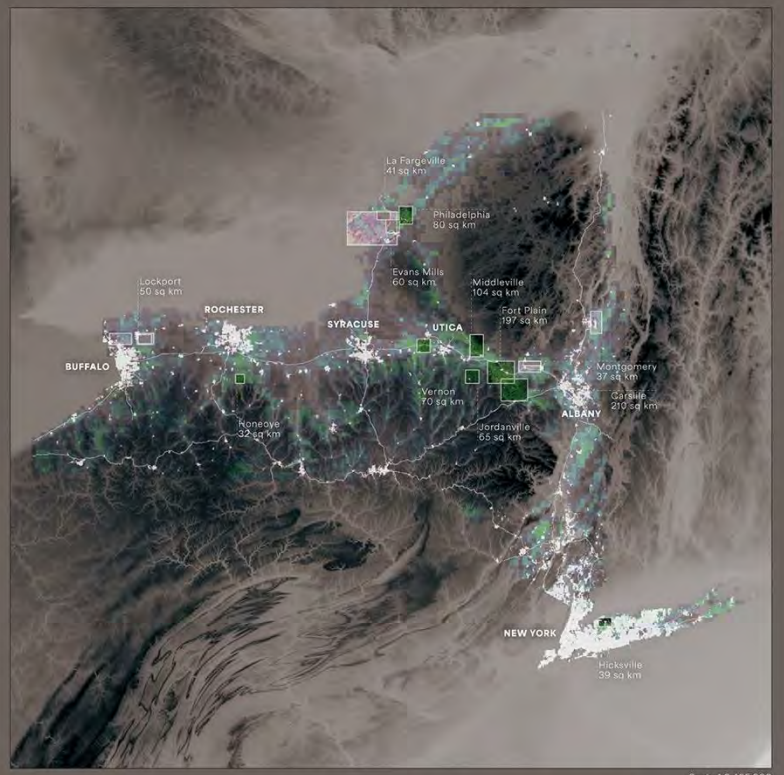
Wieringermeer Wind Energy Spatial Quality Plan, Netherlands

In the municipality of Hollands Kroon, the landscape architecture firm H+N+S Landschapsarchitecten developed a spatial quality plan for wind energy that strove to guide future development of wind turbines in the Wieringermeer polder (H+N+S Landscape Architects, n.d.). This area had been a pioneer in wind energy development in the Netherlands, with numerous solitary wind turbines having been erected on farms early on, followed by a number of linear turbine arrays erected throughout the Wieringermeer. The polder landscape can be characterized as open, large-scale, and rational, with clear geometric lines of fields and canals bounded by its ring dykes. Roads run parallel to some of the canals, and these lines are reinforced with linear tree plantings of single and double rows of trees. Many of the linear arrays of turbines already can along canals or ditches, but varied widely in their turbine type, their height, rotor diameter, color, material, and spacing.

Typical landscape quality in the Wieringermeer polder (source: H+N+S Landscape Architects, 2014)

SPATIAL ANALYSIS

Instructor: Robert Pietrusko
Course: UPenn MEDIA 3
Fall 2024 (LARP5430)



NEW YORK STATE SUITABILITY ANALYSIS

FOR BOUTIQUE AGRICULTURE FARMS AND SOLAR FARMS

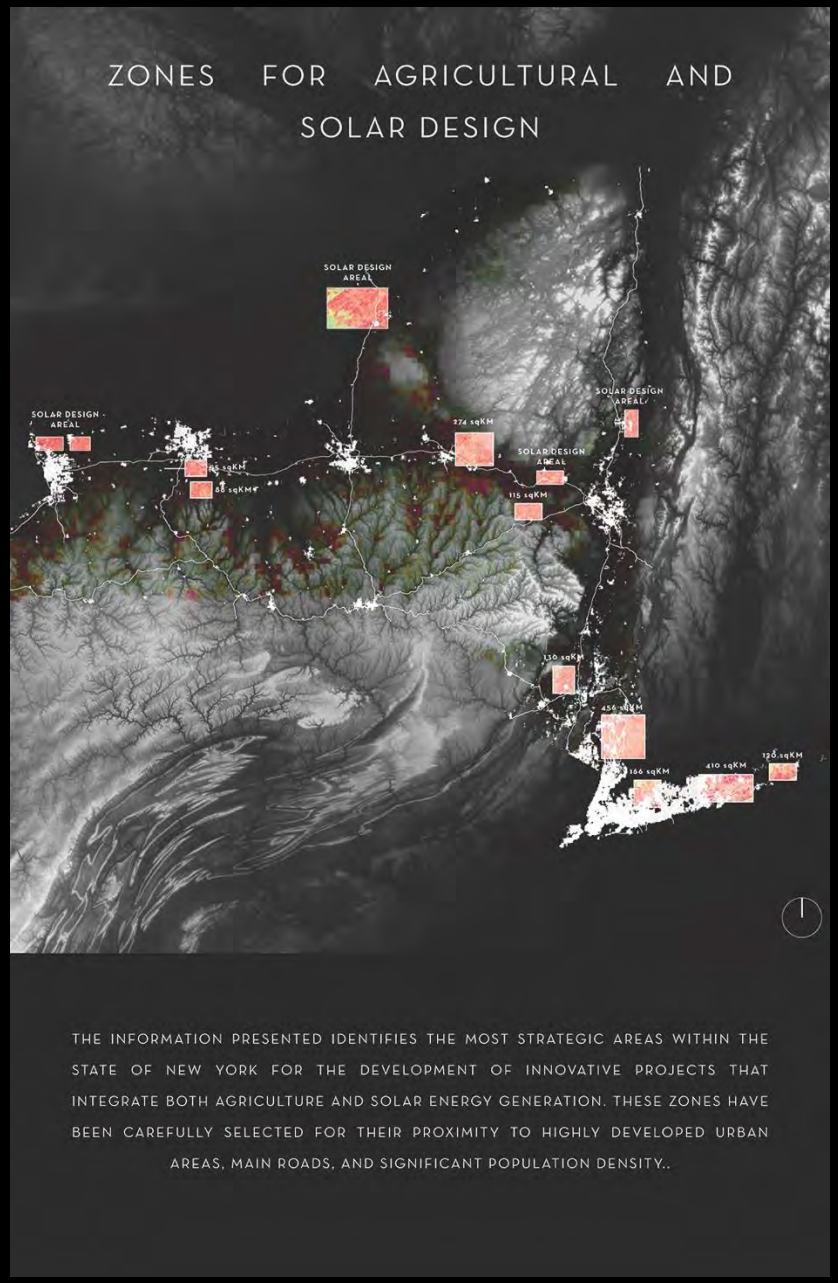
New York State has a thriving gourmet food industry, with 445 restaurants in the state having at least one Michelin star as of 2024. Sourcing food that is of the caliber these restaurants require can be a challenge. This map seeks to identify growing conditions that suit these boutique agricultural needs in the state.

Unlike industrial agriculture, these farms can grow enough produce on a smaller plot of land, so the suitability analysis eliminates the need for clear cutting forests or filling wetlands, leaving us with smaller plots of land to identify. In addition, produce we think of in grocery stores and restaurants can thrive off of different soil than is typically sought for industrial agricultural needs. We look for rich soils that are well draining, but prioritize muck and fine-textured soils.

Another priority in the needs of these farms is powering the site, so identifying areas suitable for solar farms has also been denoted in the lighter squares.

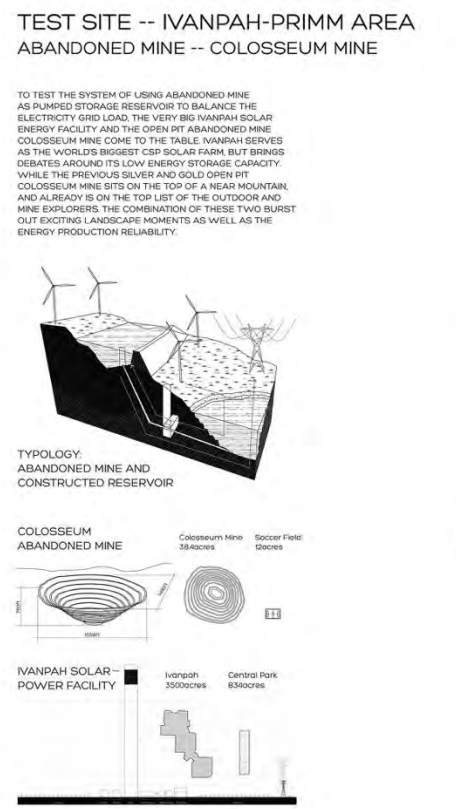
Each of these sites identified is within a 60 kilometer radius of cities, meaning they are within relatively easy driving distance to the restaurants with whom they serve. Improvements can be made to these travel corridors to improve tie spent traveling.

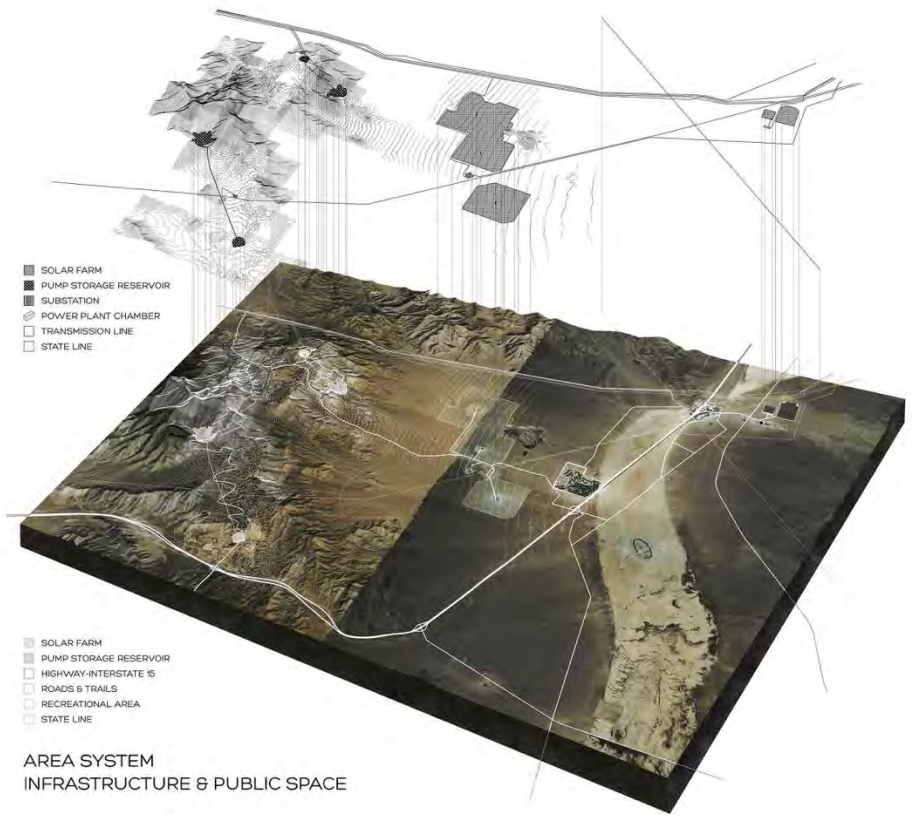
Megan Singleton

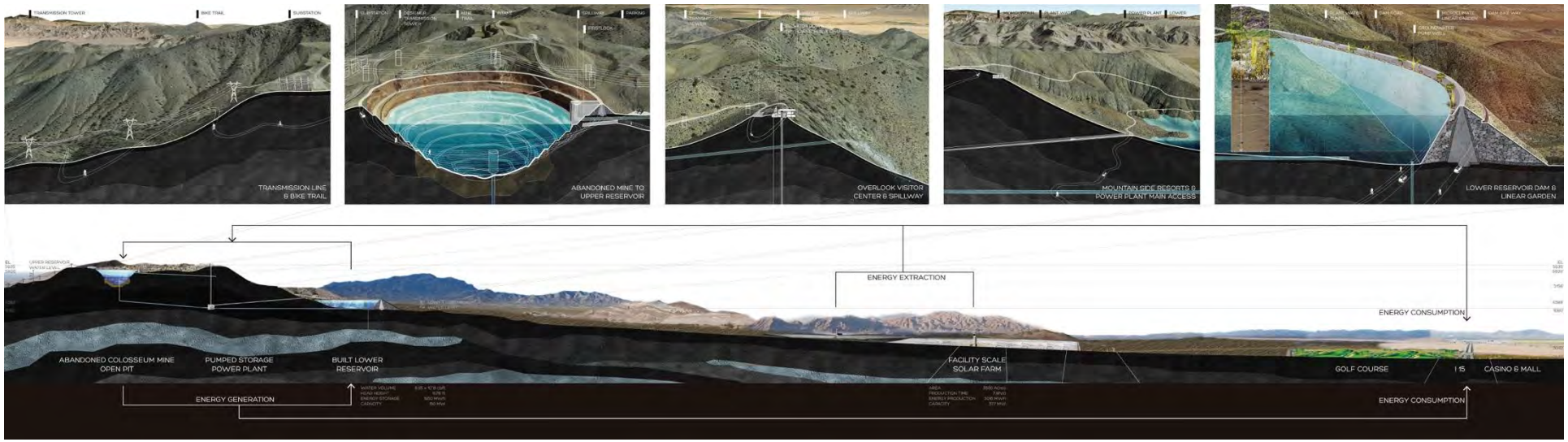


Adrian Casas

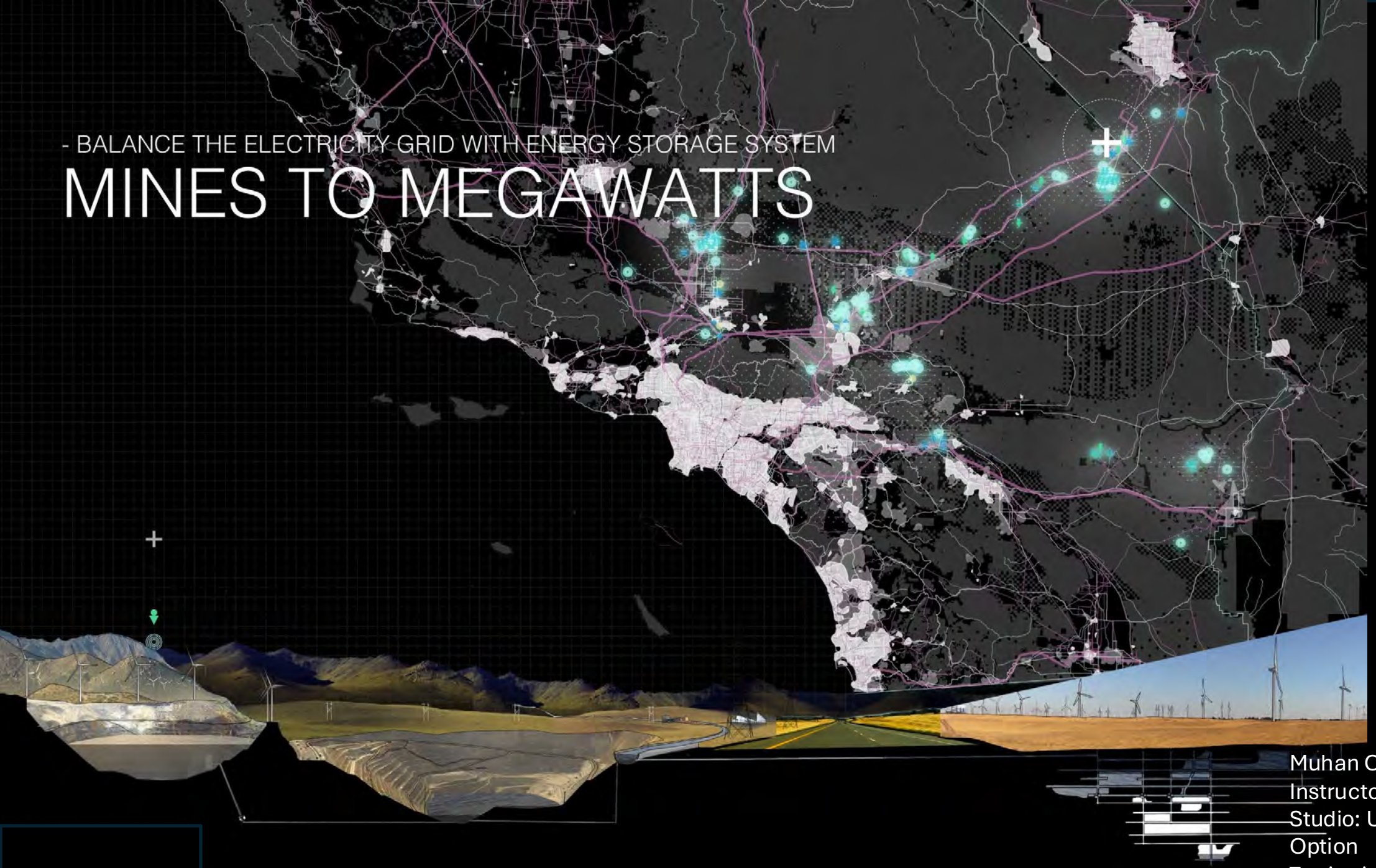
EXPERIENTIAL INNOVATION







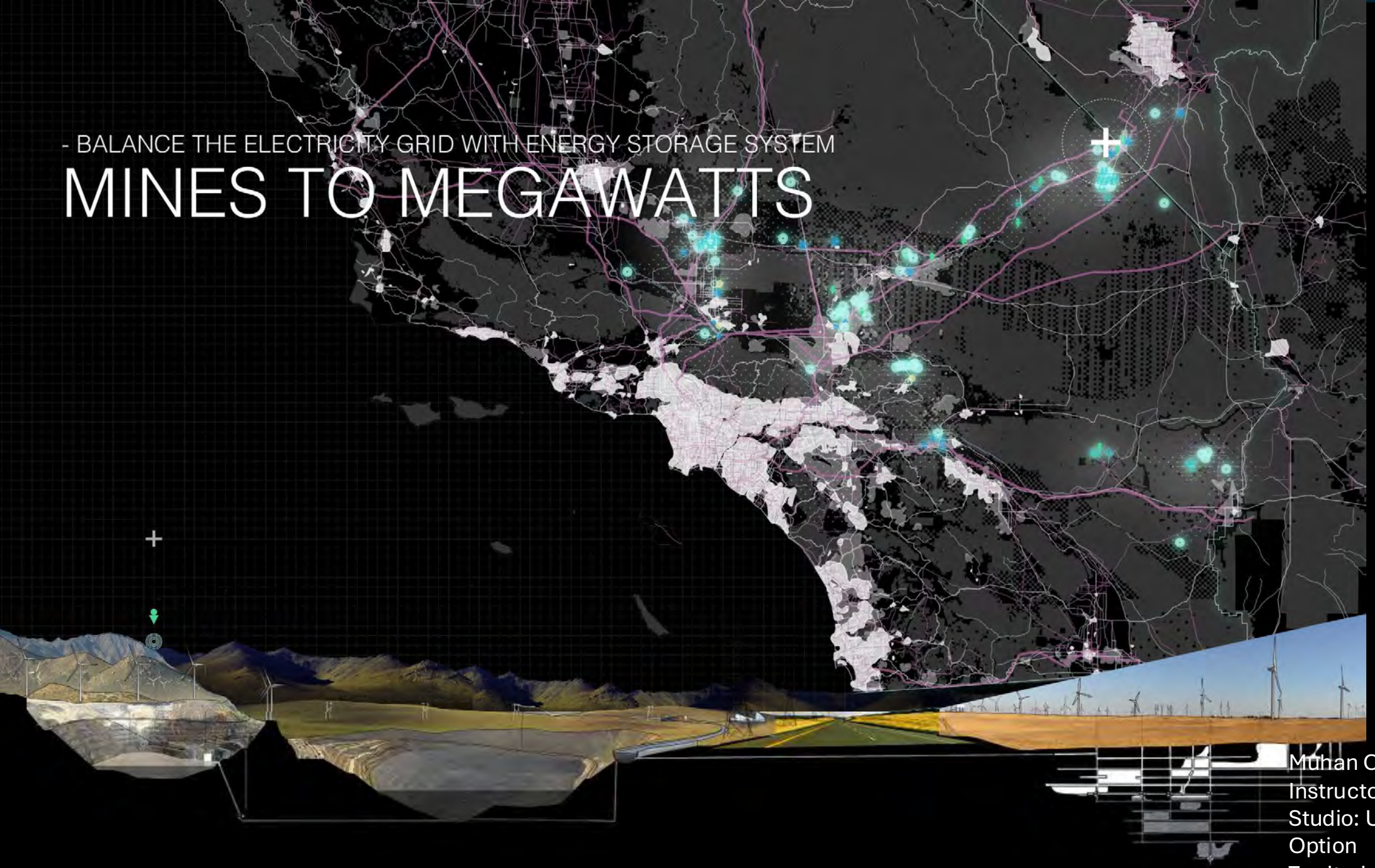
Penn Landscape, Territories of Extraction Studio, MUHAN CUI (2014)



Muhan Cui
Instructor: Nicholas Pevzner
Studio: UPenn LARP 701 Option
Territories of Extraction

- BALANCE THE ELECTRICITY GRID WITH ENERGY STORAGE SYSTEM

MINES TO MEGAWATTS



Muhan Cui
Instructor: Nicholas Pevzner
Studio: UPenn LARP 701 Option
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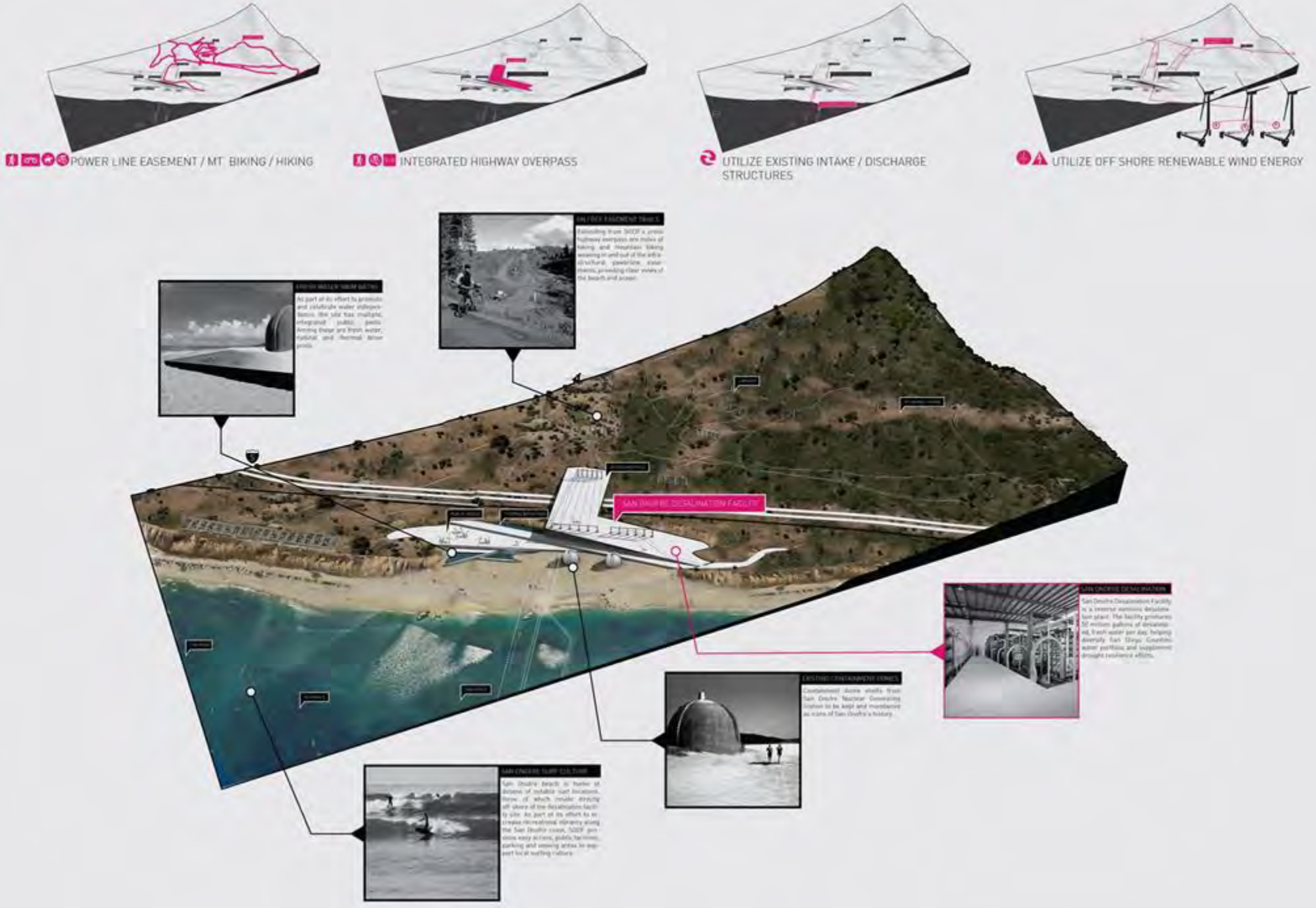
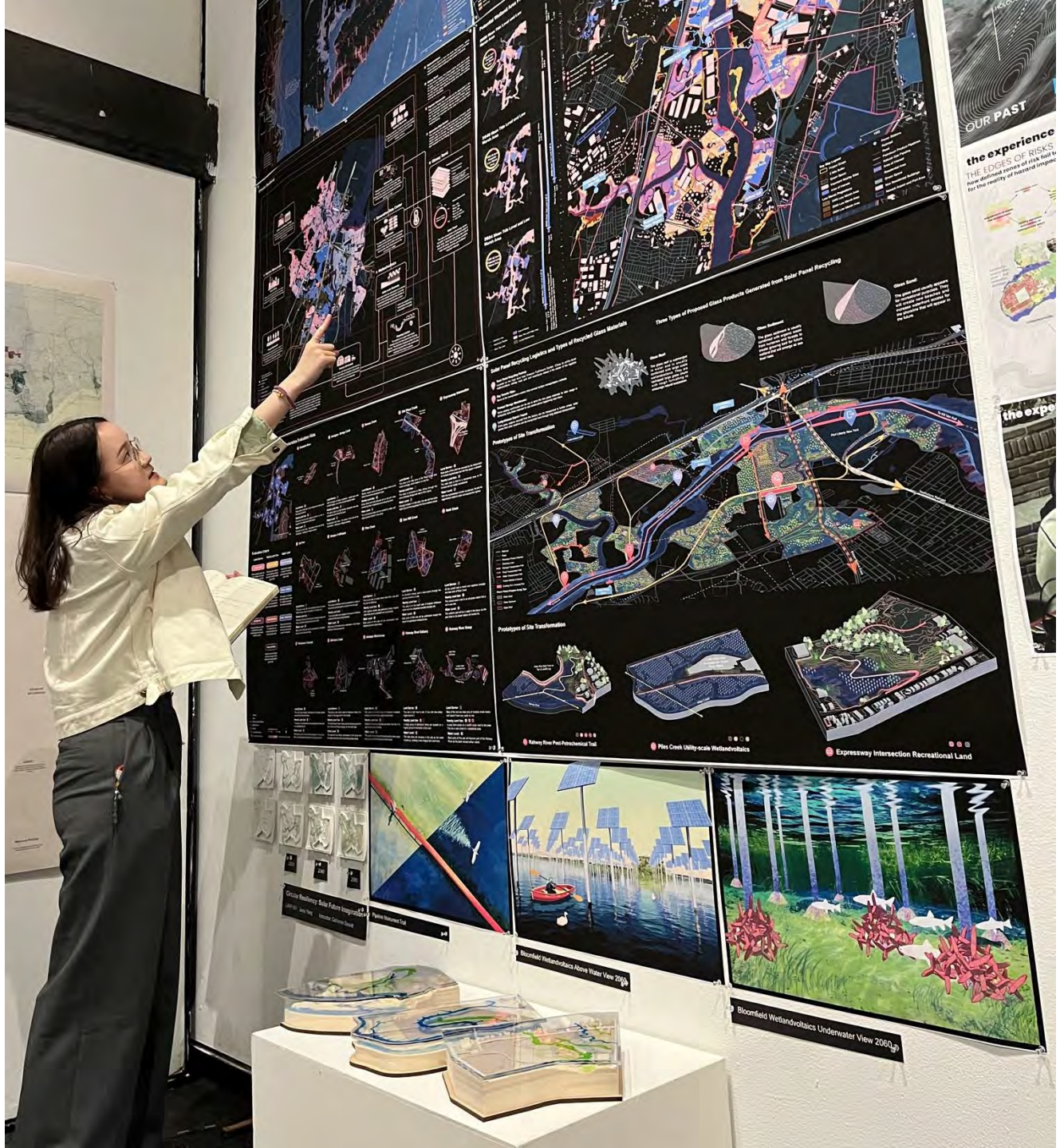
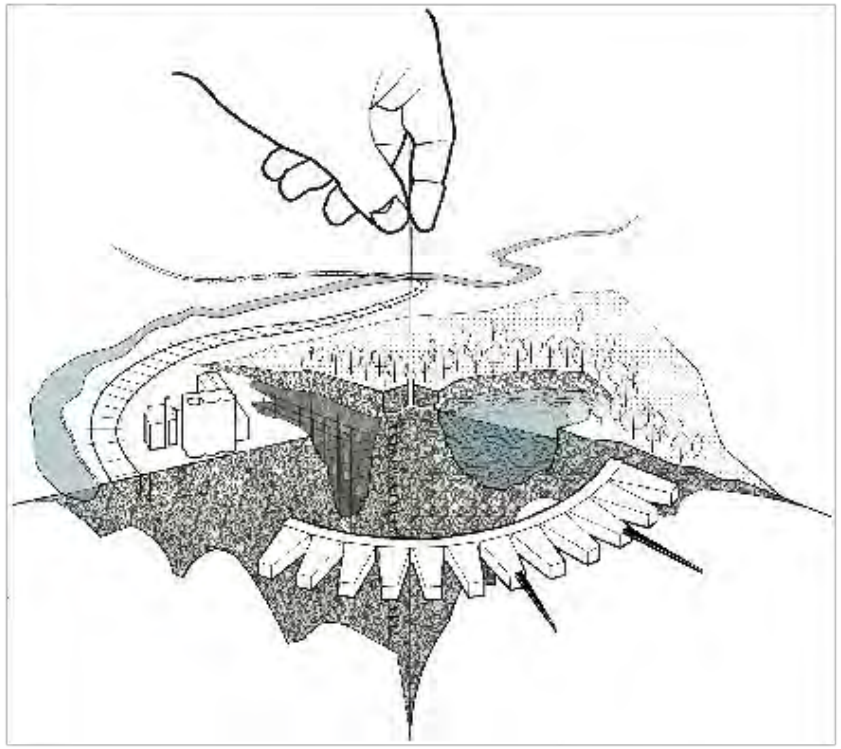


Eric Hull
Instructor: Nicholas Pevzner
Studio: UPenn LARP 701 Option
Territories of Extraction



Junyi Yang
Instructor: Catherine Seavitt
Studio: UPenn LARP 601 Core Studio
Fall 2024



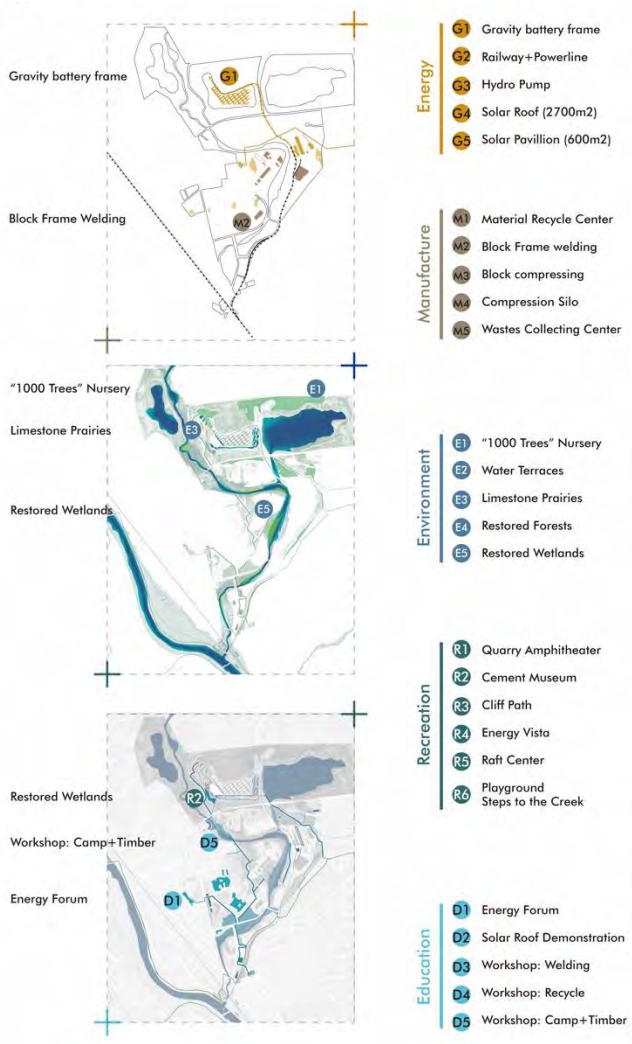
The Atlas Quarry #4 Neighborhood: Integration of the Landscape Elements

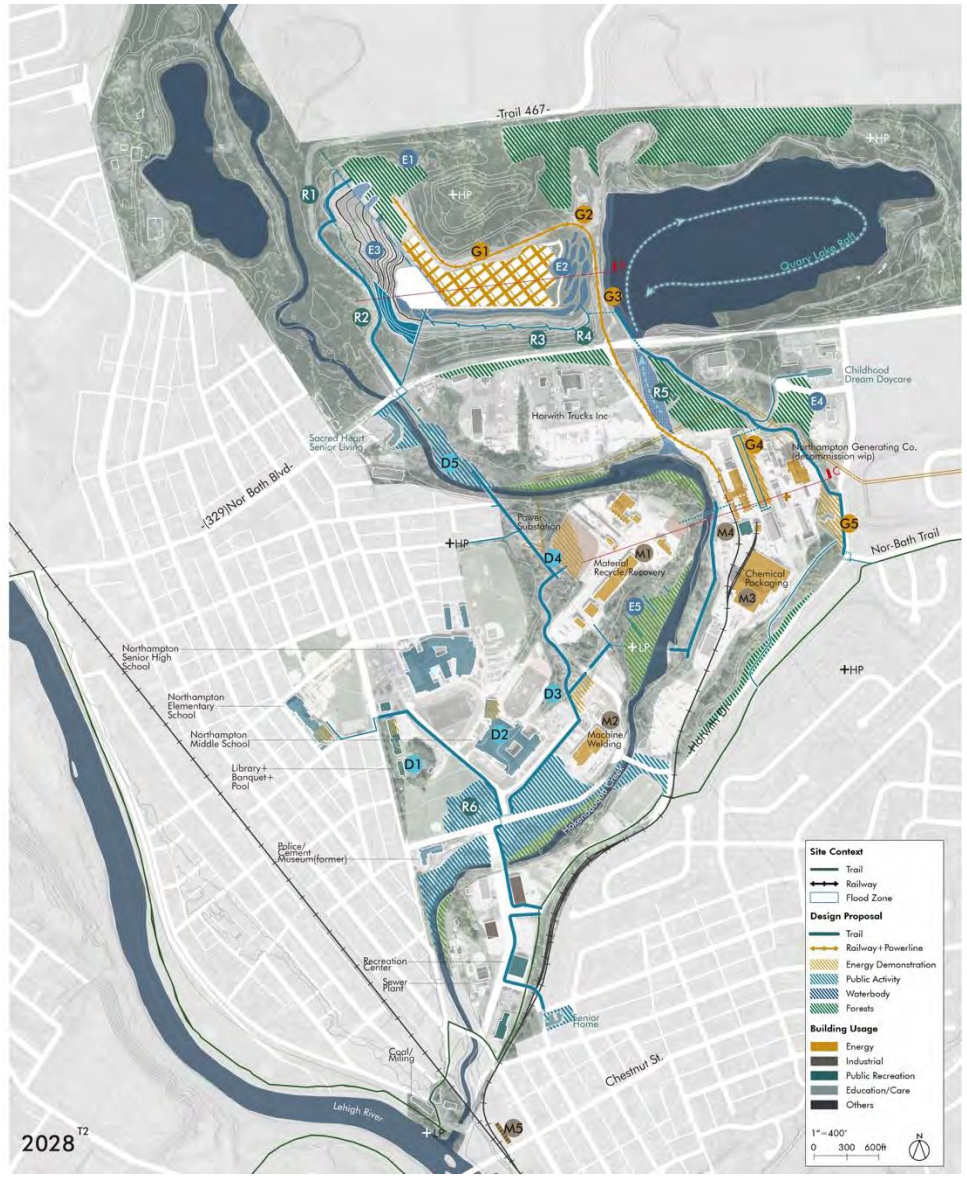
I believe that the elements within the landscapes, such as quarries, abandoned warehouses and cement silos, railways, rivers and beautiful lakes, can be integrated with future energy system, like the elements within the machine, to form an entity.

The north part of the site are 2 quarries and an active Industrial Complex. The Northampton Generating Company currently uses coil and combustible industrial wastes to produce energy in a not-so-clean way.

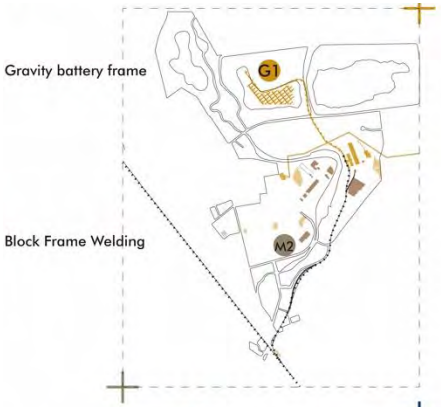
Across the Hokendauqua Creek is the Northampton Education Zone. Northampton High School football teams call themselves Konkrete Kids to emphasize the pride and the Pennsylvania German tradition. Ed Pany, a former worker of the Atlas Cement Co., is the current director of the Atlas Cement Memorial Museum.

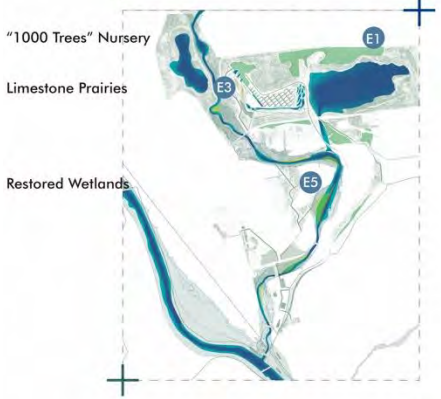
Fig1. Manifesto: integrated machinery
Fig2. Photowork: Material and Cultural flow
Fig3. Land Section: The 300ft quarry, the industrial complex, and the education zone

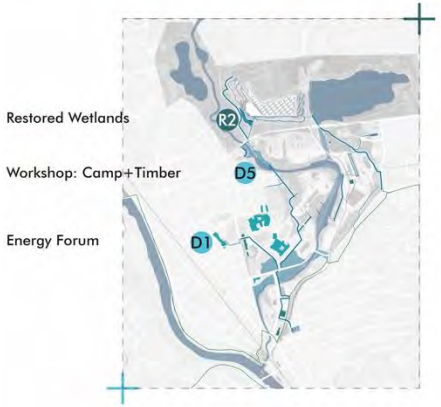




Jason Chun-Cheng Yeh
Instructor: Todd Montgomery
Studio: UPenn LARP 601 Core Studio
Fall 2023







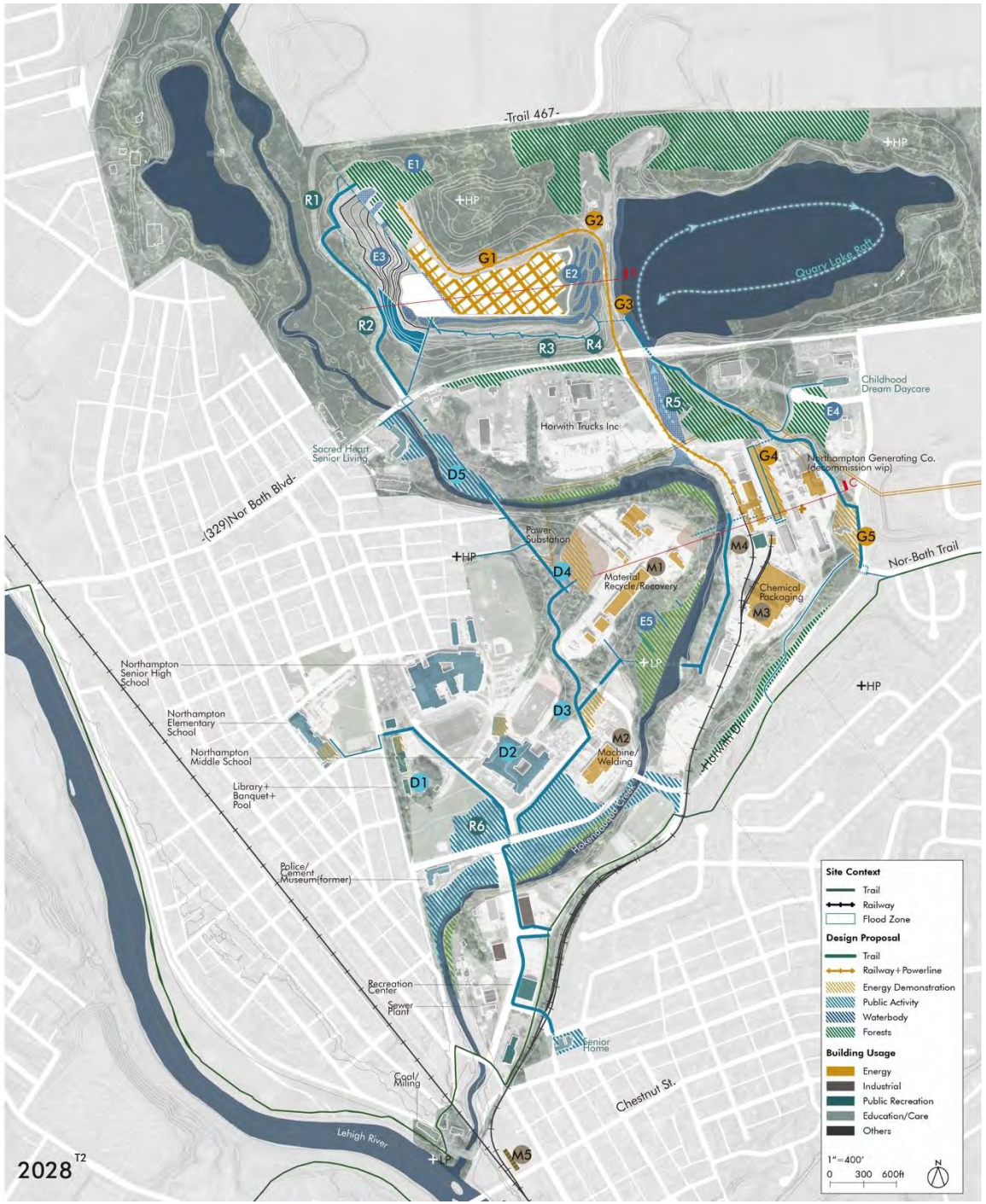
Energy
- G1 Gravity battery frame
- G2 Railway+Powerline
- G3 Hydro Pump
- G4 Solar Roof (2700m2)
- G5 Solar Pavillion (600m2)

Manufacture
- M1 Material Recycle Center
- M2 Block Frame welding
- M3 Block compressing
- M4 Compression Silo
- M5 Wastes Collecting Center

Environment
- E1 "1000 Trees" Nursery
- E2 Water Terraces
- E3 Limestone Prairies
- E4 Restored Forests
- E5 Restored Wetlands

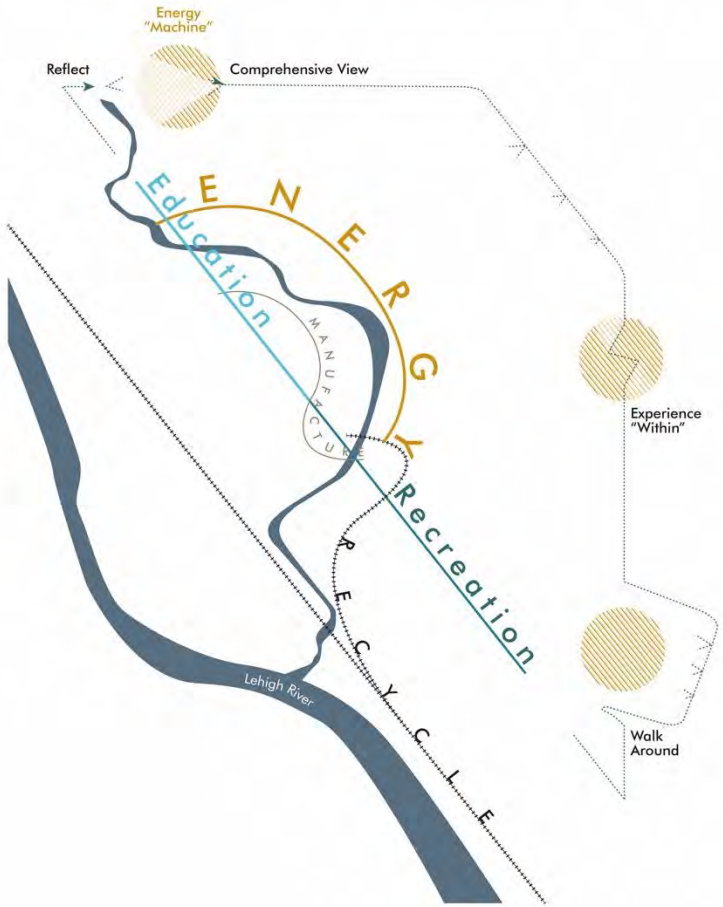
Recreation
- R1 Quarry Amphitheater
- R2 Cement Museum
- R3 Cliff Path
- R4 Energy Vista
- R5 Raft Center
- R6 Playground Steps to the Creek

Education
- D1 Energy Forum
- D2 Solar Roof Demonstration
- D3 Workshop: Welding
- D4 Workshop: Recycle
- D5 Workshop: Camp+Timber



Jason Chun-Cheng Yeh
Instructor: Todd Montgomery
Studio: UPenn LARP 601 Core Studio
Fall 2023

"Interpretive public access to and through energy landscapes, if designed with care from the get-go, can head off situations where energy developers simply fence off land in the name of security."
—<Designing for Just and Multifunctional Energy Landscapes>

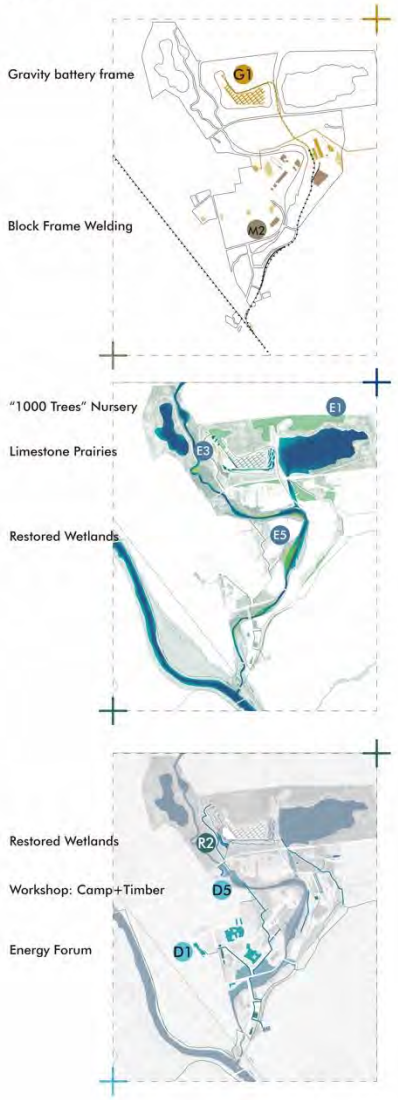


By inserting Gravity Battery Storage System in the quarry/mine, we may have the chance to

1/ reach cleaner energy production -> Sustainable Future

2/ downscale the energy system -> Regional Energy Democracy

3/ provide alternative usage to the land "scars" -> Utilize the Environmental Contexts



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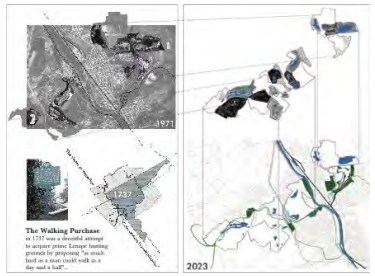

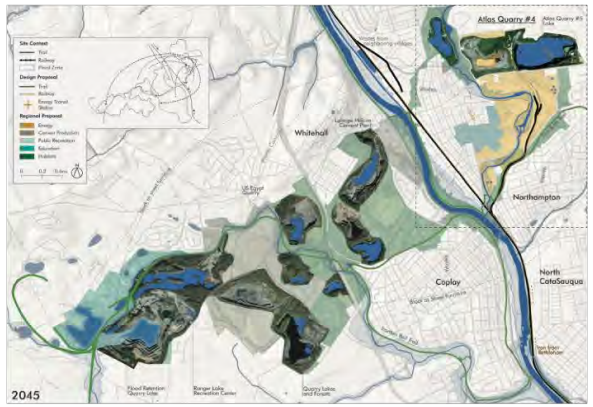

Fig1. 1737: The Vector
Fig2. 1971: The Quarries
Fig3. 2023: The detached quarries and their surroundings
Fig4. 2045: The Integration

The Cement Belt: Utilizing Quarries With Their Unique Potentials

In the regional proposal on the Cement Belt in Lehigh Valley, the Atlas Quarry #4 is going to be used as the new energy core, and other quarries can perform their duties altogether. Wastes collected from the region will be compressed as gravity battery blocks and be stored at the Atlas Quarry #4 for energy production. Neighboring industrial zone manufactures products with clean energy and distributes to the western quarries, where public recreation and education usages are the main focus. The retention quarry lake prevents seasonal floods with integration of the existed Ironton Rail Trail. In 1971, the Atlas Cement Co. was at its peak. Date back to the 1700s, the site was a camp where Willam Penn's Sons stay for the notorious Walking Purchase, following the Lehigh River's direction.

Jason Chun-Cheng Yeh
Instructor: Todd Montgomery
Studio: UPenn LARP 601 Core Studio
Fall 2023

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REBECCA O'NEIL
Research PI, Energy Infrastructure
Pacific Northwest National Laboratory (PNNL)

YEKANG KO
Associate Professor
University of Oregon; Senior Scientist, PNNL

JASPER HUGTENBURG
Landscape Architect
H+N+S Landscape Architects

Pacific Northwest
NATIONAL LABORATORY

ConCord

Council of Educators in
Landscape Architecture conference
Portland, OR

Rebecca O'Neil
Advisor, Energy Infrastructure

March 28, 2025

U.S. DEPARTMENT OF ENERGY | GDO

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DISCIPLINARY OPPORTUNITY TO MOVE UPSTREAM IN DEVELOPMENT CYCLE AND SCALE

ENERGY PLANNING AT LANDSCAPE SCALES OR LARGER SCALES

Vision, imagination, possibility
Methods for working and integrating at landscape level (not binary presence absence, not invisible), new technology designs and formats, characterization patterns and typologies

COMMUNITY ENERGY PLANNING

Place-based but not focused on single specific development, more precise methods of integration across many values for long term

POST SITE SELECTION, END OF REGULATORY PROCESS

Micro-adjustments to optimal cost and engineering design to minimize impacts

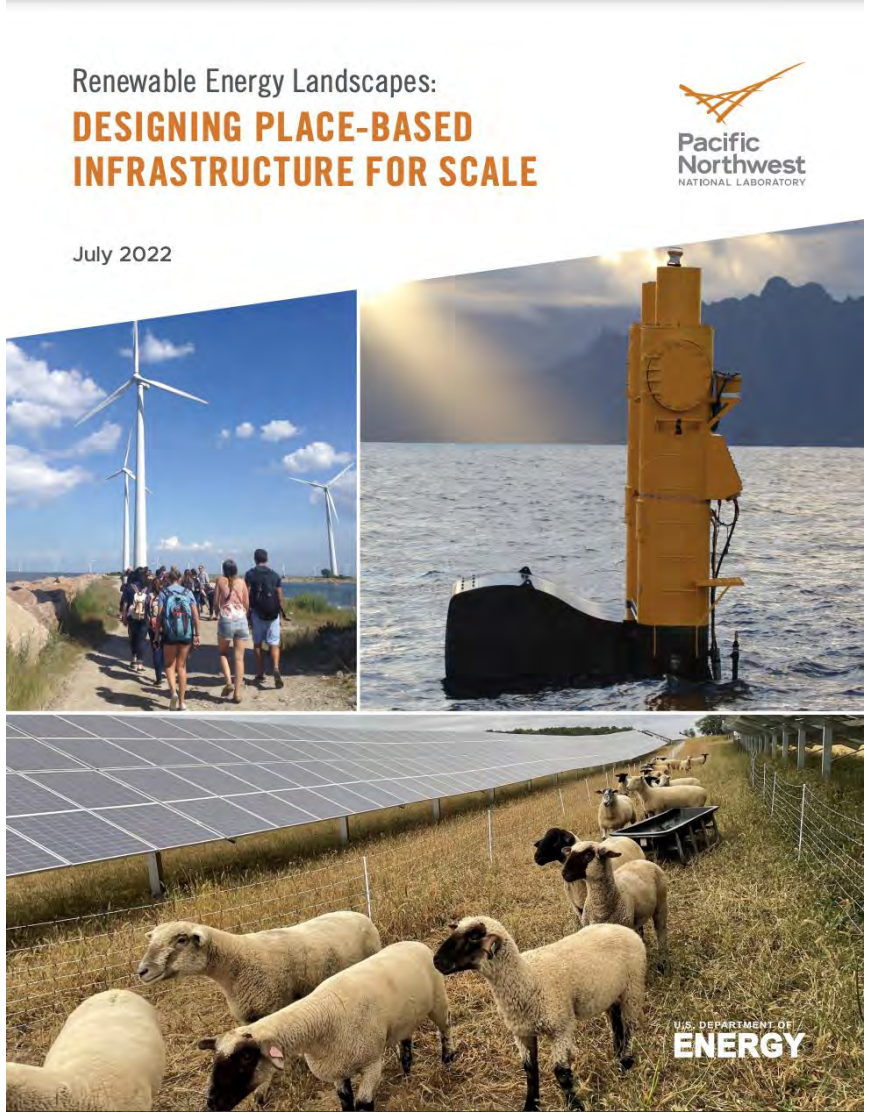
ENERGY RESOURCE PROGRAMS AND POLICIES

Principles and constraints for resource planning for utilities, state policy making, alternative interests and industries with independent policies and interests, benefit accounting, stakeholder practice

SPECIFIC ENERGY PROJECT AND SITE SELECTION

Regulatory engagement at top-end for integrating and expanding value proposition and benefit accumulation, early stakeholder engagement and buy in on design, location, purpose, need

TYPICAL ENERGY DEVELOPMENT STAGES, FROM LANDSCAPE TO SITES

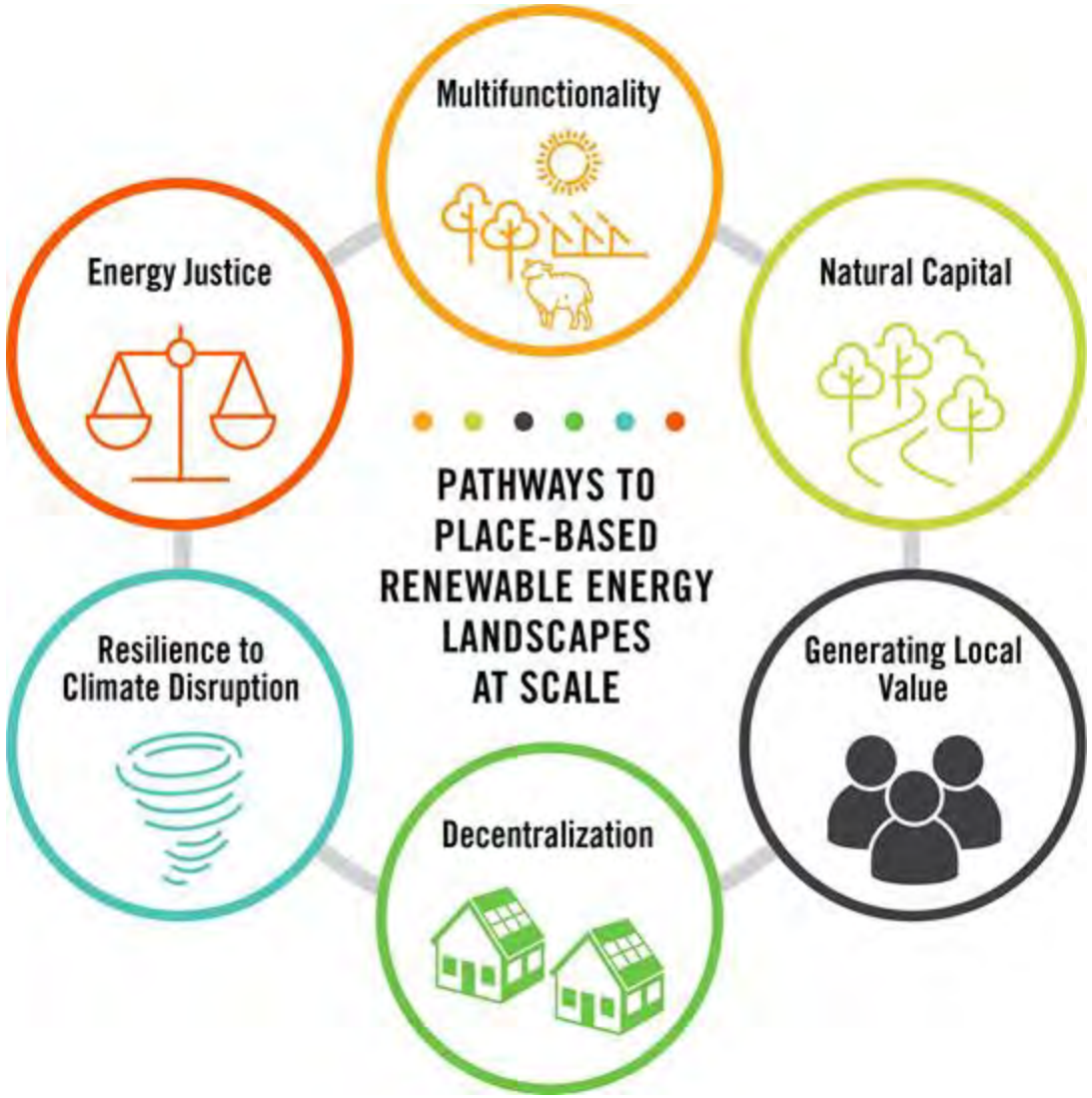


Rebecca O'Neil, Danielle Preziuso, Katie Arkema, PNNL

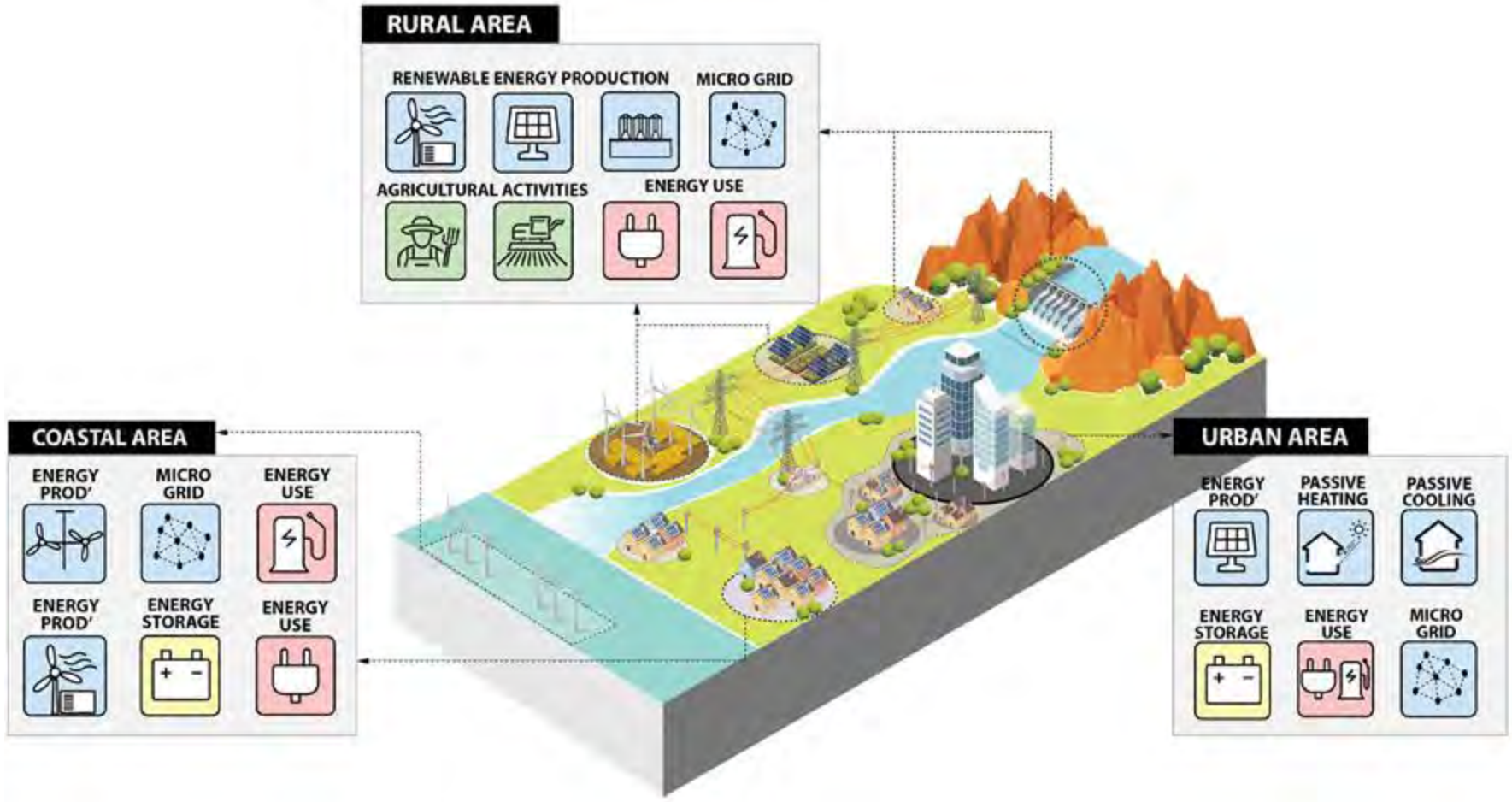
Yekang Ko, University of Oregon & PNNL

Nicholas Pevzner, University of Pennsylvania

Kirk Dimond, University of Arizona



Teaching Renewable Energy Landscapes in Classrooms



Images © Yeongseo Yu

DISCIPLINARY OPPORTUNITY TO MOVE UPSTREAM IN DEVELOPMENT CYCLE AND SCALE

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Vision, imagination, possibility
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Landscape Planning Analysis:
- Integrated resource planning
- Land suitability analysis
- Scenario planning

Community engagement:
co-design and planning

Site Design:
- Site design typology development
- Site engineering and construction details
- Landscape performance assessment

Landscape Planning Analysis: Integrated resource planning

Planning for a Green New Deal:

A Transect Approach for Oregon Energy Landscapes

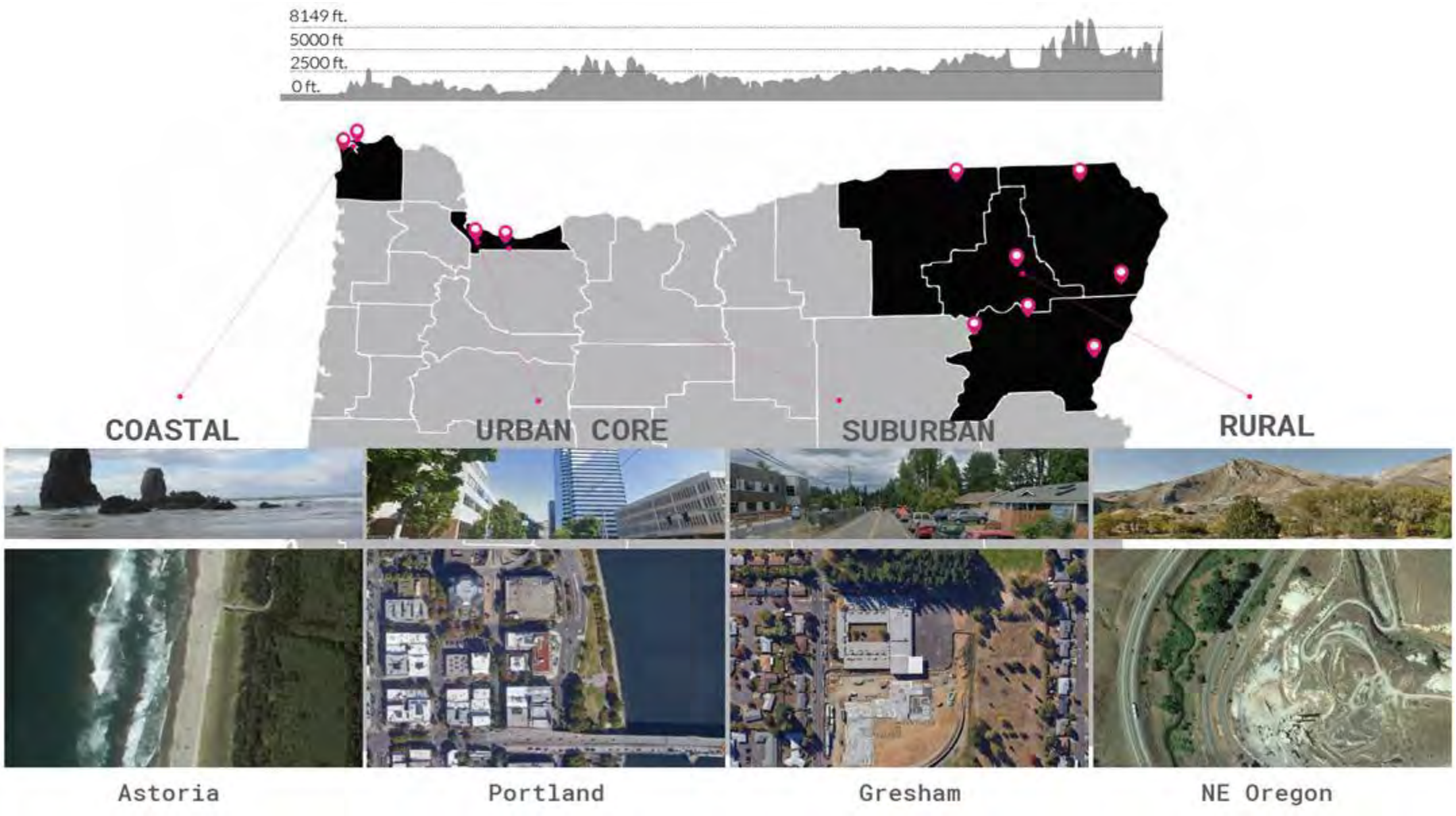
Spring 2020 . LA 440/540

Introduction to Landscape Planning Analysis

Department of Landscape Architecture

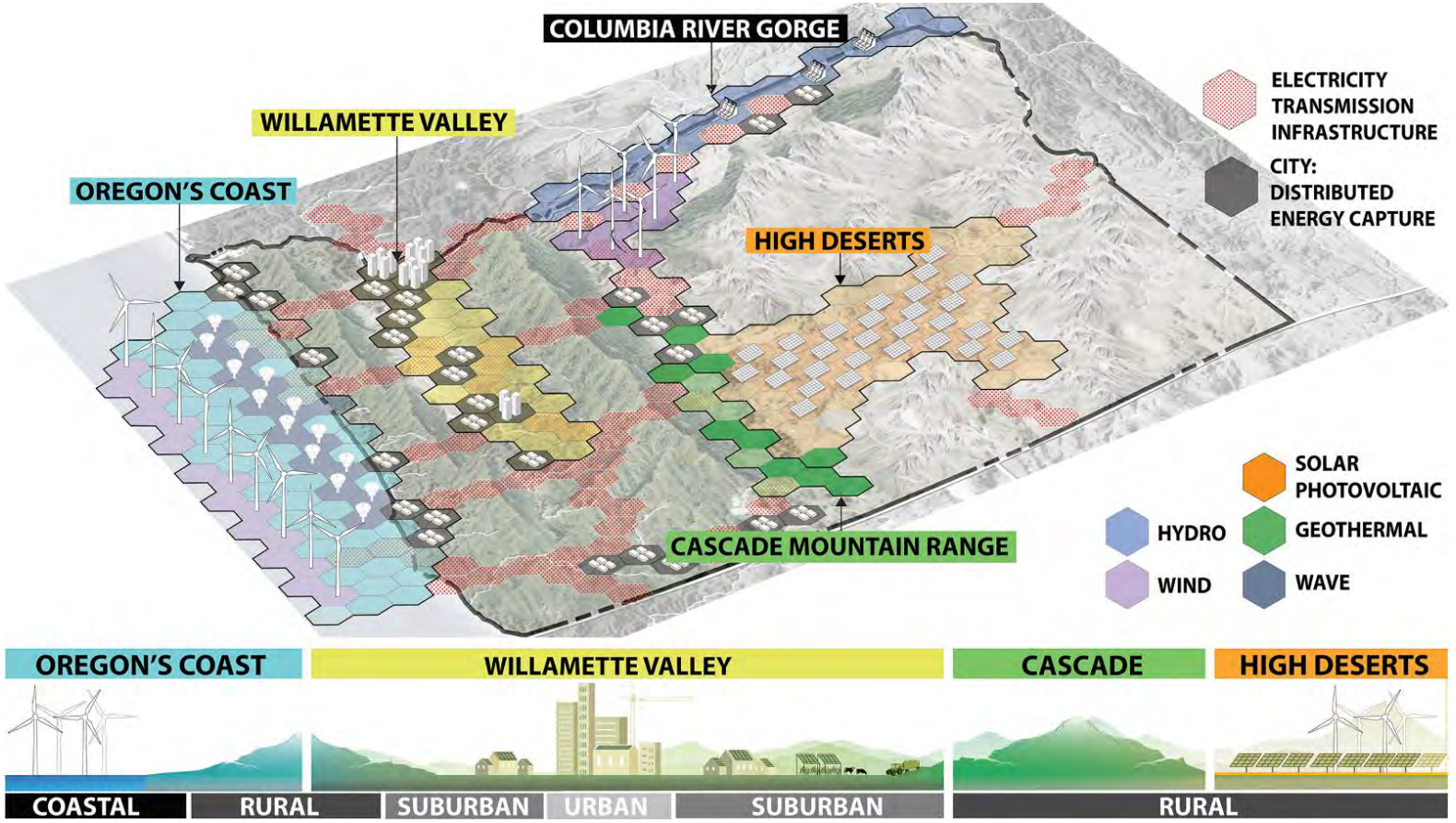
University of Oregon

Landscape Planning Analysis: Integrated resource planning



Landscape Planning Analysis: Integrated resource planning

Advancing Energy Democracy through an **Energyshed** Framework: Tools for Place-Based Renewable Energy Infrastructure



Yekang Ko, Yeongseo Yu, University of Oregon

Landscape Planning Analysis: Land suitability analysis

Renewable Energy 197 (2022) 879–892

Contents lists available at ScienceDirect

Renewable Energy

journal homepage: www.elsevier.com/locate/renene

Resolving the conflict of greens: A GIS-based and participatory least-conflict siting framework for solar energy development in southwest Taiwan

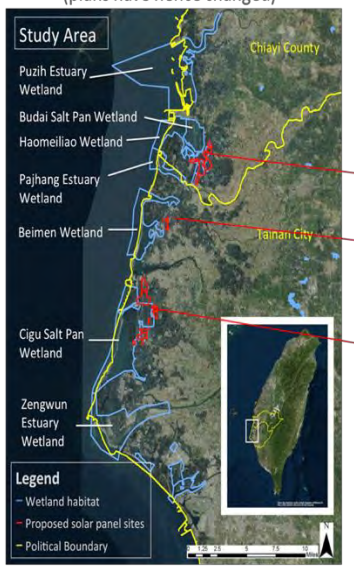
Hsiao-Wen Wang [a,*], Adrienne Dodd [b], Yekang Ko [c]

[a] Department of Hydraulic and Ocean Engineering, National Cheng Kung University, Tainan, 701, Taiwan, ROC
[b] Department of Landscape Architecture and Urban Planning, University of California, Berkeley, CA, 94703, USA
[c] Department of Landscape Architecture, University of Oregon, 5249 University of Oregon, Eugene, OR, 97403-5249, USA

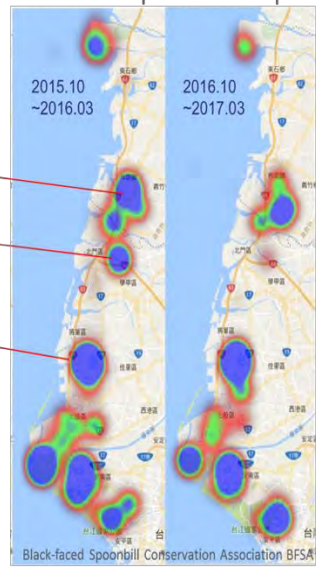
ARTICLE INFO

Keywords:
Renewable energy siting
Energy transition
Multicriteria decision making
Stakeholder engagement
Spatial planning

2016 plans presented by the Bureau of Energy (plans have hence changed)



Black-faced Spoonbill hotspots



DISTRIBUTIONAL JUSTICE	PROCEDURAL JUSTICE	RECOGNITIONAL JUSTICE
how the resources, services, and benefits are equitably distributed	how the decision-making process is participatory and accessible to all	how the voices and values from local and marginalized communities are represented

PARTICIPATORY RENEWABLE ENERGY SITE SELECTION

1. STAKEHOLDER ENGAGEMENT
2. ANALYZE STAKEHOLDER INFORMATION
3. REGIONAL SUITABILITY MAPPING

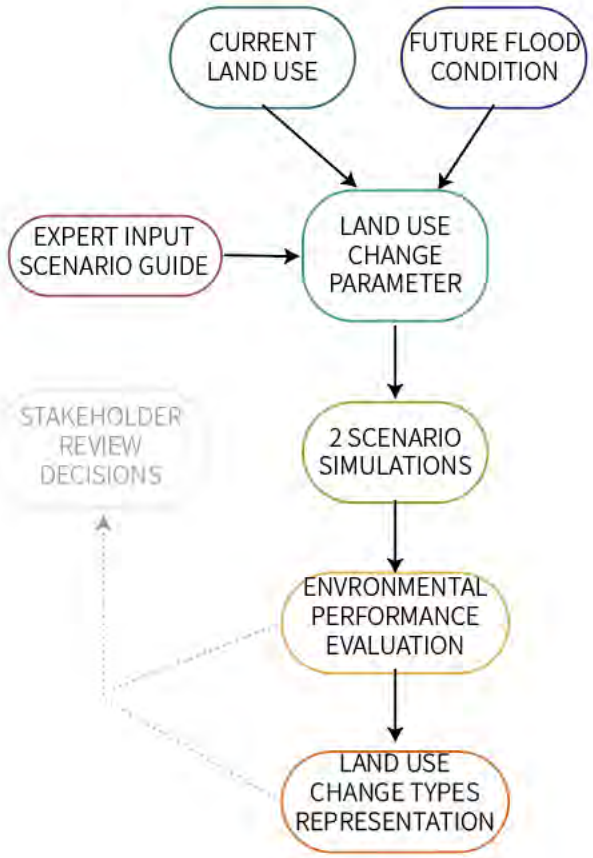
MULTI-FUNCTIONAL SITE DESIGN FOR LOCAL CO-BENEFITS

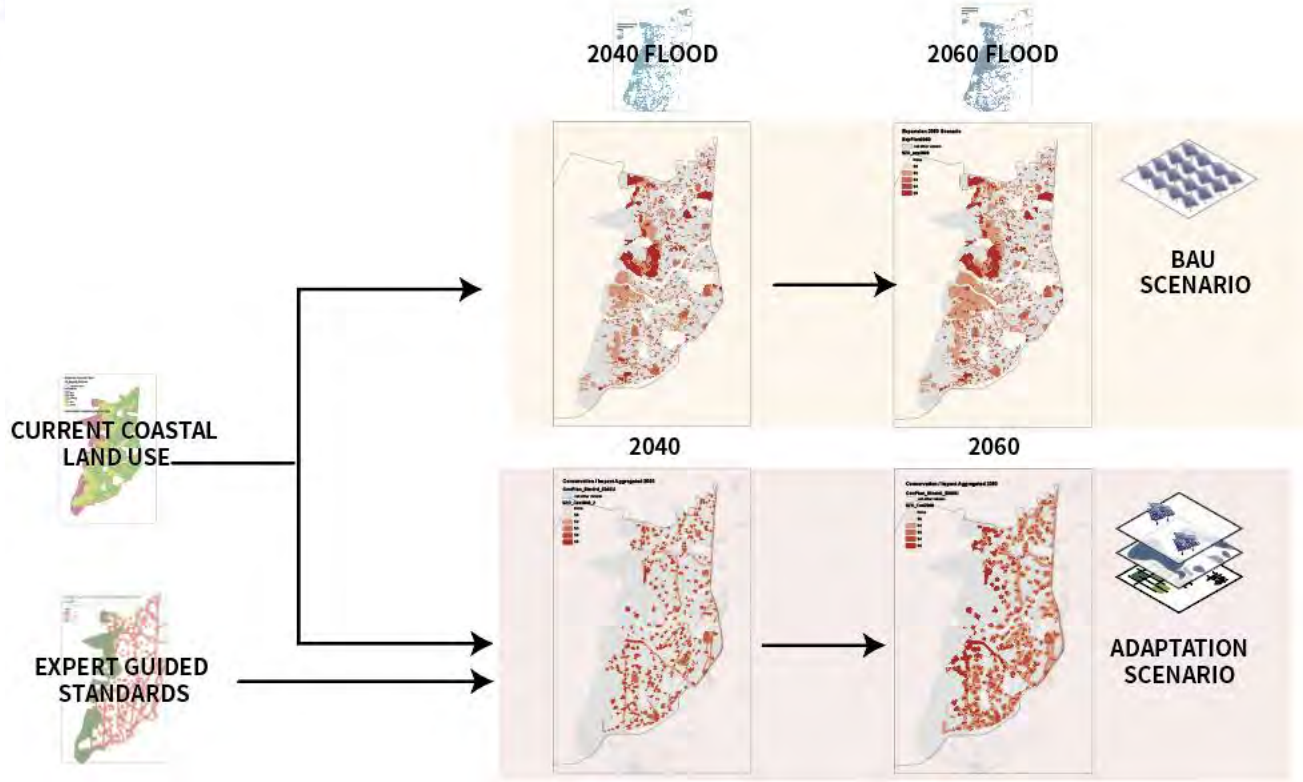
4. SITE EVALUATION

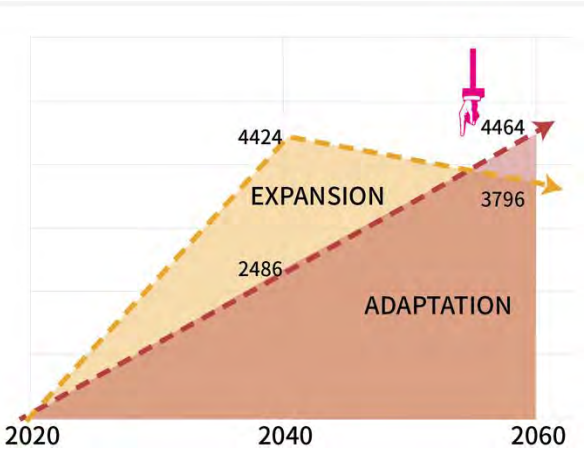
COMMUNITY OWNERSHIP RENEWABLE ENERGY

5. LEAST CONFLICT SITES IDENTIFIED

Landscape Planning Analysis: Scenario planning

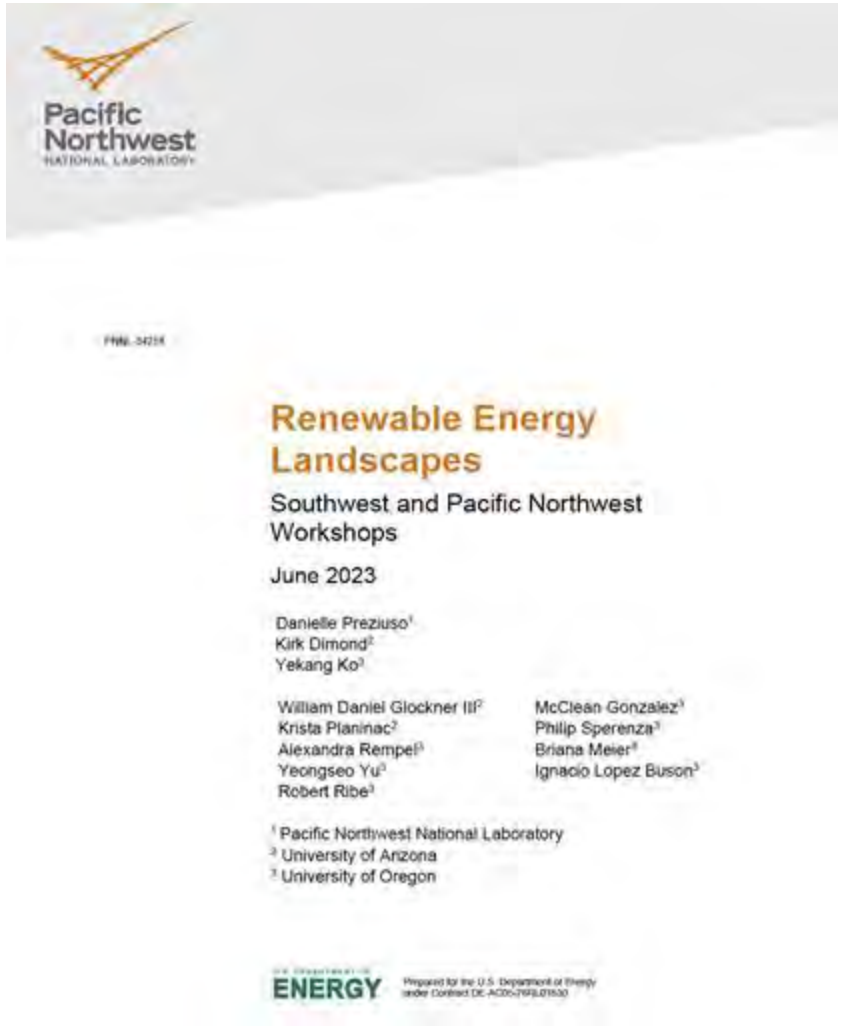


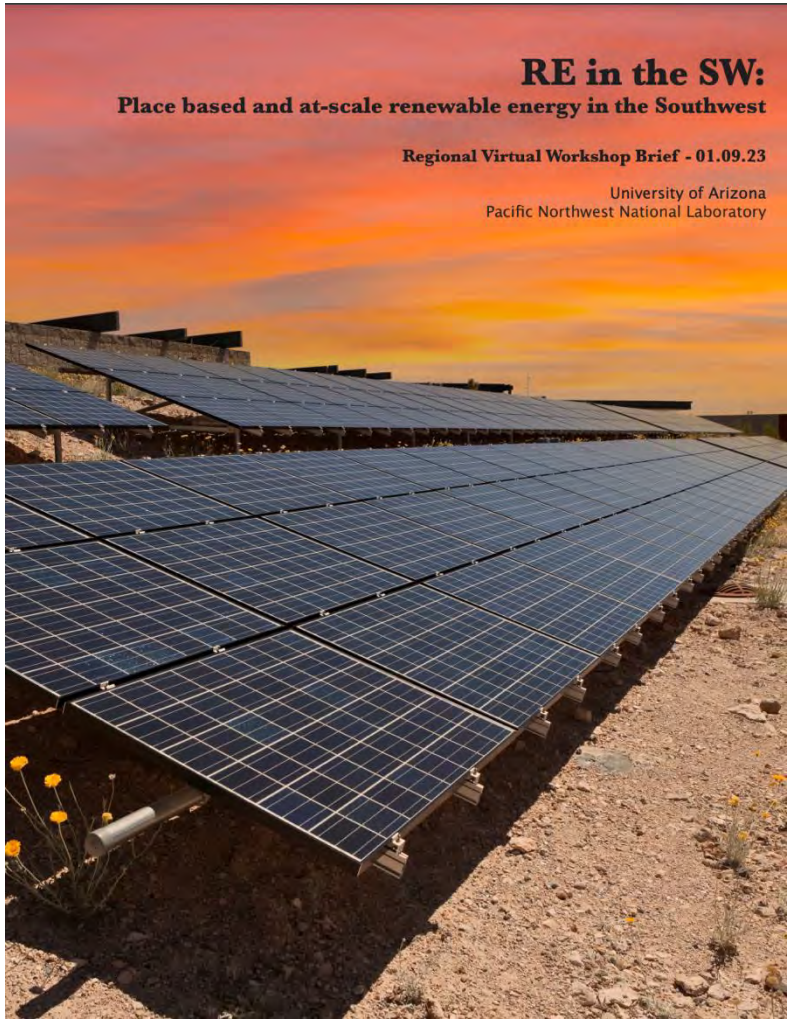


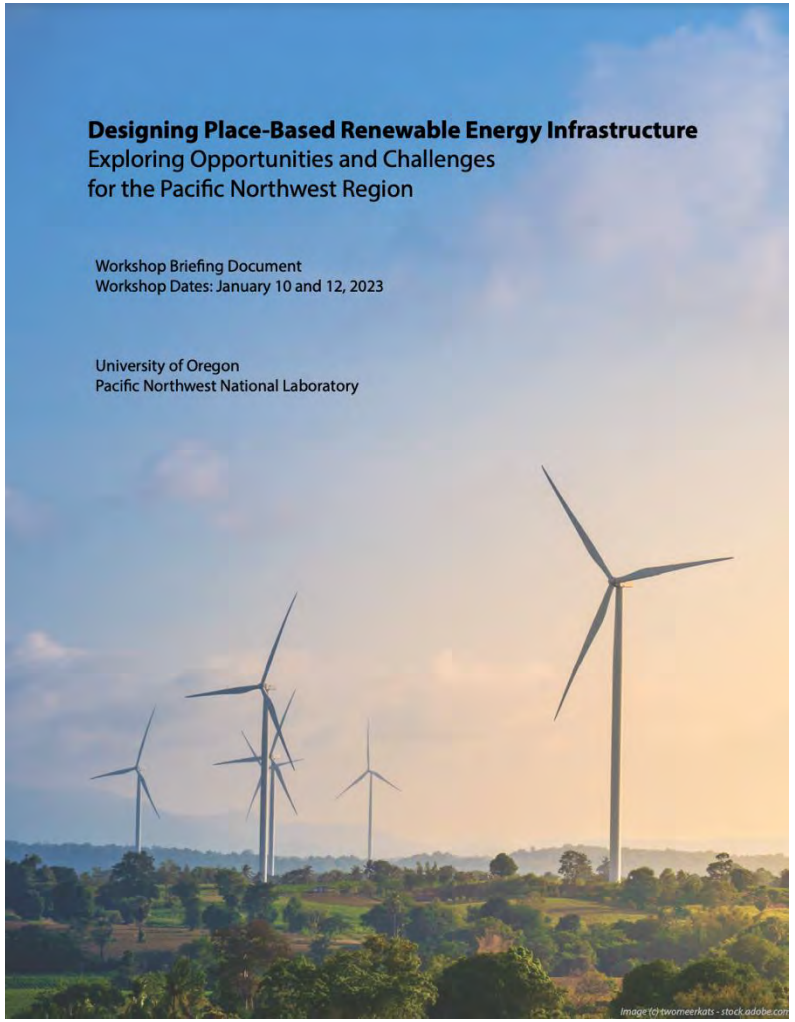


Source: William Weiti Lien, University of Oregon

Community Engagement: Co-design and planning

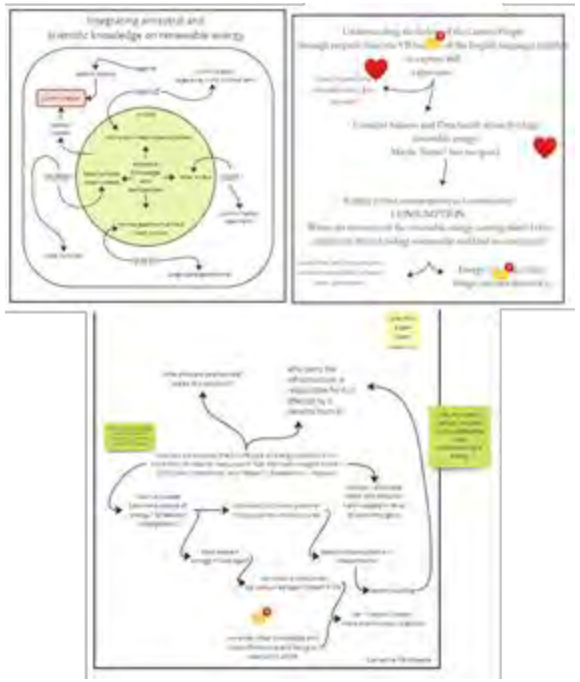


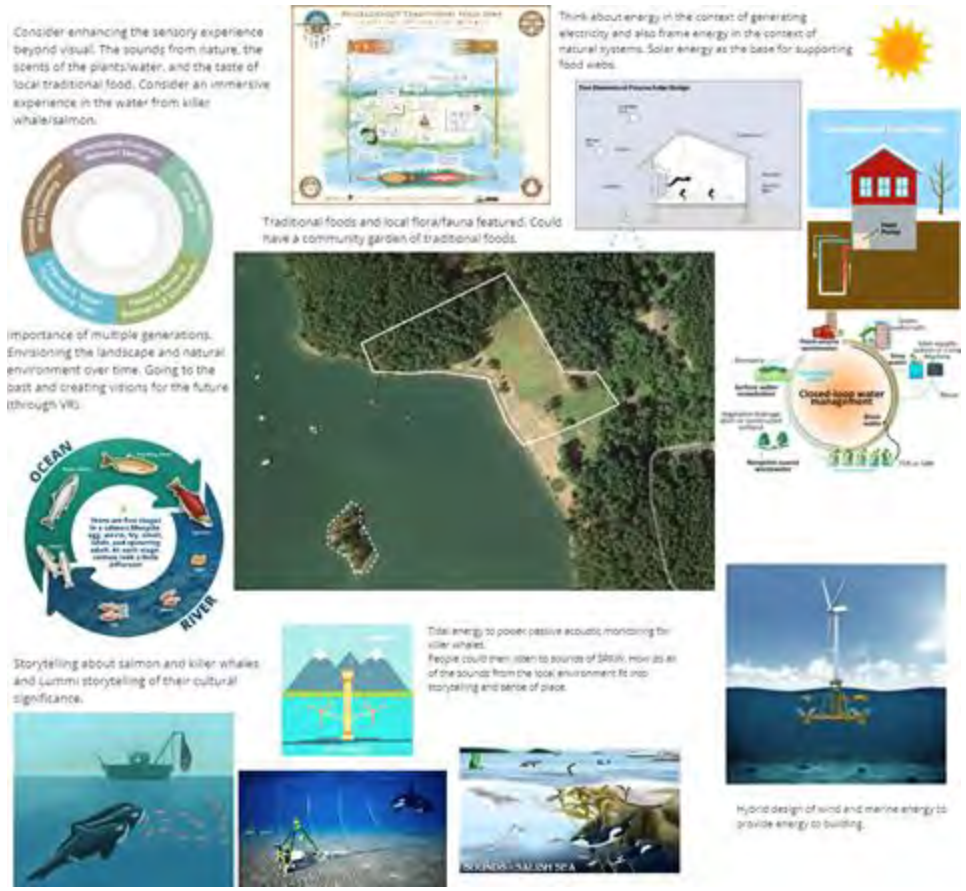


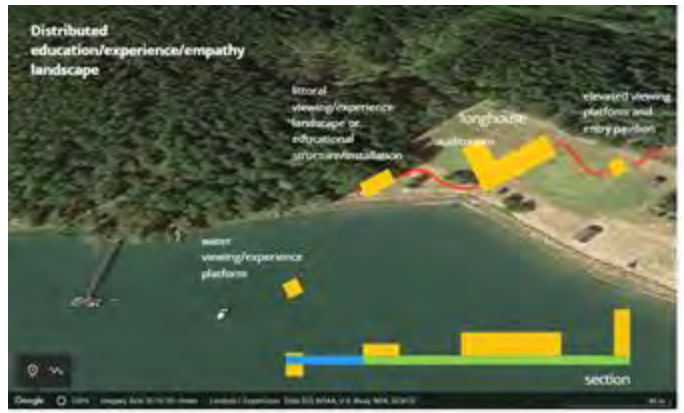


Community Engagement: Co-design and planning

Coast Salish Cultural and Natural Heritage Center, Washington: Resilience and Energy Justice







PV panels on longhouse roof or elsewhere?

habitat bench (tidal shelves for salmon) along shoreline? (as in Olympic Sculpture Park, Seattle)

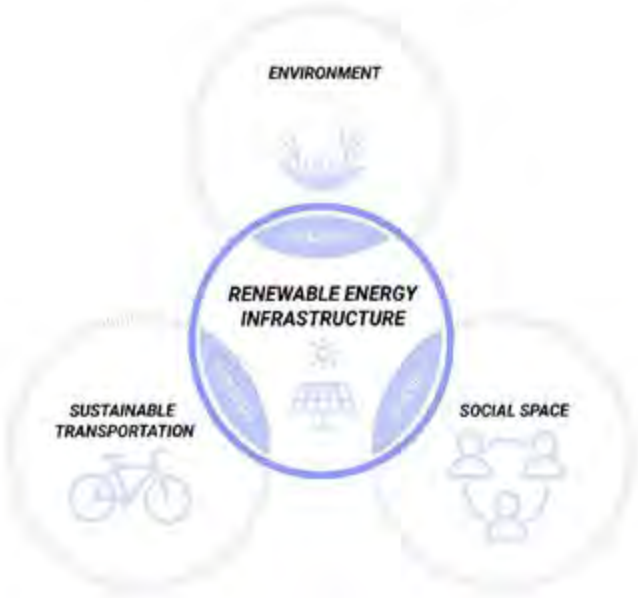
siting considerations:
-longhouse (L-shape) with doors at either end of main axis with potential auditorium on the small part of the L
-siting for communication over distance and strategic concealment
-sustainable solar and water integration
-want to site the building as part of a broader storytelling network / landscape that is more distributed, facilitates key views and interactions with the water to support empathy-based narratives

Coast Salish Institute longhouse as structure example

Justin Fowler

Site Design: Typology development

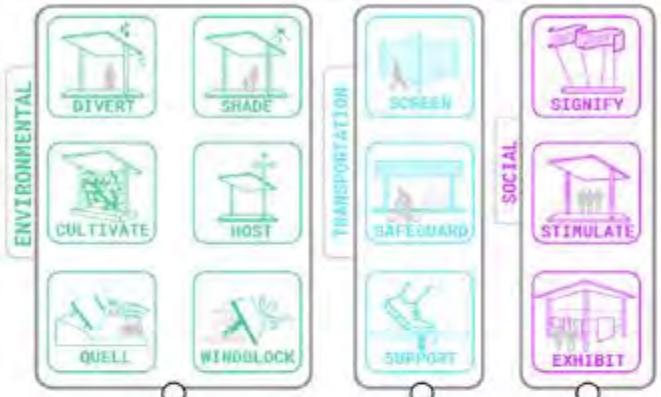
How could renewable energy synergize with social space, environmental functions, and sustainable transportation in urban public space to create hyperfunctional energy landscapes?



how to assemble a hyperfunctional energy landscape:

apply

ENERGY INFRASTRUCTURE SYNERGIES



to

UNDERUTILIZED PUBLIC SPACE

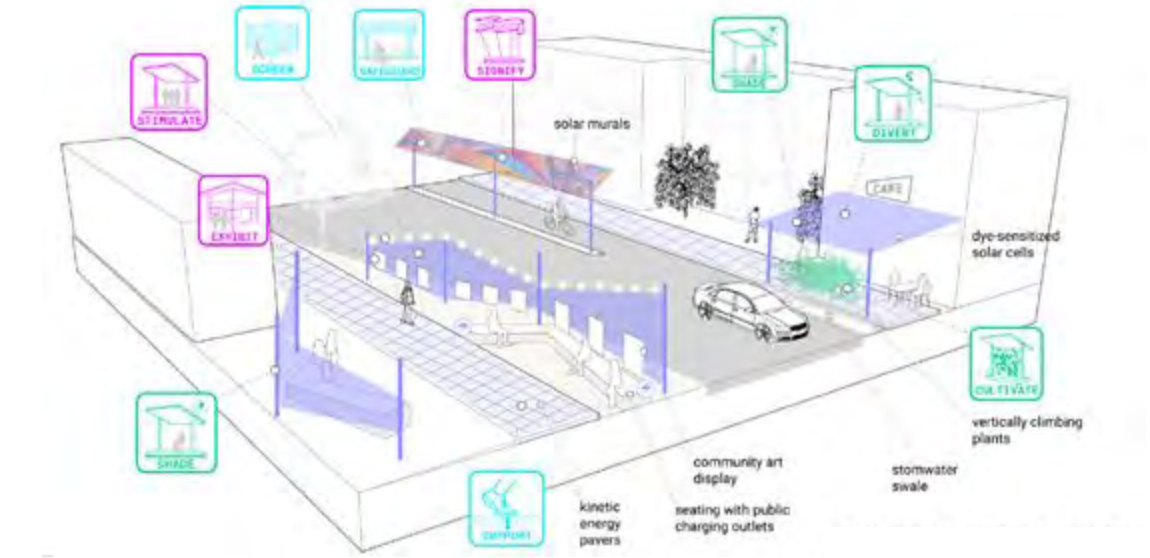
LENTS GREEN RING

for example,

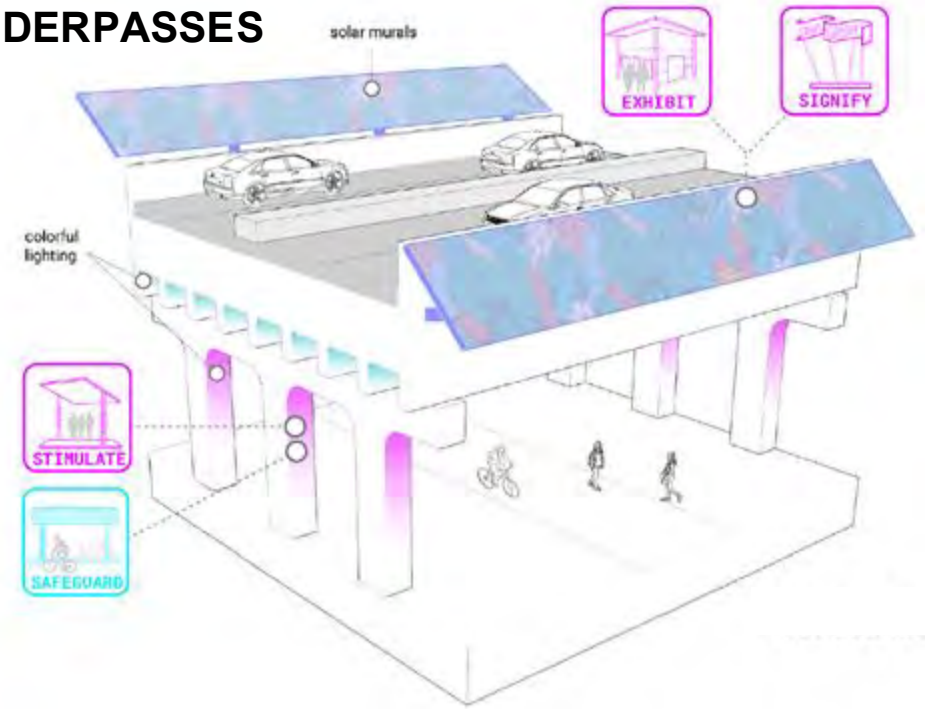
the Lents Neighborhood of Portland, Oregon

URBAN DESIGN FRAMEWORK

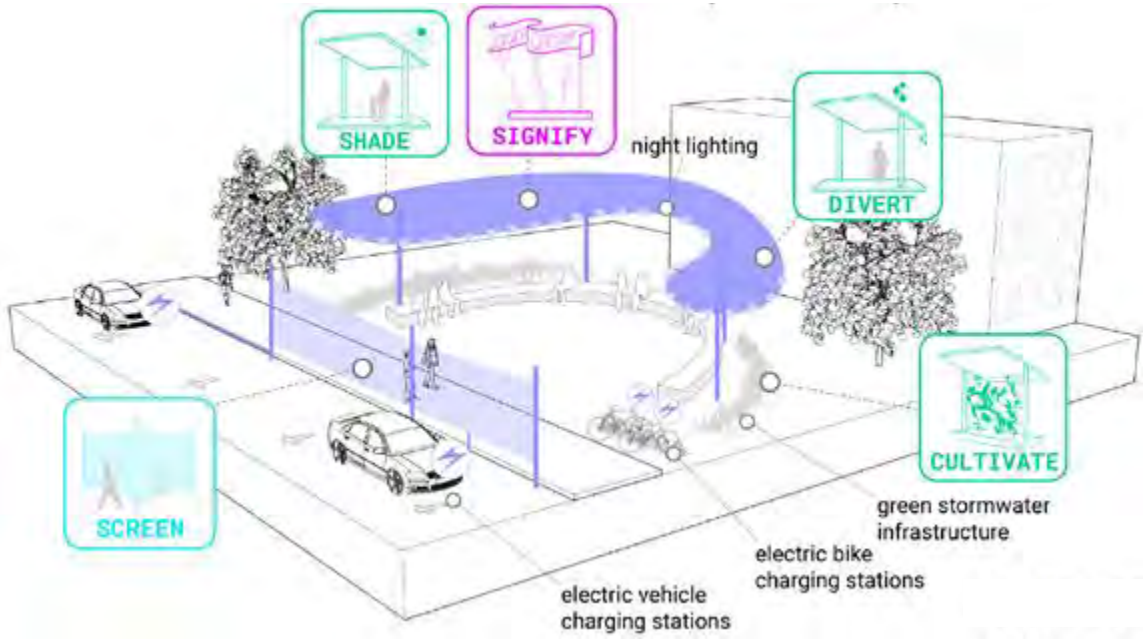
URBAN STREETS



UNDERPASSES

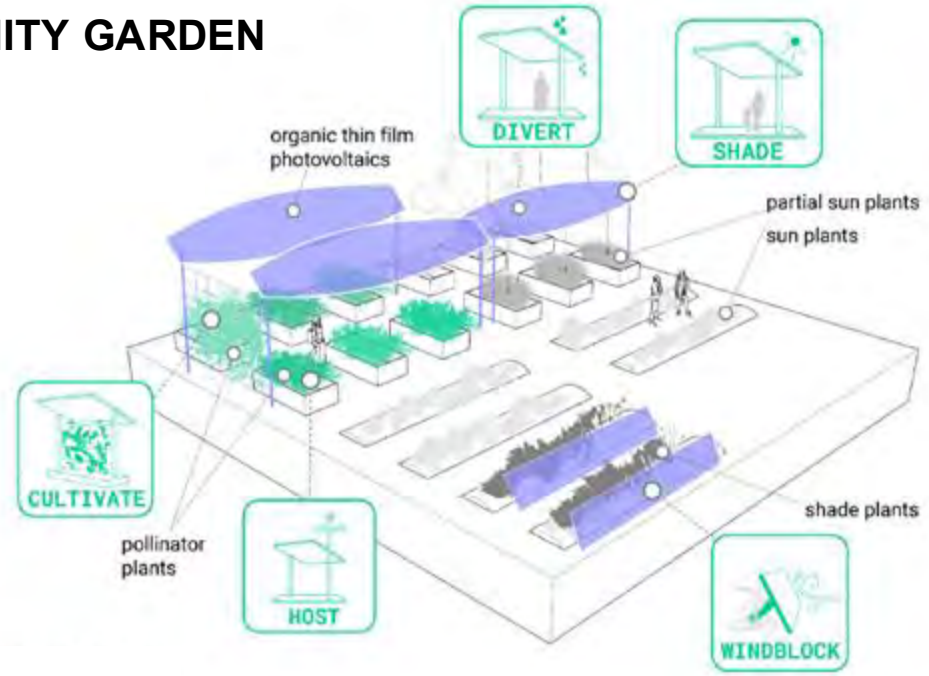


VACANT LAND

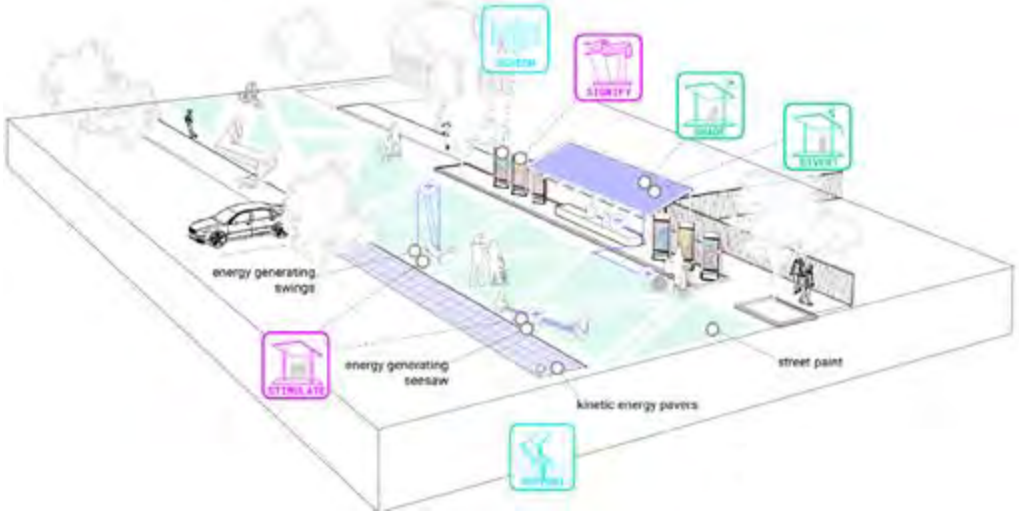


PARKING LOTS

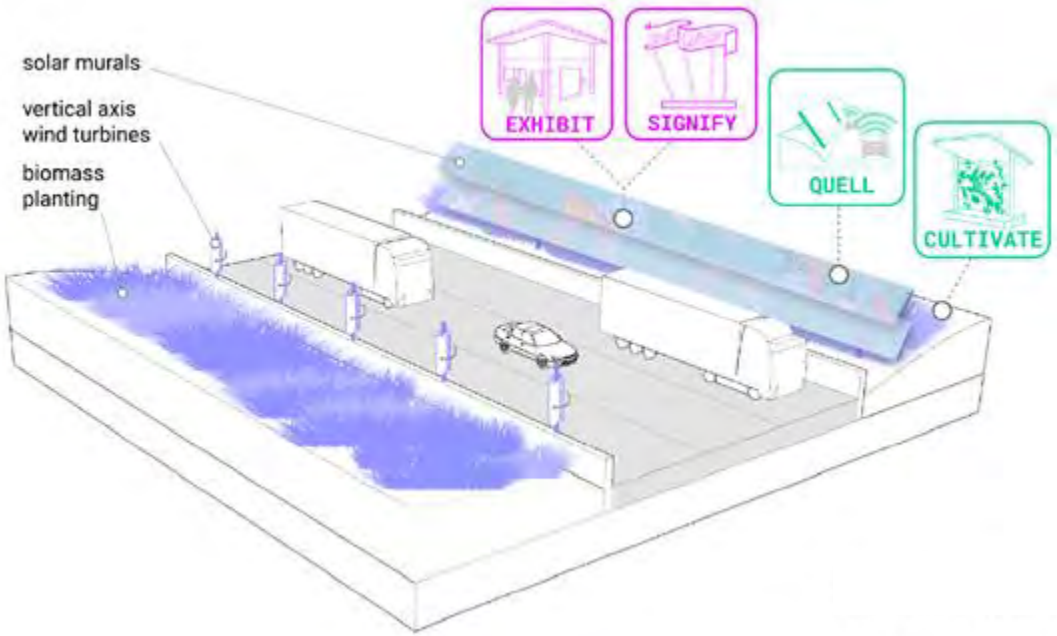
COMMUNITY GARDEN



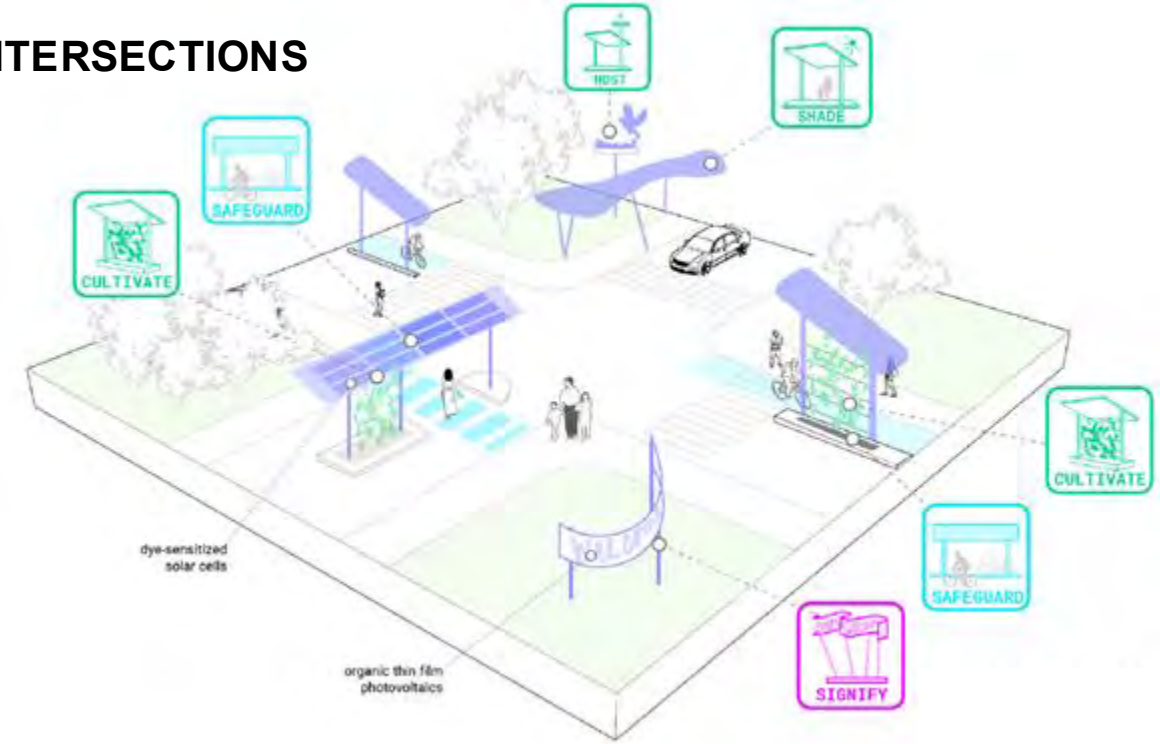
SLOW & PLAY STREETS



HIGHWAYS



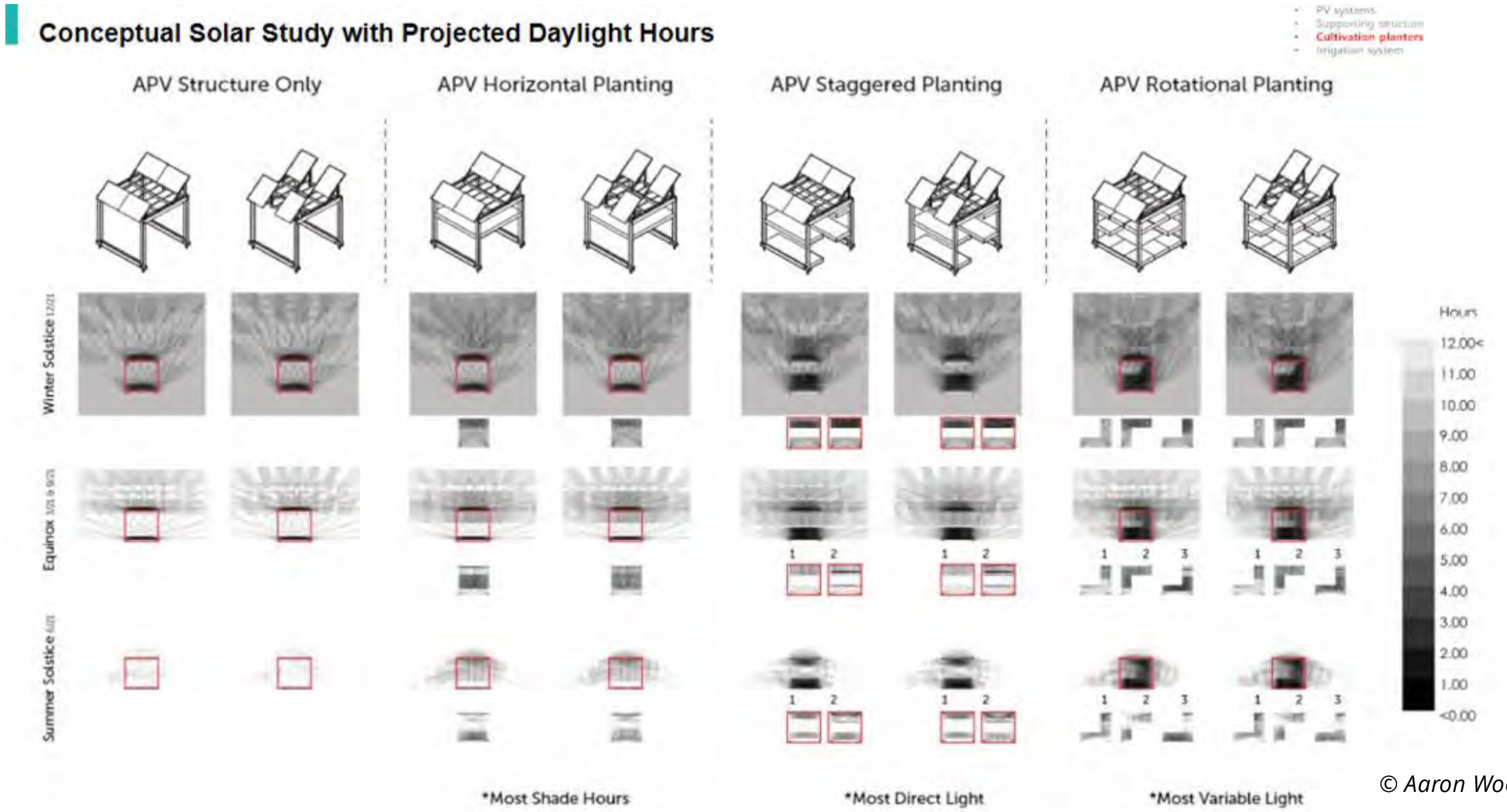
INTERSECTIONS



Site Design: Typology development

Aaron Woolverton,
University of Oregon
Advisor: Yekang Ko and Junhak Lee

Site Design: Landscape performance analysis



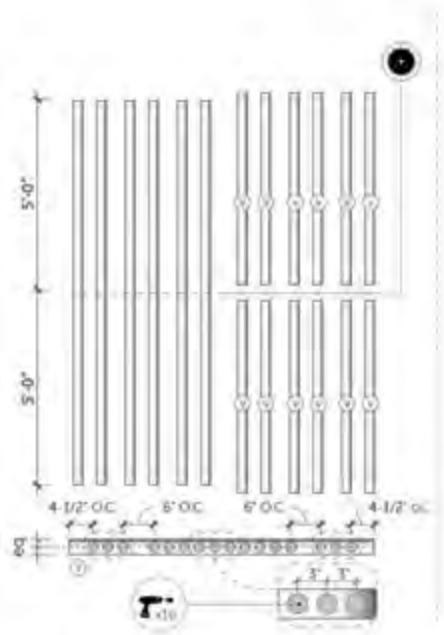
Prototype of urban agrivoltaic: Design Manual

Tools Needed

- Chop Saw
- Power Drill
- 2" Hole Saw Drill Bit
- Wrench

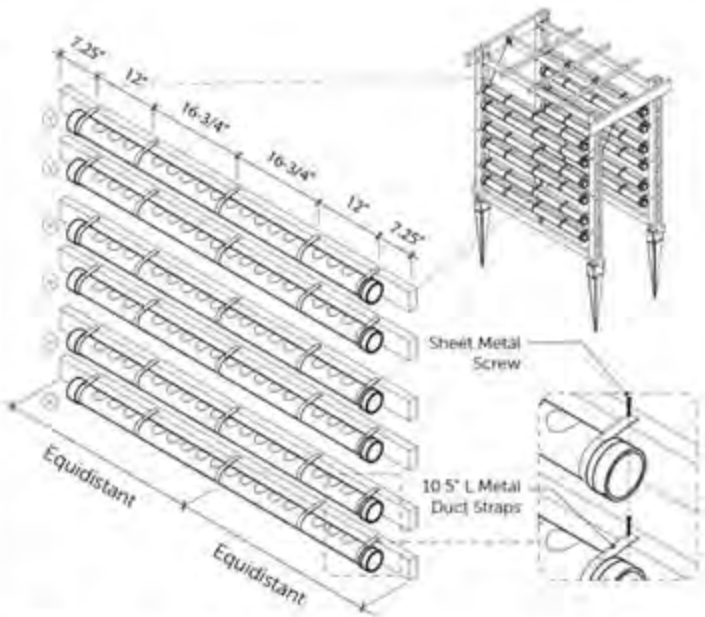
Materials Needed

- 2 x 4 x 12' Lumber (x6)
- 3/8" x 5" Carriage Bolts (x24)
- 3/8" Washers (x24)
- 3/8" Nuts (x24)
- Metal Duct Straps
- 3" Dia. x 10' PVC Pipes
- Metal Sheet Screws
- Soil
- Crops



Step 27

For the planting system, cut six of the 10' long 3" Dia. PVC into two equal 5' long sections (v). Using the 2" diameter drilling saw bit, cut holes into the PVC. These holes should be centered on the pipe and should be placed according to the above



Step 28

To tie these PVC pieces (v) onto the structure, you must use a roll of metal duct straps. Each wall of PVCs requires thirty 10.5" long sections of duct straps. These duct straps should be tied into the top rails of the 2 x 4 boards with metal sheet screws. Ideally, these [illegible] w the PVCs to float above one another. After this step, you may now fill the PVC with soil and prepare the system for plants.


Reserved
Parking for
30 MINUTE LIMIT
LOAD/UNLOAD
AT ALL TIMES

DISCIPLINARY OPPORTUNITY TO MOVE UPSTREAM IN DEVELOPMENT CYCLE AND SCALE

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Configurating the energy layer: Next steps

- Create a resource guide of best practices for renewable energy integrated design projects collaborating with LAF.
- Establish a network or coalition of landscape architecture educators to discuss the integration of renewable energy landscapes.
- Strengthen our role in accelerating the energy transition within the ASLA Climate Action framework.

LANDSCAPE ARCHITECTURE FOUNDATION

ISSUES WHAT WE DO WHO WE ARE

Upcoming Webinar: Energy Landscapes - The Potential of Transmission Corridors

ENERGY LANDSCAPES: THE POTENTIAL OF TRANSMISSION CORRIDORS FOR RECREATION, RESILIENCE, AND ECOLOGY

Wednesday, April 9

1-2pm EDT

Chris Henderson
Research Scientist
PNNL

Katie Morrice
Earth Scientist
PNNL

Jonah Susskind
Director of Climate Strategy
SWA Group

Yekang Ko (Moderator)
Associate Professor
University of Oregon

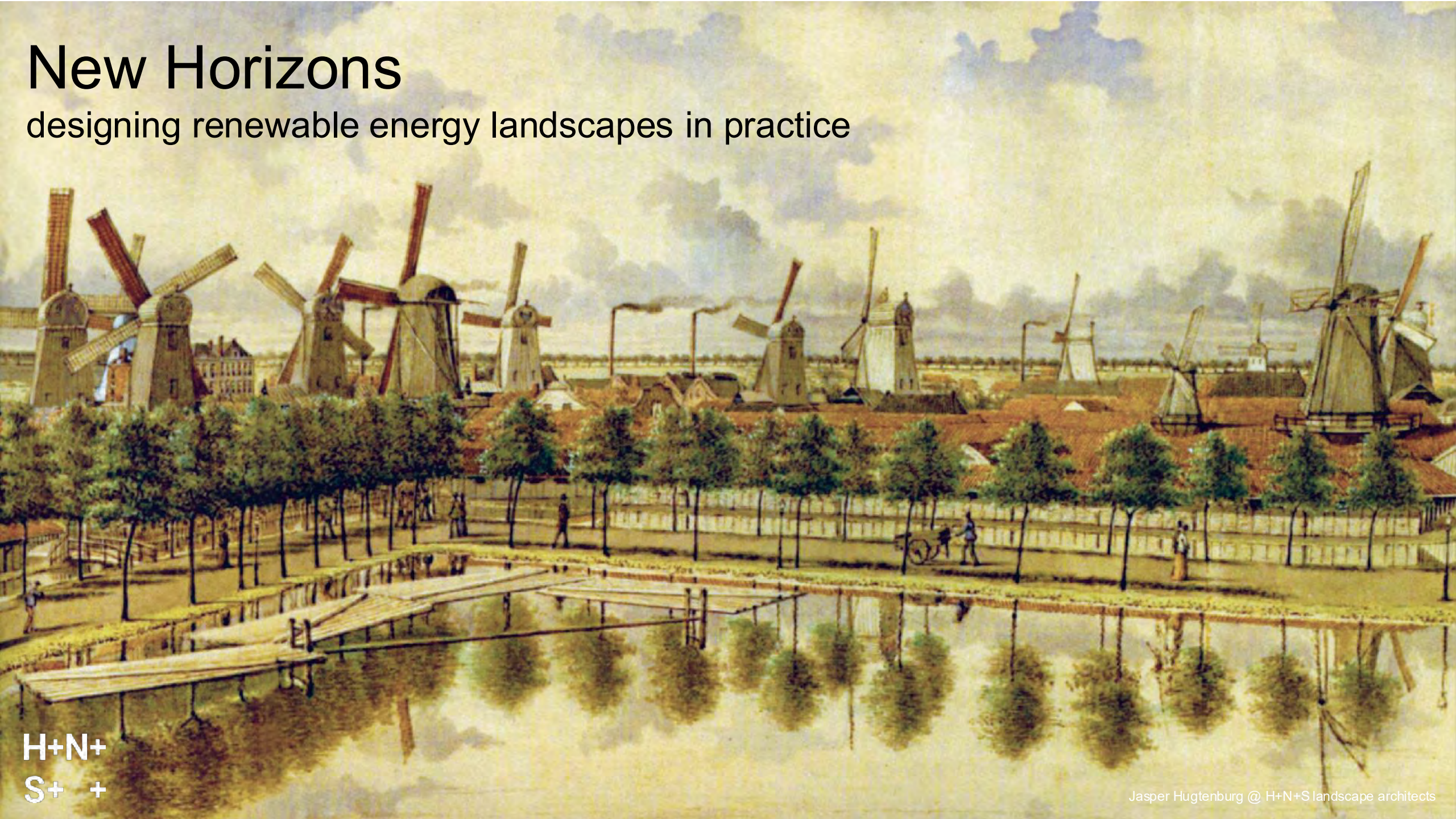
Thank you!

Yekang Ko, Ph.D.
Associate Professor of Landscape Architecture
University of Oregon
Director, APRU Sustainable Cities and Landscapes Program
Senior Scientist, Pacific Northwest National Laboratory

yekangko@uoregon.edu

New Horizons

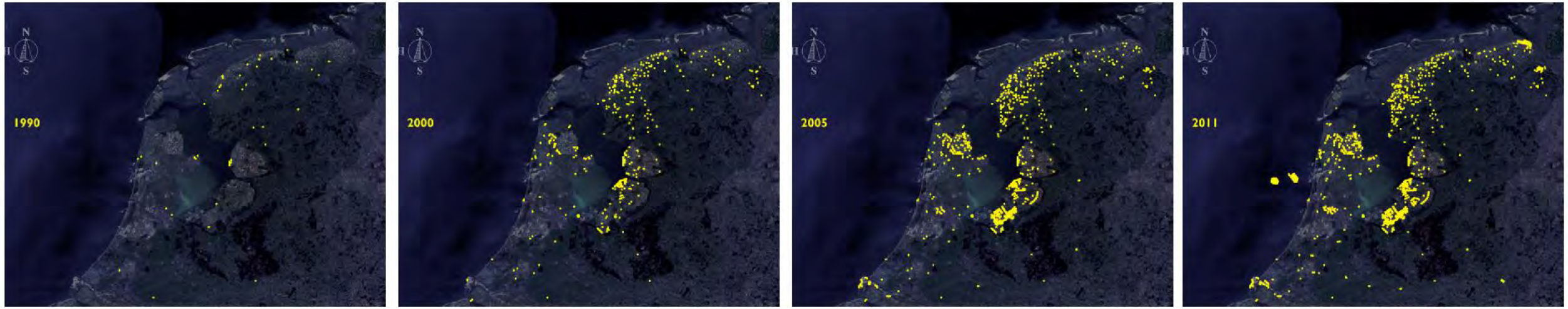
designing renewable energy landscapes in practice



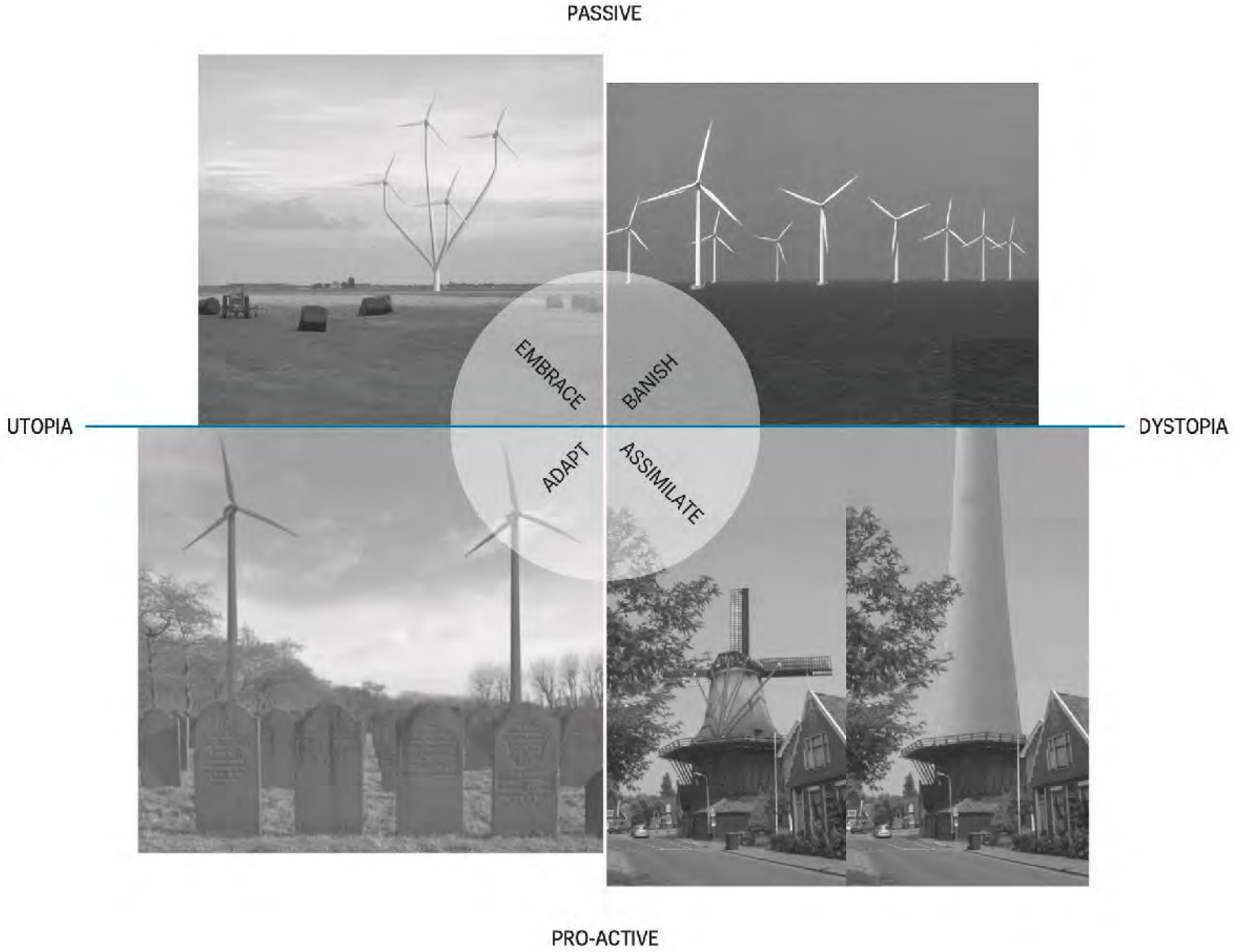
H+N+
S+ +

Jasper Hugtenburg @ H+N+S landscape architects

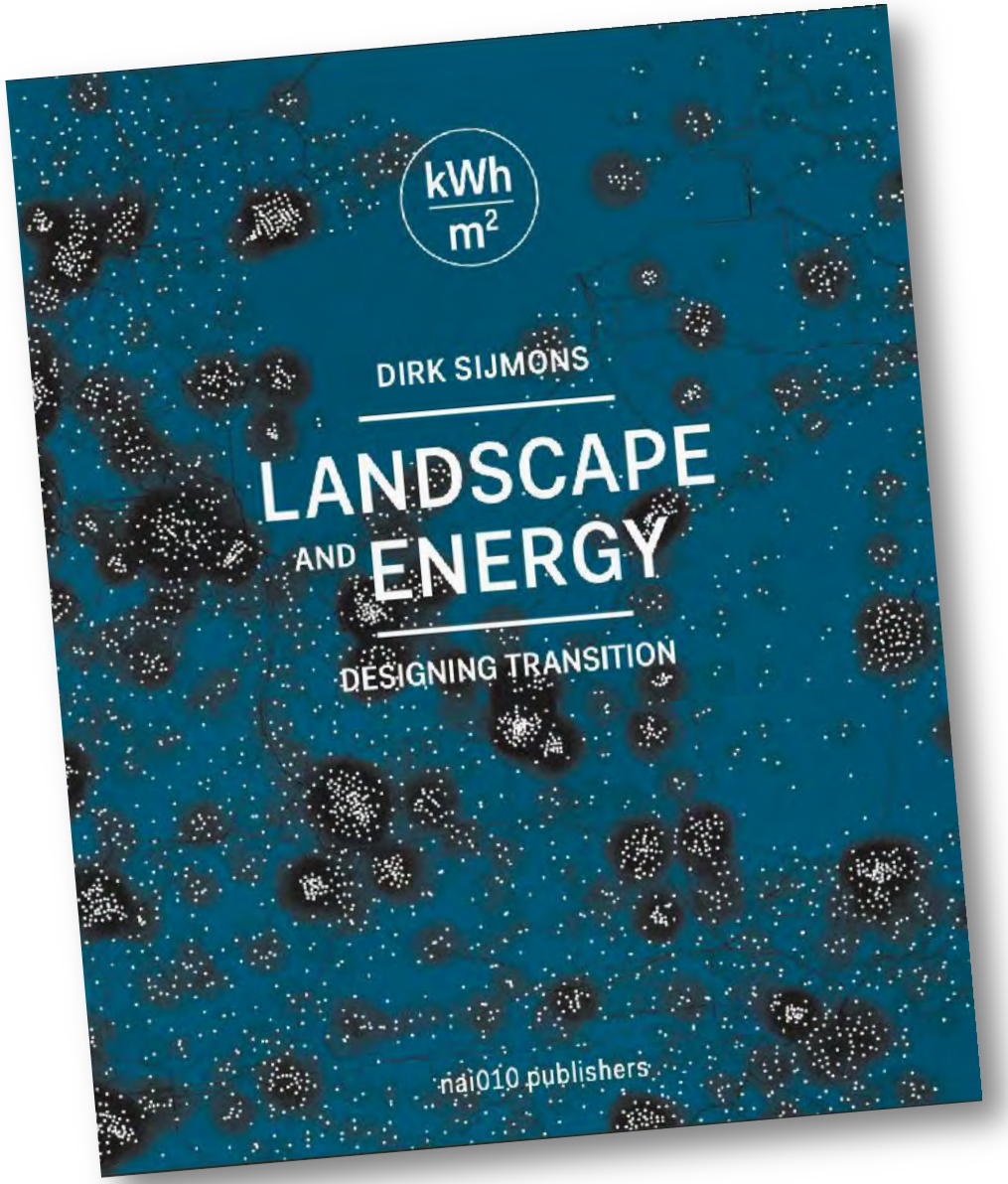
Renewable energy production as a potential threat to traditional landscape values



The philosophy of dealing with potential threats to the landscape



Energy landscapes: from threat to designed opportunities



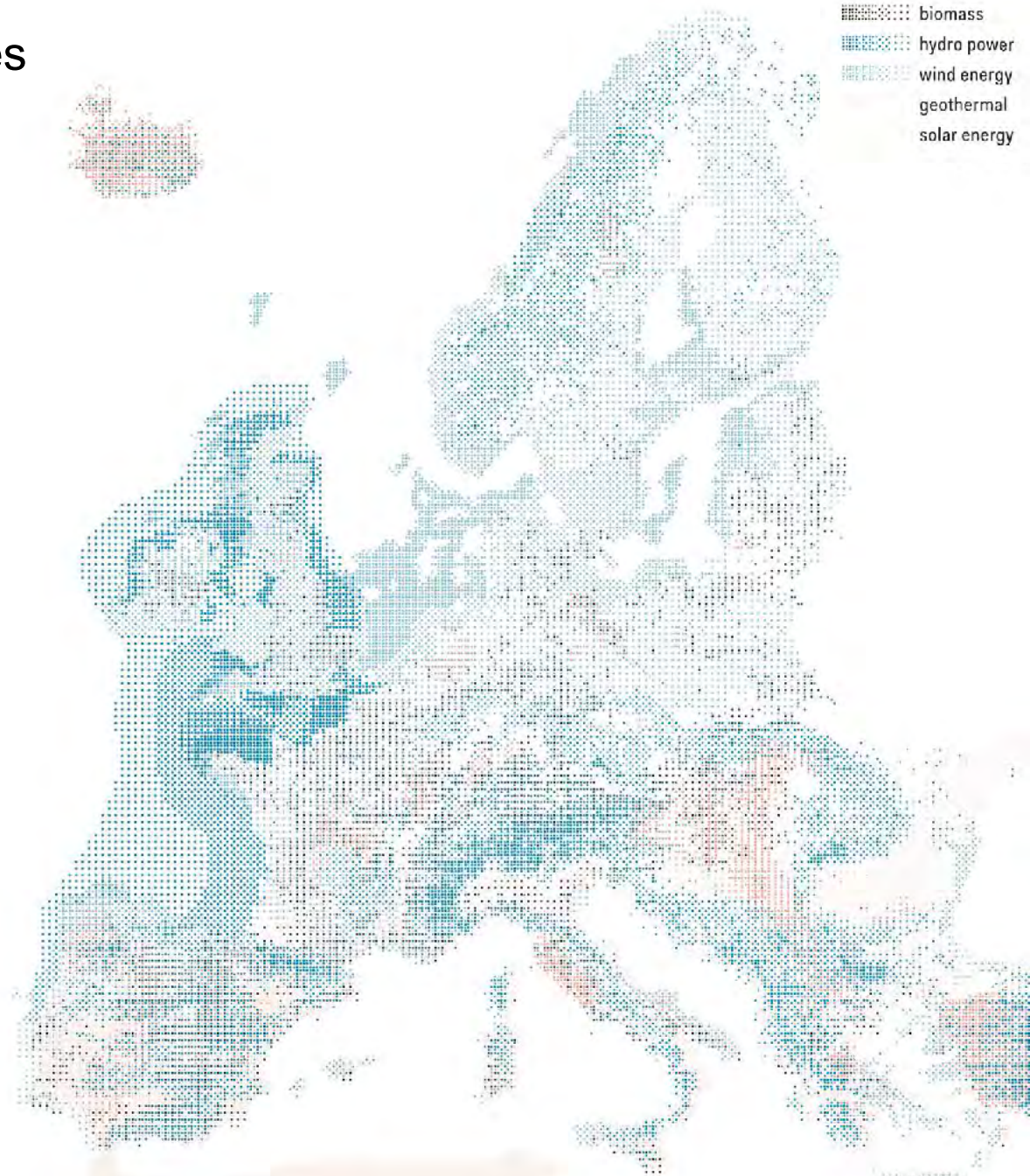
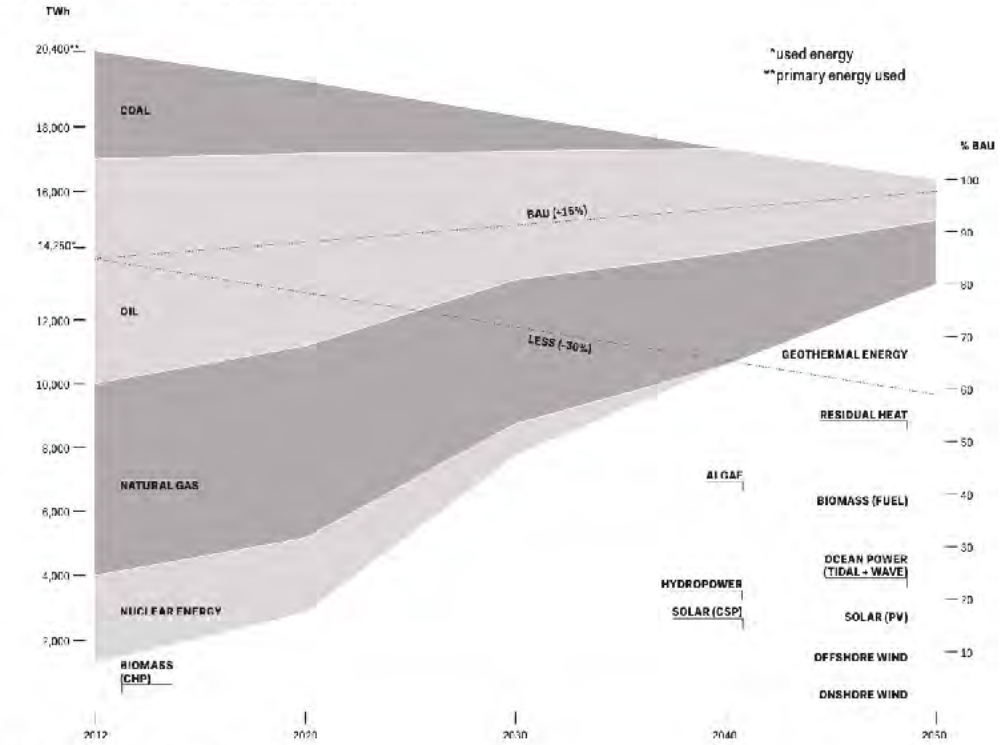


image credits: nai010 publishers



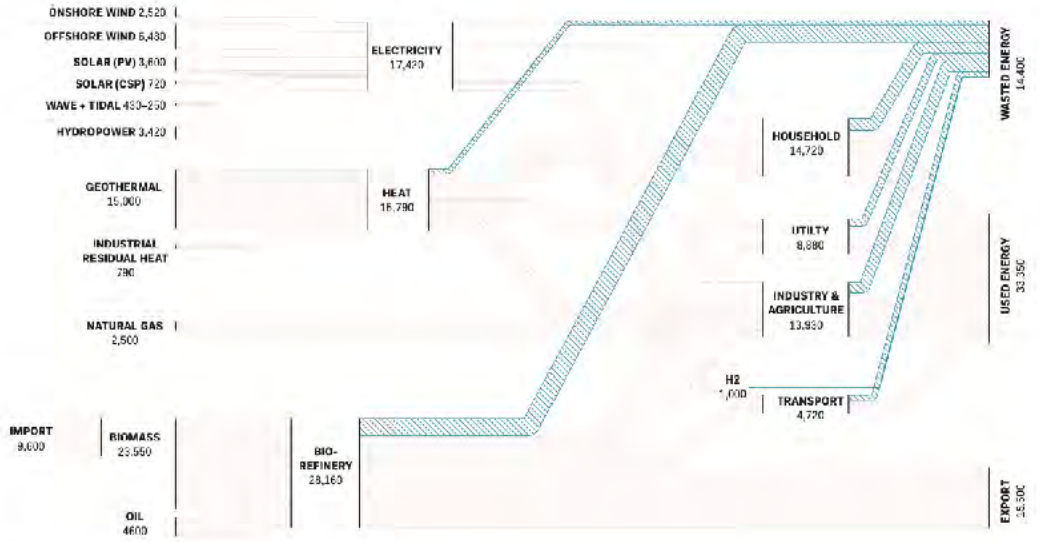
↑ Energy transition, Europe

Following Through: Europe 2040-2050

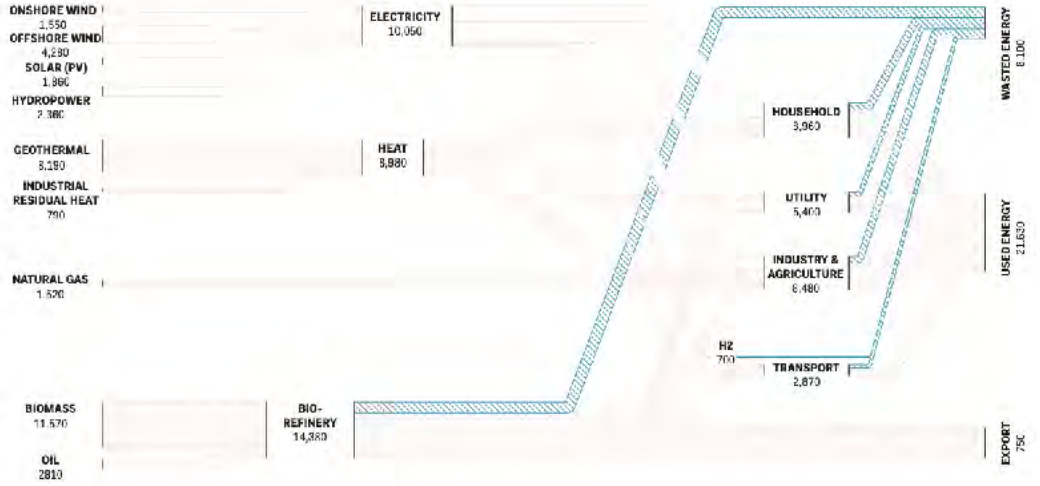
A new method of calculating the costs of energy consumption will be introduced after 2030, with the internalization of the energy costs that have until that point been externalized (Carbon added tax). This will trigger such a steep rise in the price of fossil fuels that renewable energy will become the more competitive option. There will be increases of scale in both wind and solar energy. Scale expansion is to be expected, for instance, in the form of enormous solar fields in southern Europe and North Africa (Concentrated Solar Power) and large offshore wind farms connected to the new energy highways. The renewable forms of energy that had been experimental or not yet economically viable up to that point will also benefit from these changes. This applies to wave motion and tidal energy and to offshore energy hubs.

The New European Energy Landscape: 2050

The European agreement to achieve an 80 per cent reduction in greenhouse gas emissions between 1990 and 2050 is achievable, providing Europe pulls together in an energetic and goal-oriented effort to develop the new energy system, by using and developing the necessary technologies and introducing new policy. The end result will be a renewable European energy landscape, in which the different regions exploit their own strengths and opportunities, while supporting and supplementing each other's needs through mutual cooperation and exchange. If this can be achieved, the energy transition will coincide with a reinvigoration of the 'old continent'.



↑ Energy management, Europe 2050 (PJ): BAU (+15%)

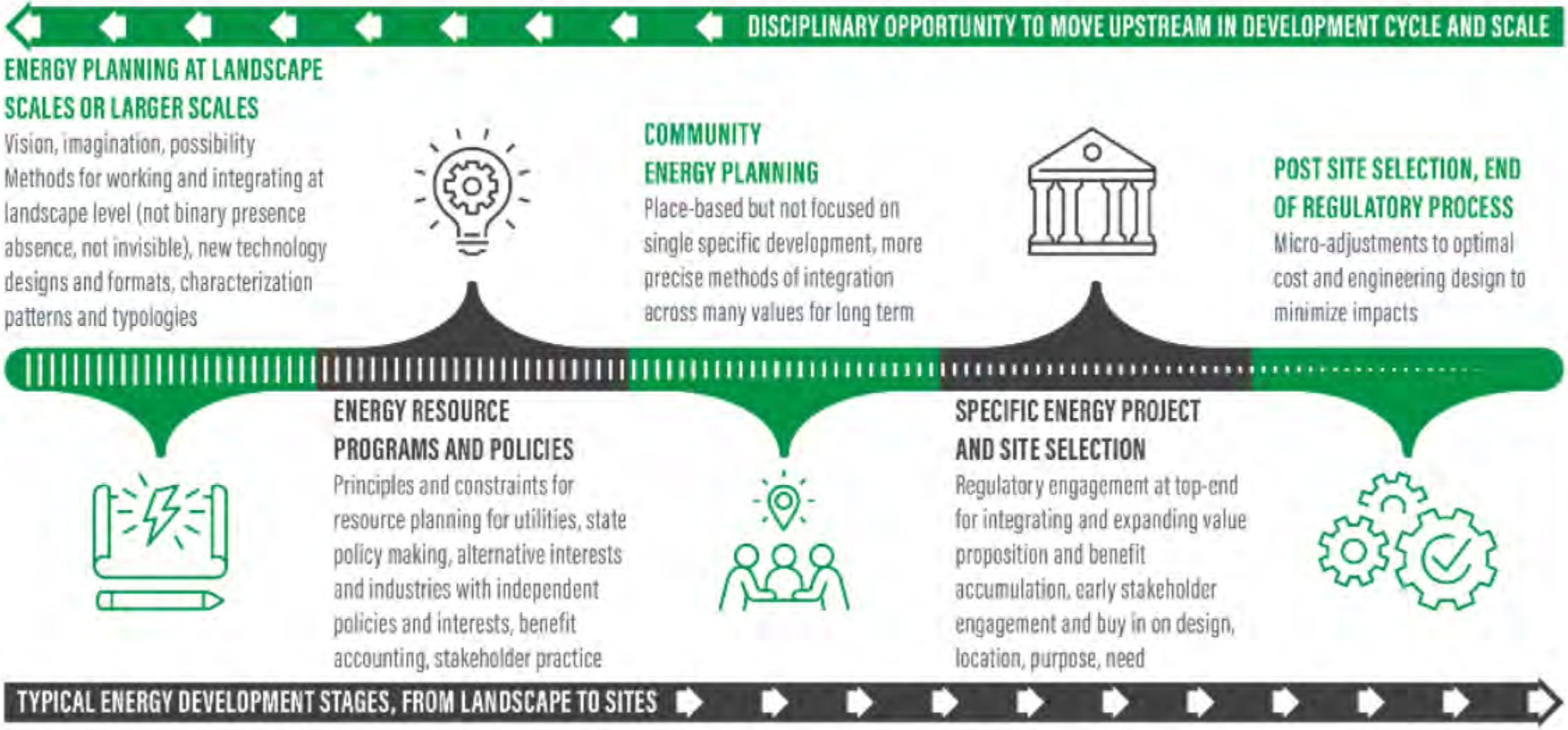


↑ Energy management, Arnhem 2050 (PJ): LESS (-30%)

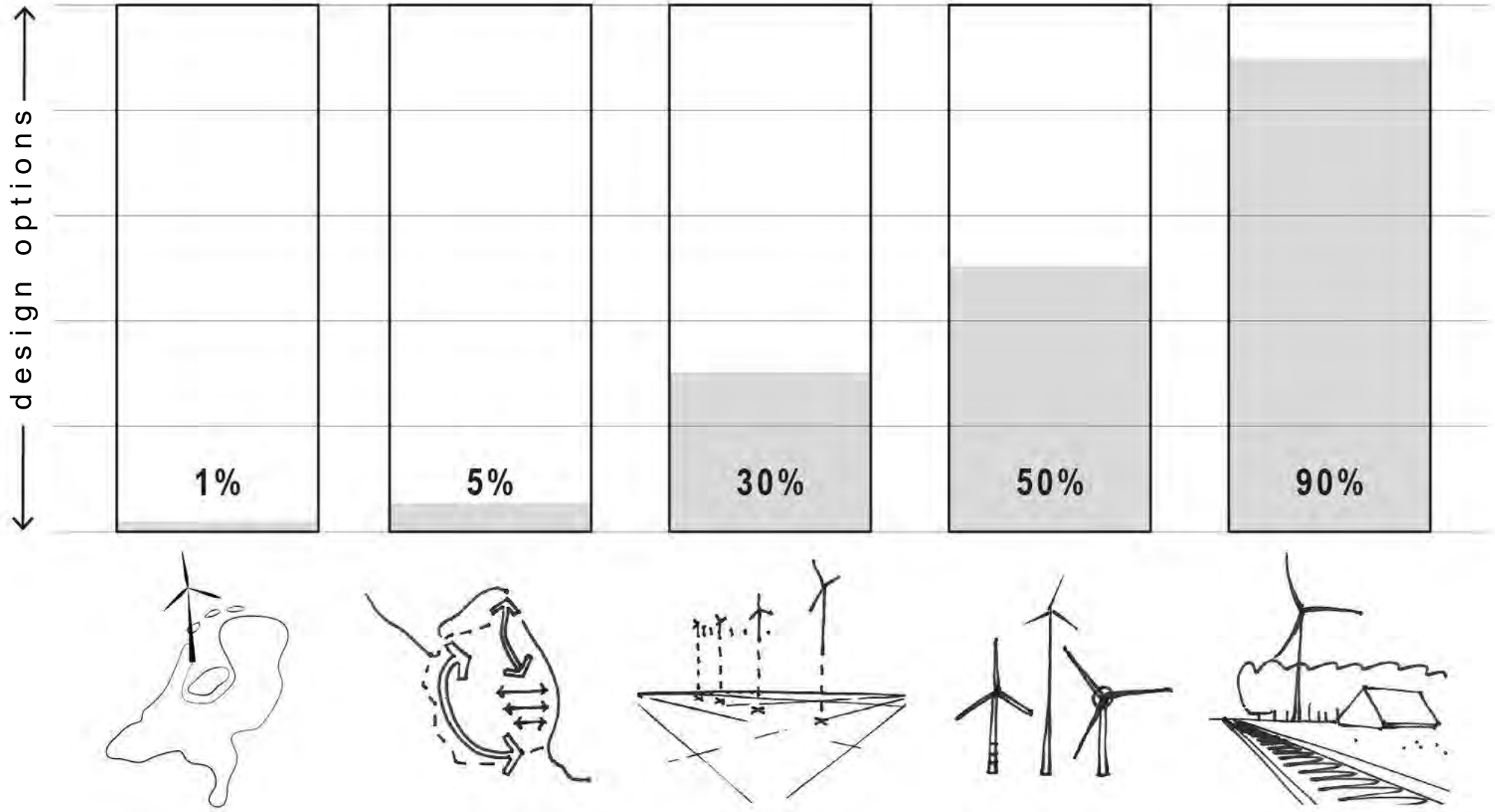
Designed opportunities to create integrated production landscapes

Designed opportunities to create new cityscapes

Design opportunities at different stages and spatial scales



Design opportunities at different stages and spatial scales

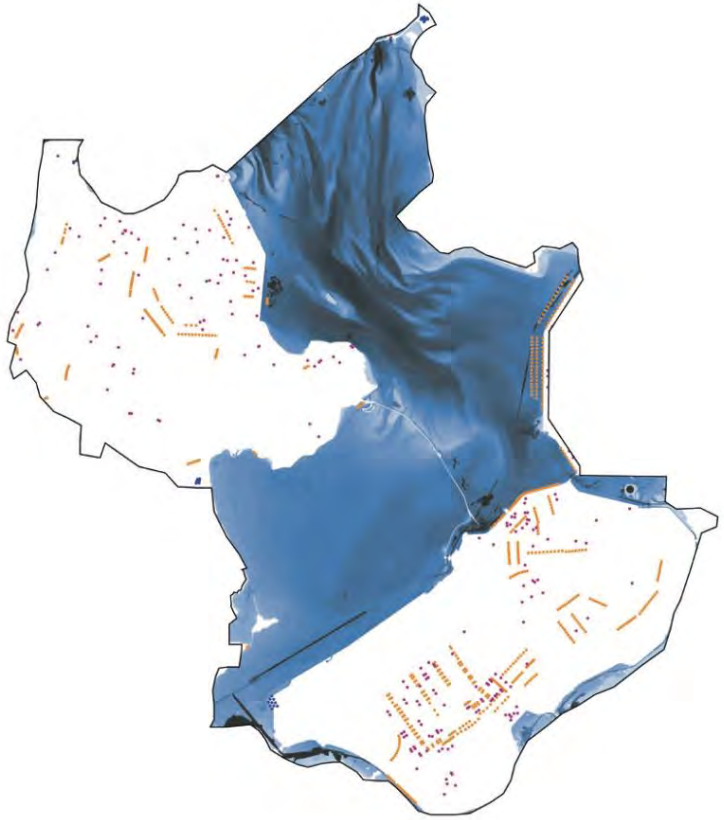


The Wieringermeer Plan

guidelines for repowering a curated polder landscape

photo credits: Hans van der Meer

More with less: tripling wind energy yield in a more harmonious energy landscape



Concept: water system as a structuring element for the polder landscape including wind energy

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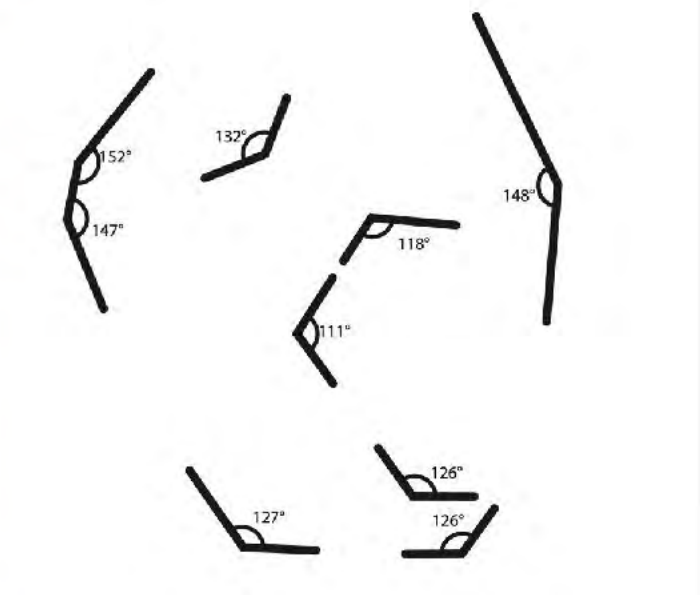
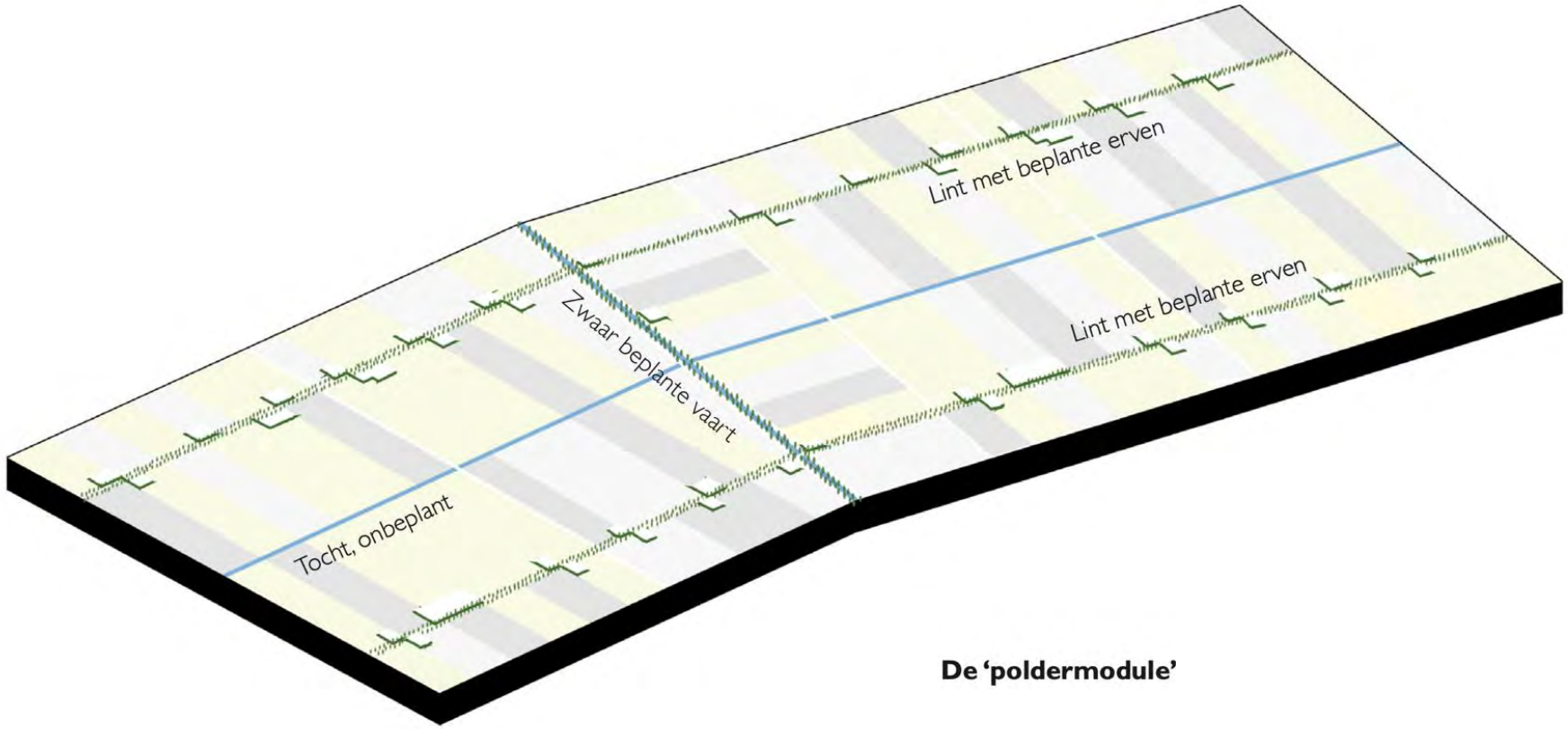
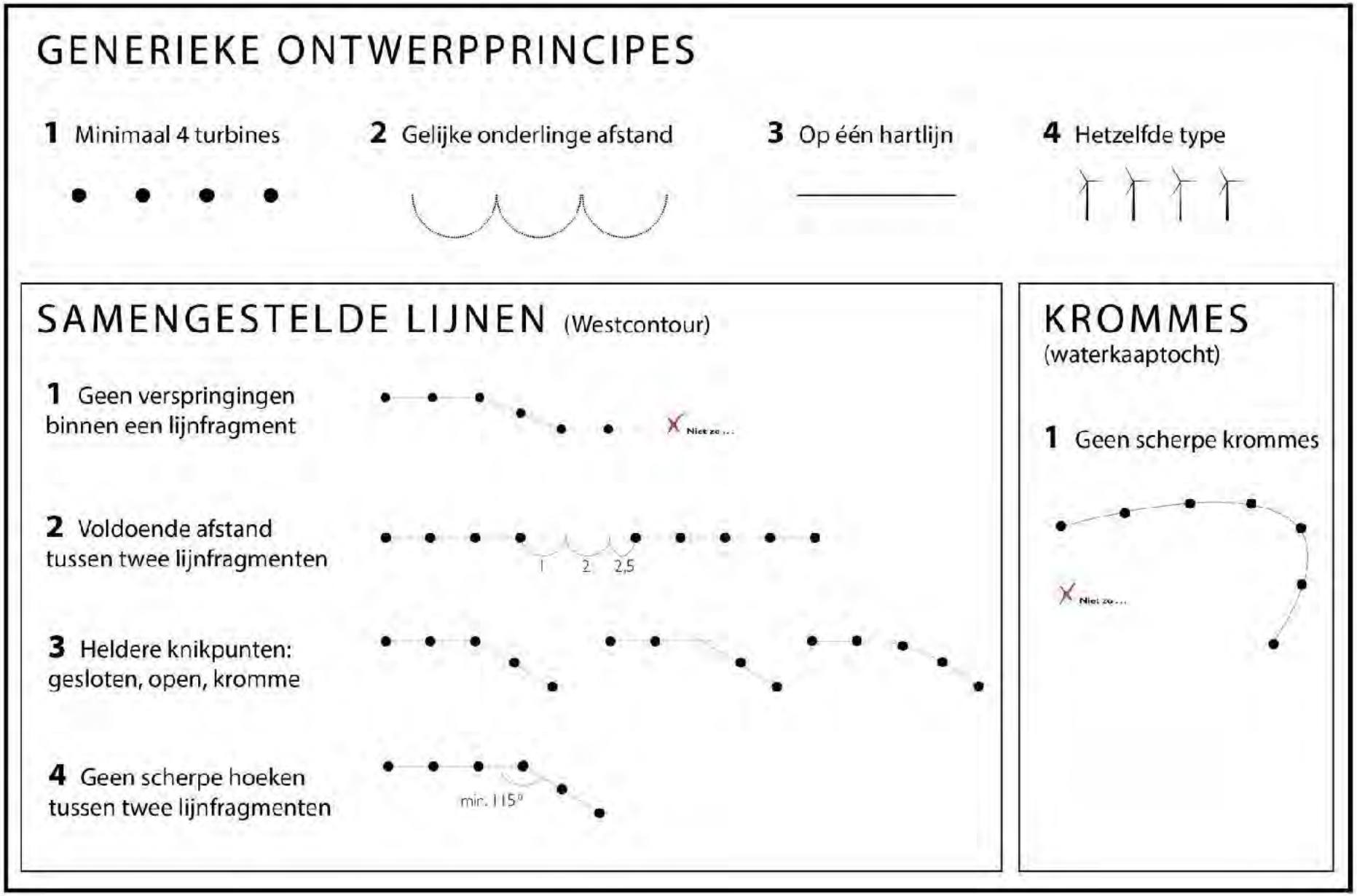


Concept: 'polder module’ as a basic building block for the wind turbine configuration

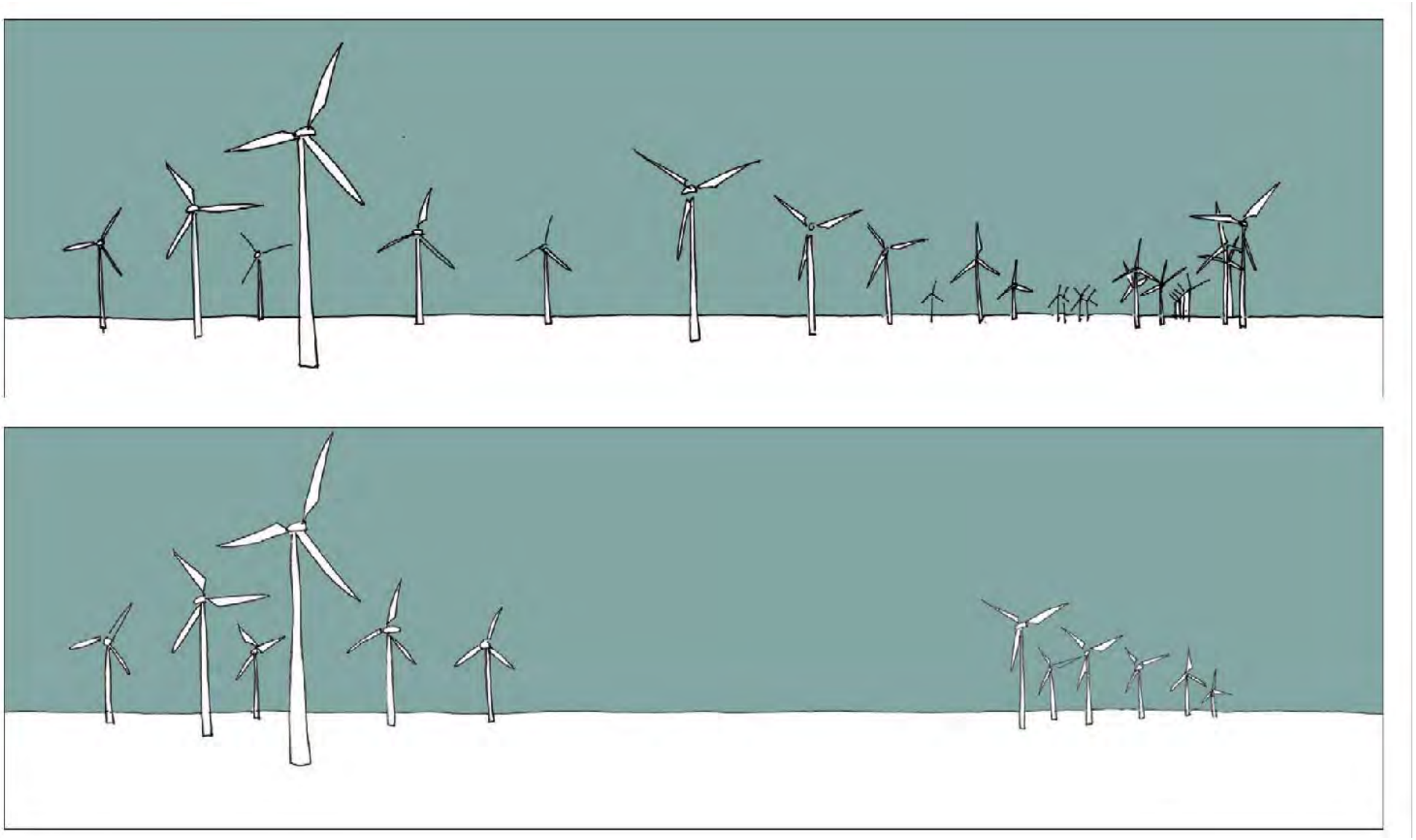


De ‘poldermodule’

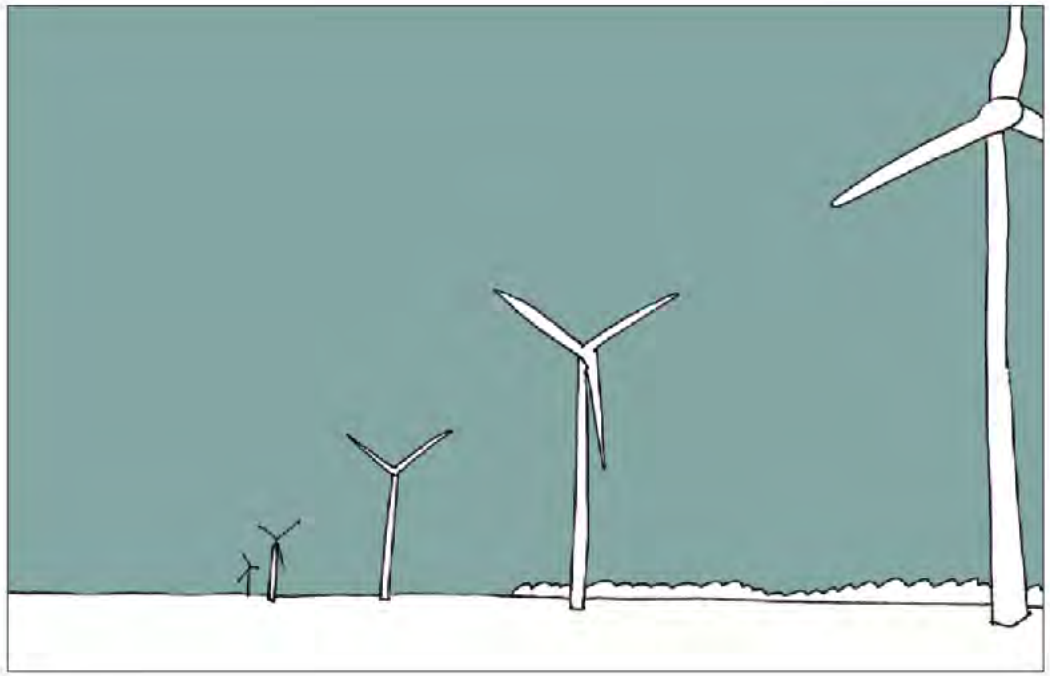
Configuration: clear linear configuration that forms a recognizable new layer in the polder landscape

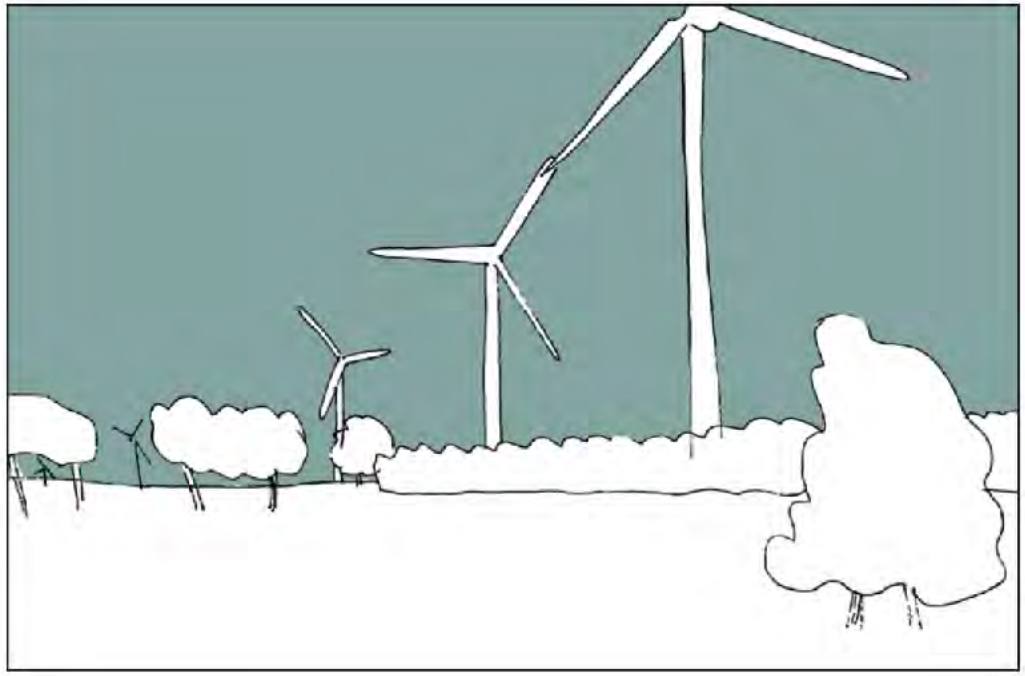


Configuration: 3D visualization of the dots on the map

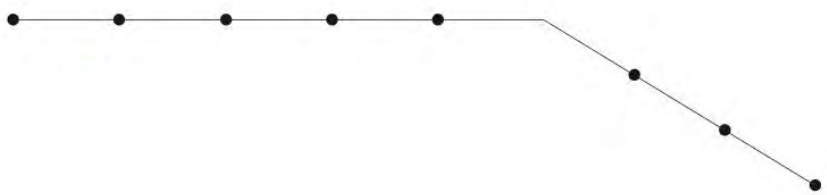


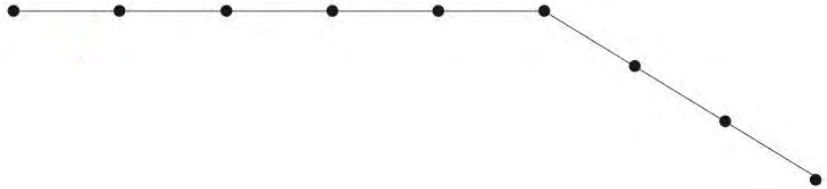
Configuration: 3D visualization of the dots on the map

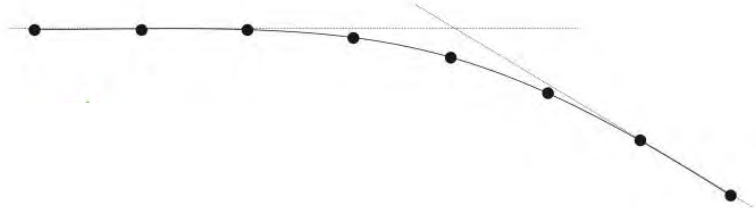


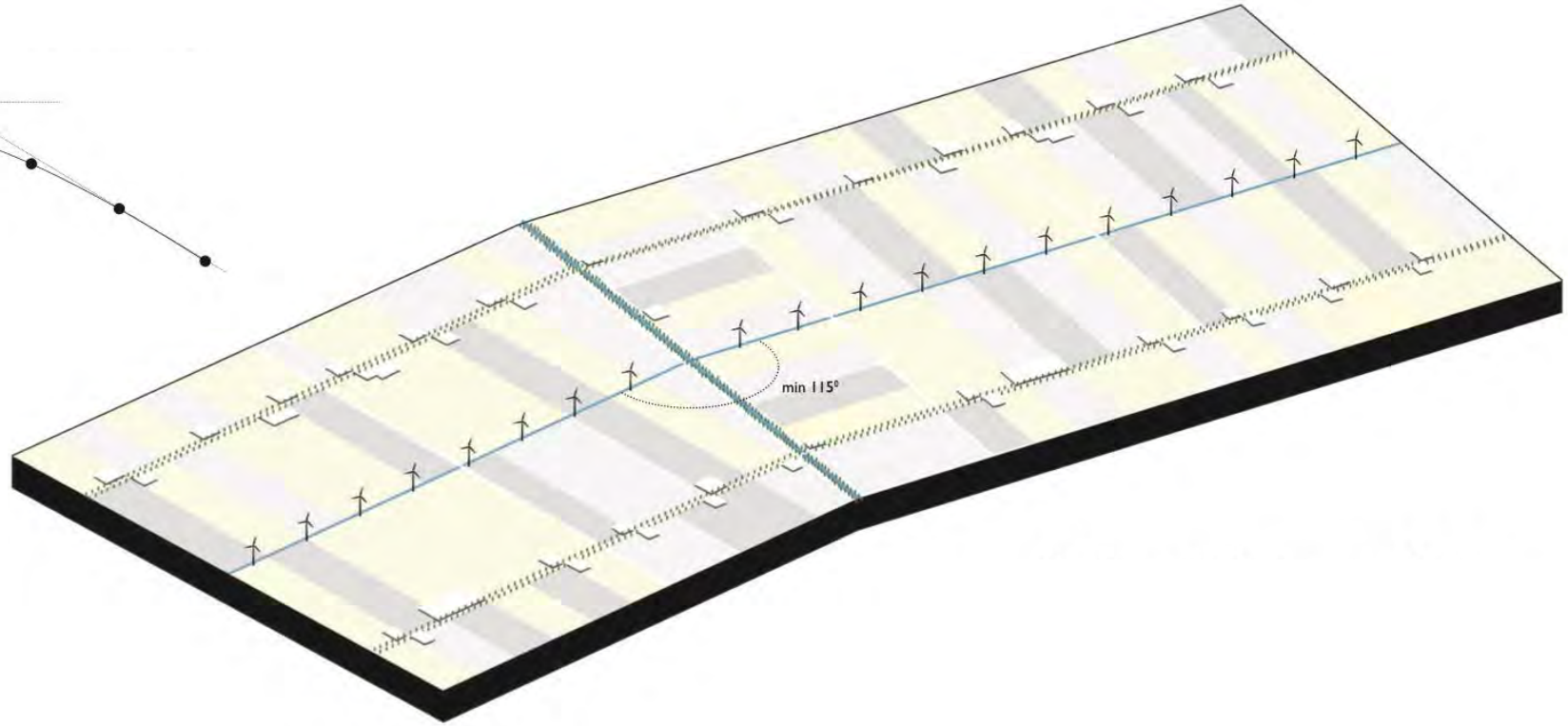


Configuration: curving rows of wind turbines

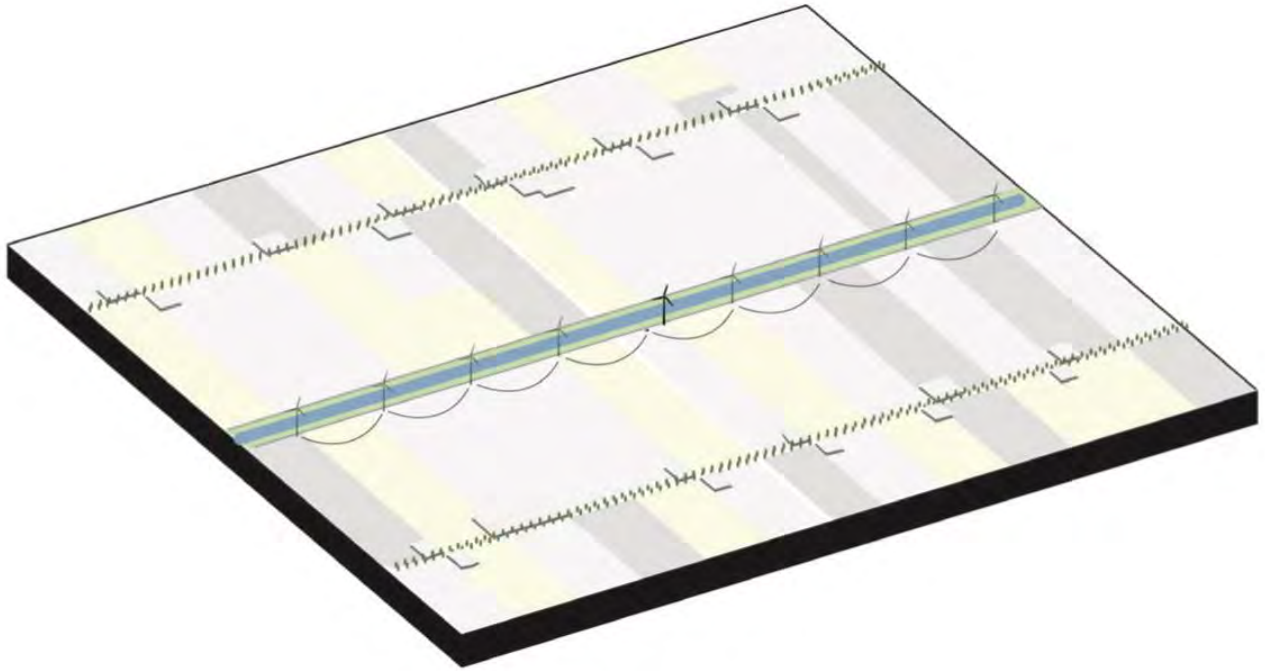


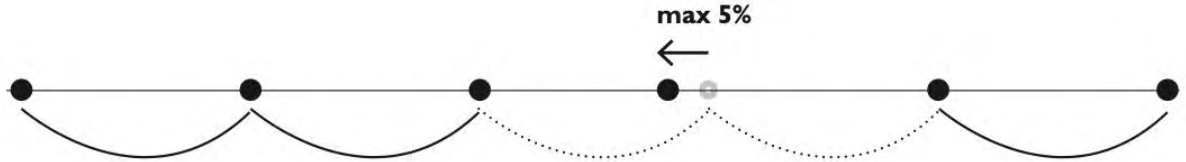




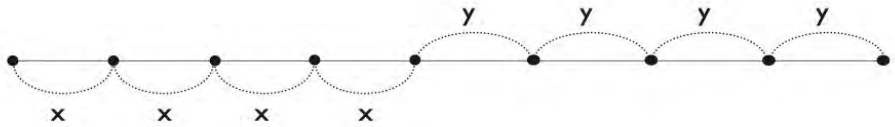


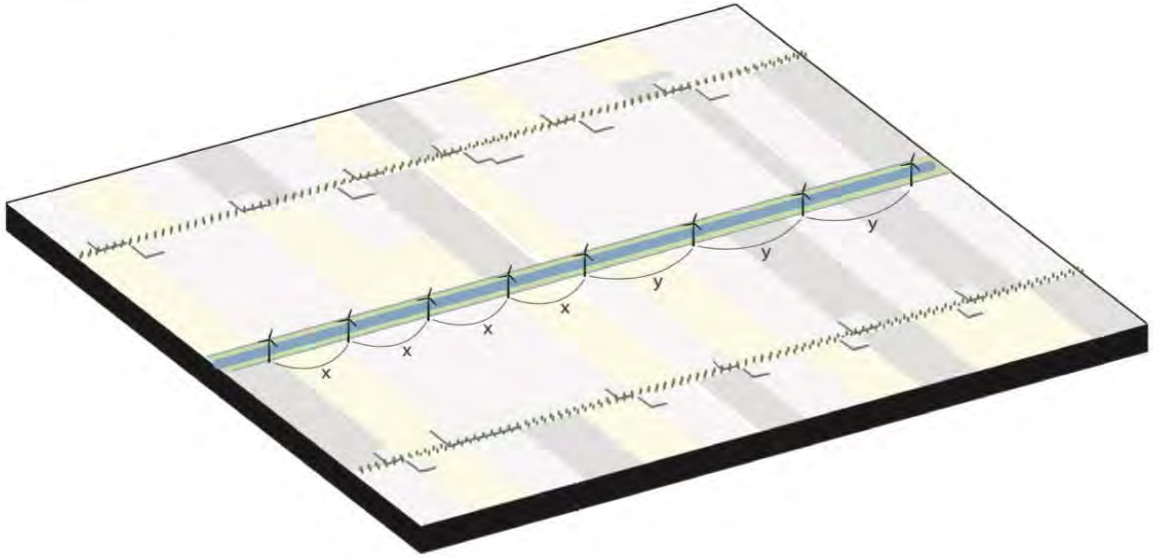
Configuration: within a row maintain the distance between the wind turbines…



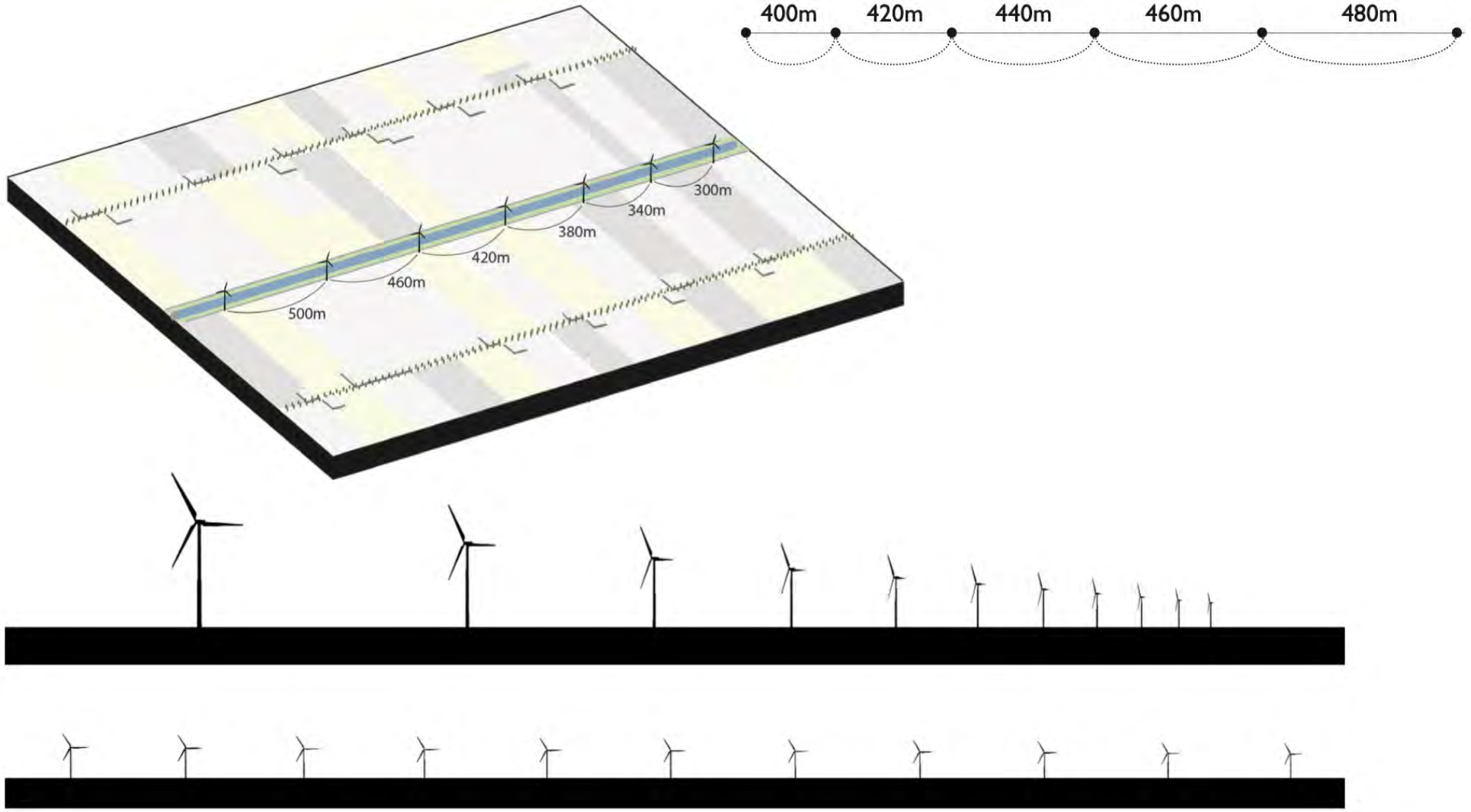


… or make decisive changes

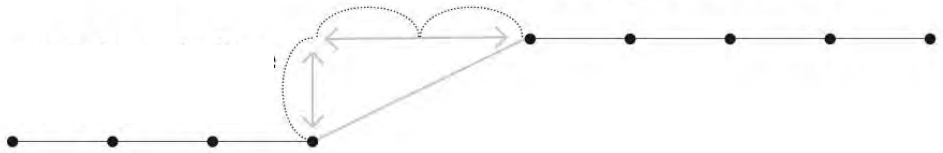


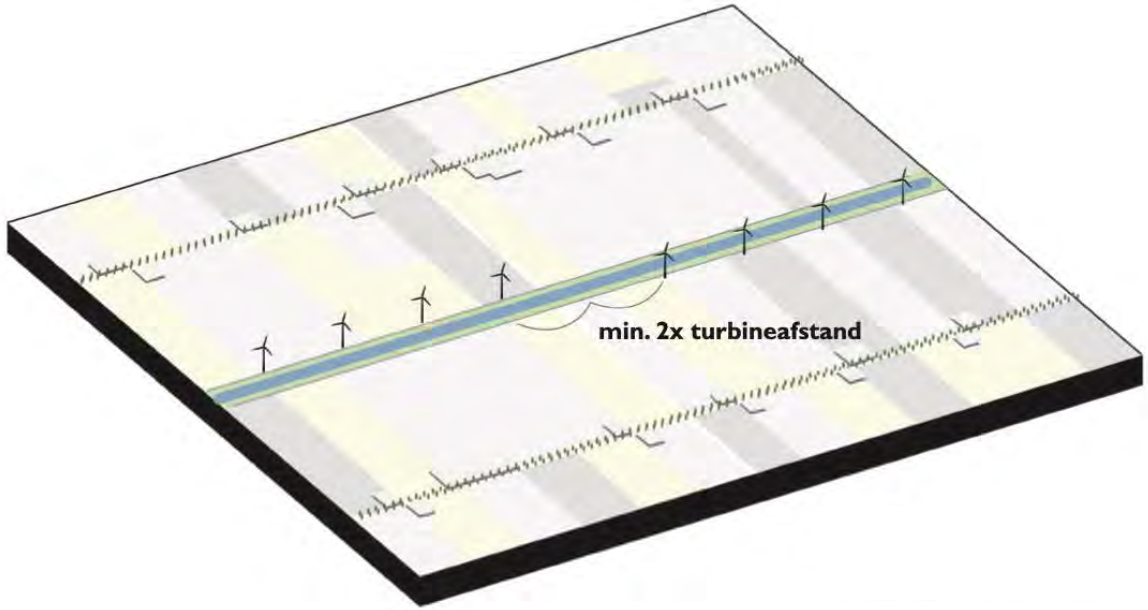


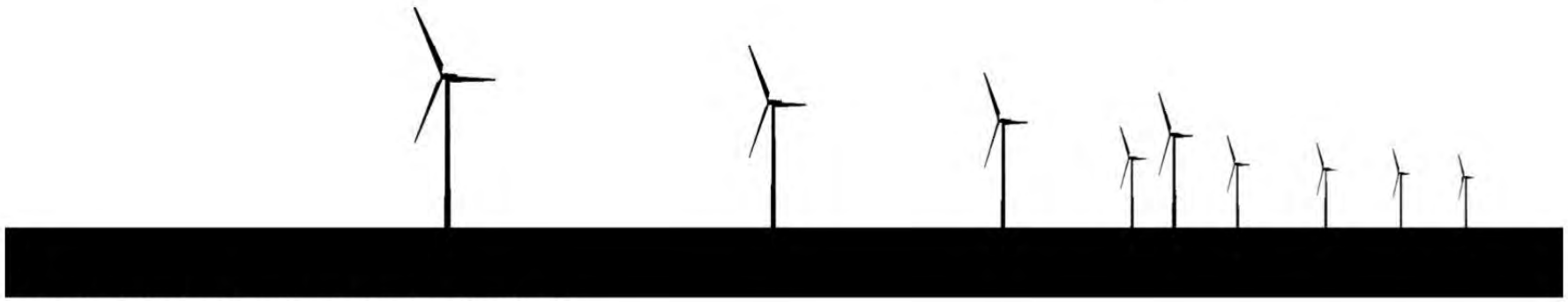
… or make progressive changes



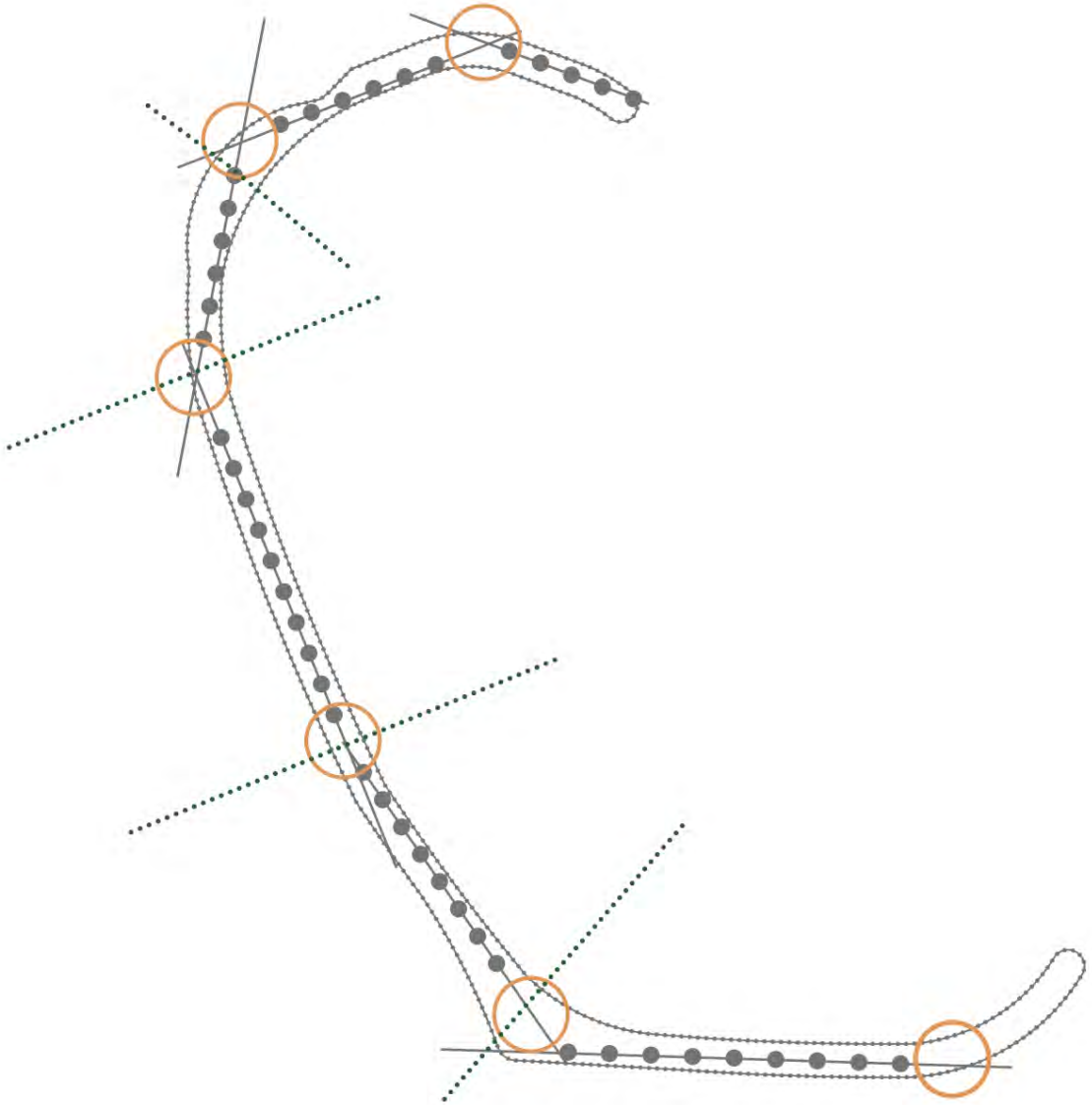
Configuration: use spacings when jumping structuring landscape elements like waterways

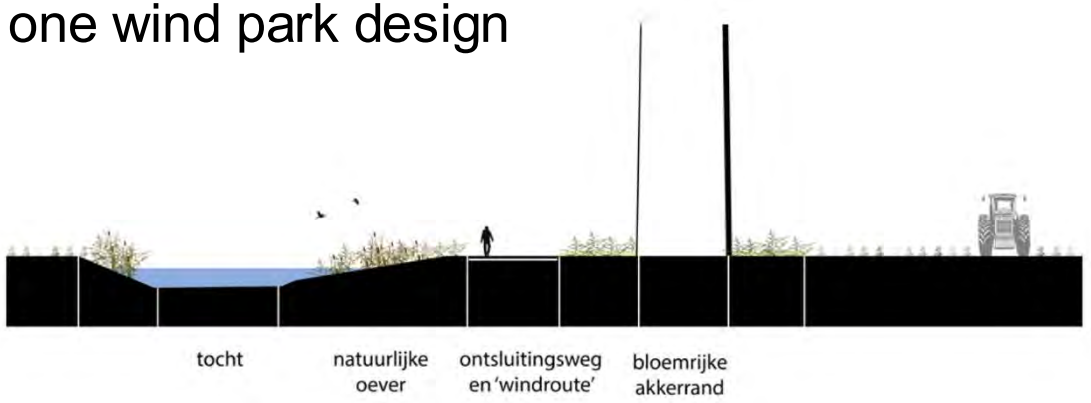


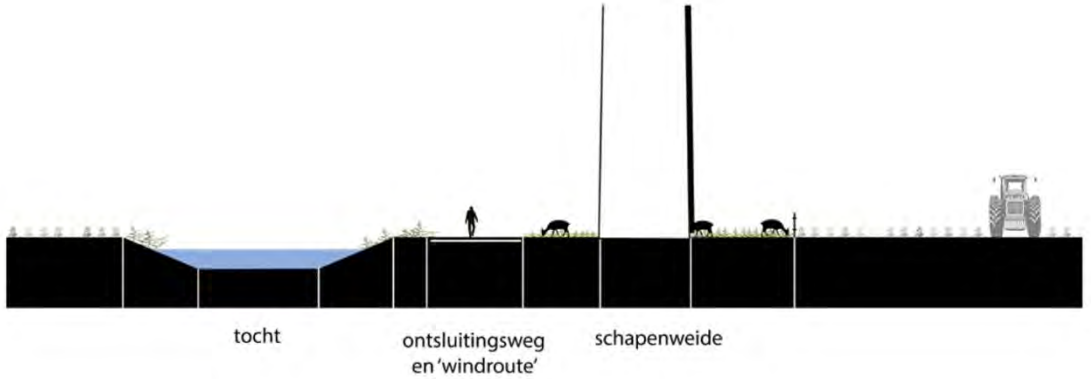


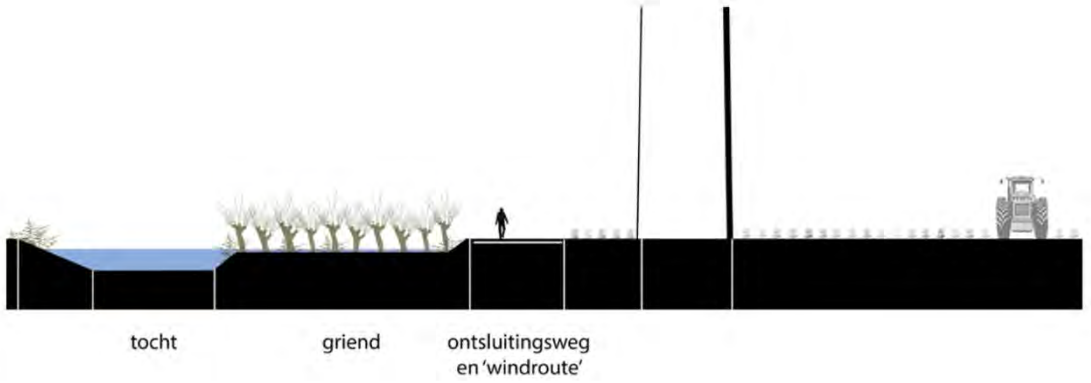


Configuration: wind turbine placement rules combined in one wind park design

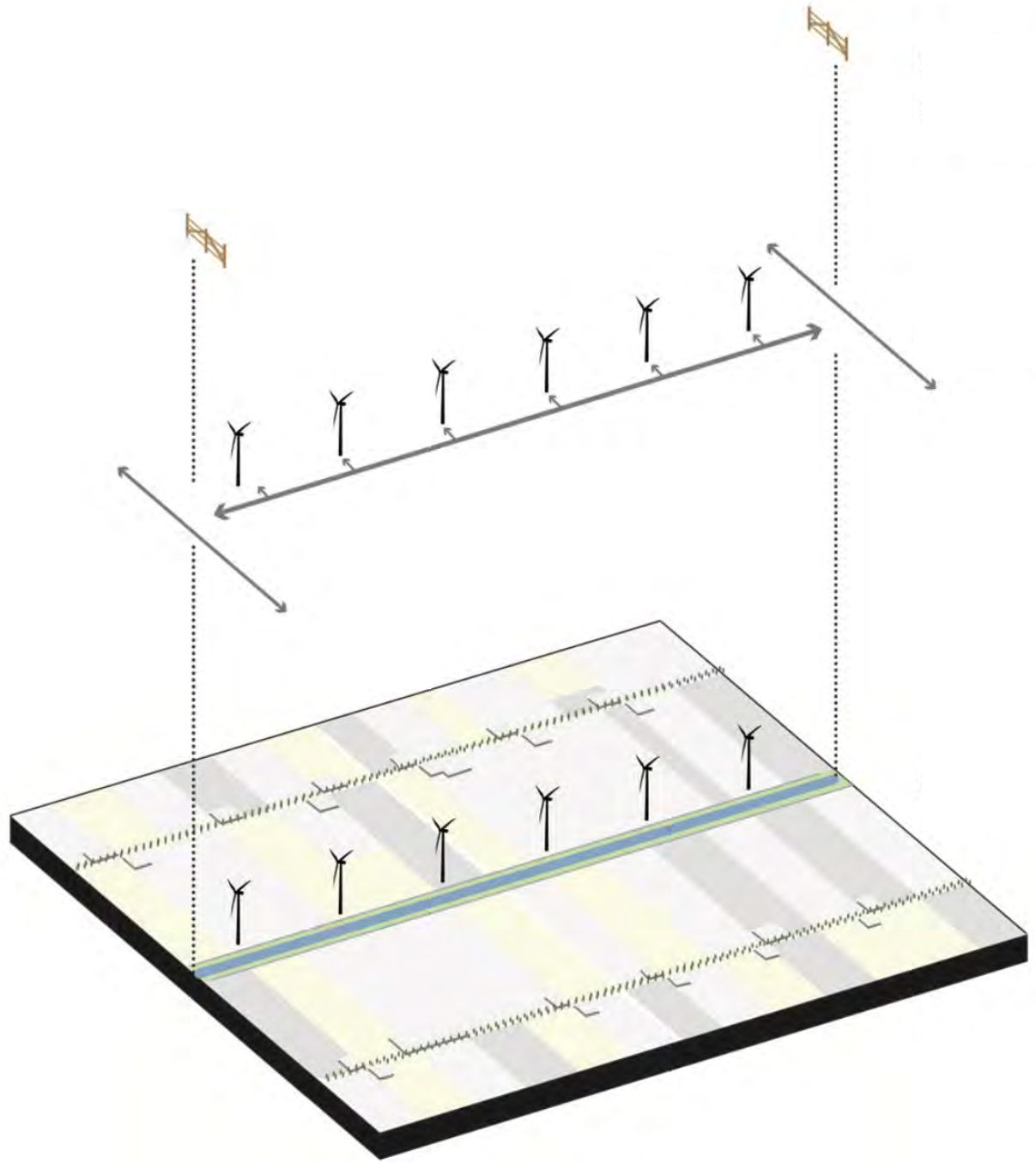




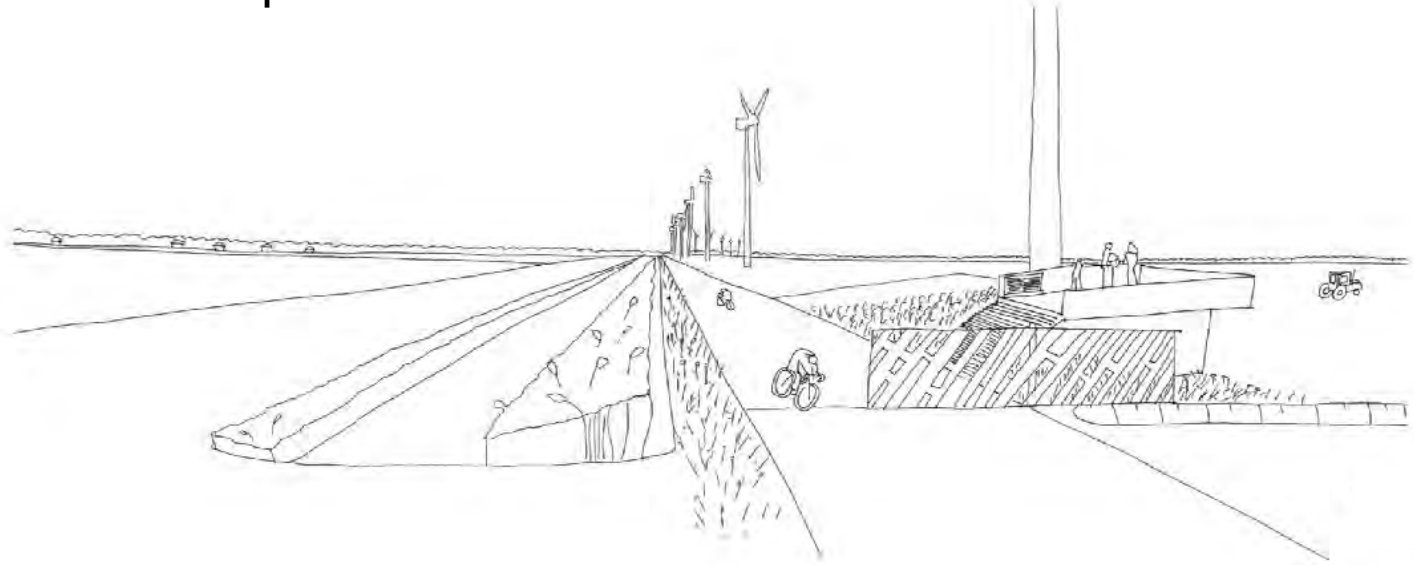


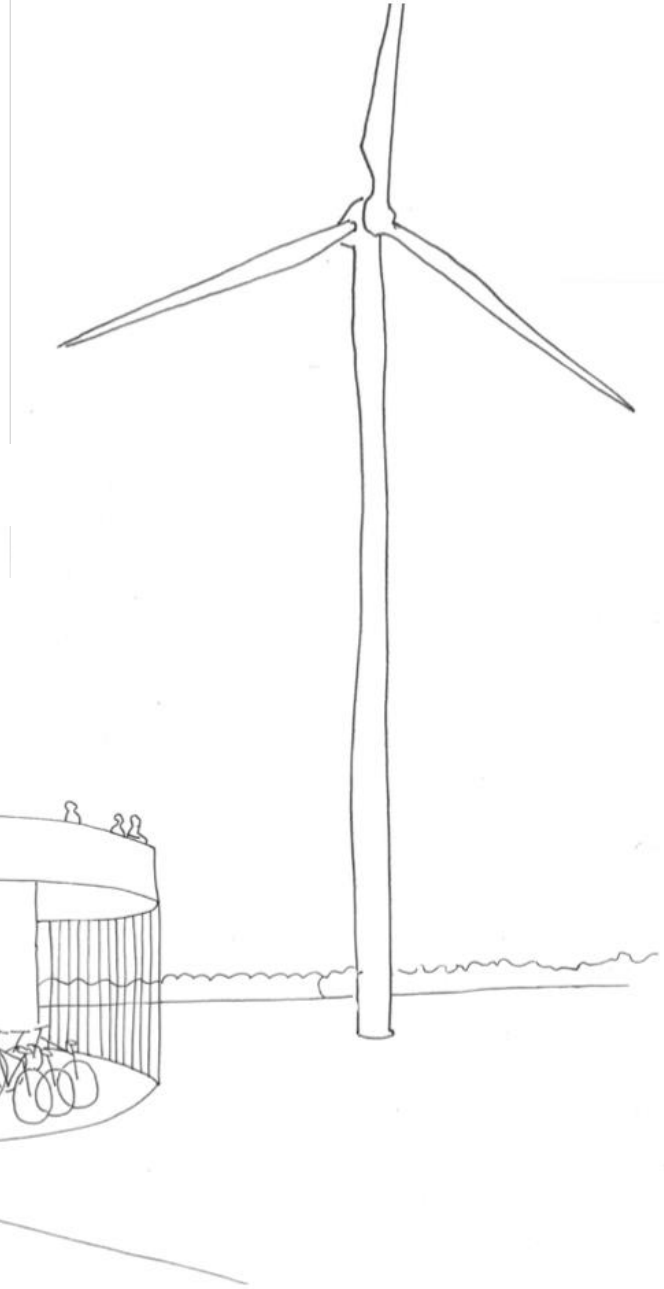


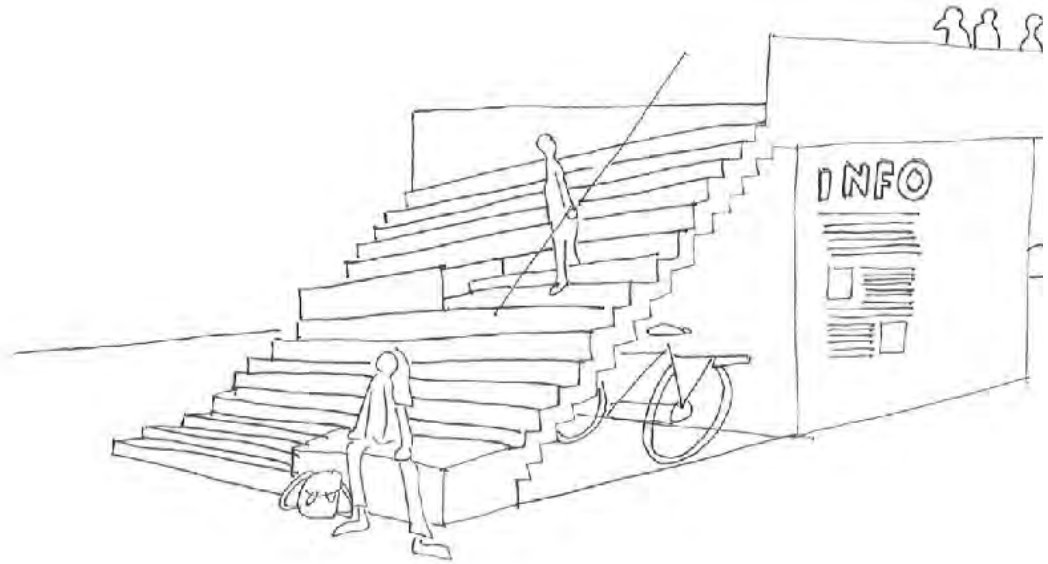
Integration wind park as an *ensemble* of elemen



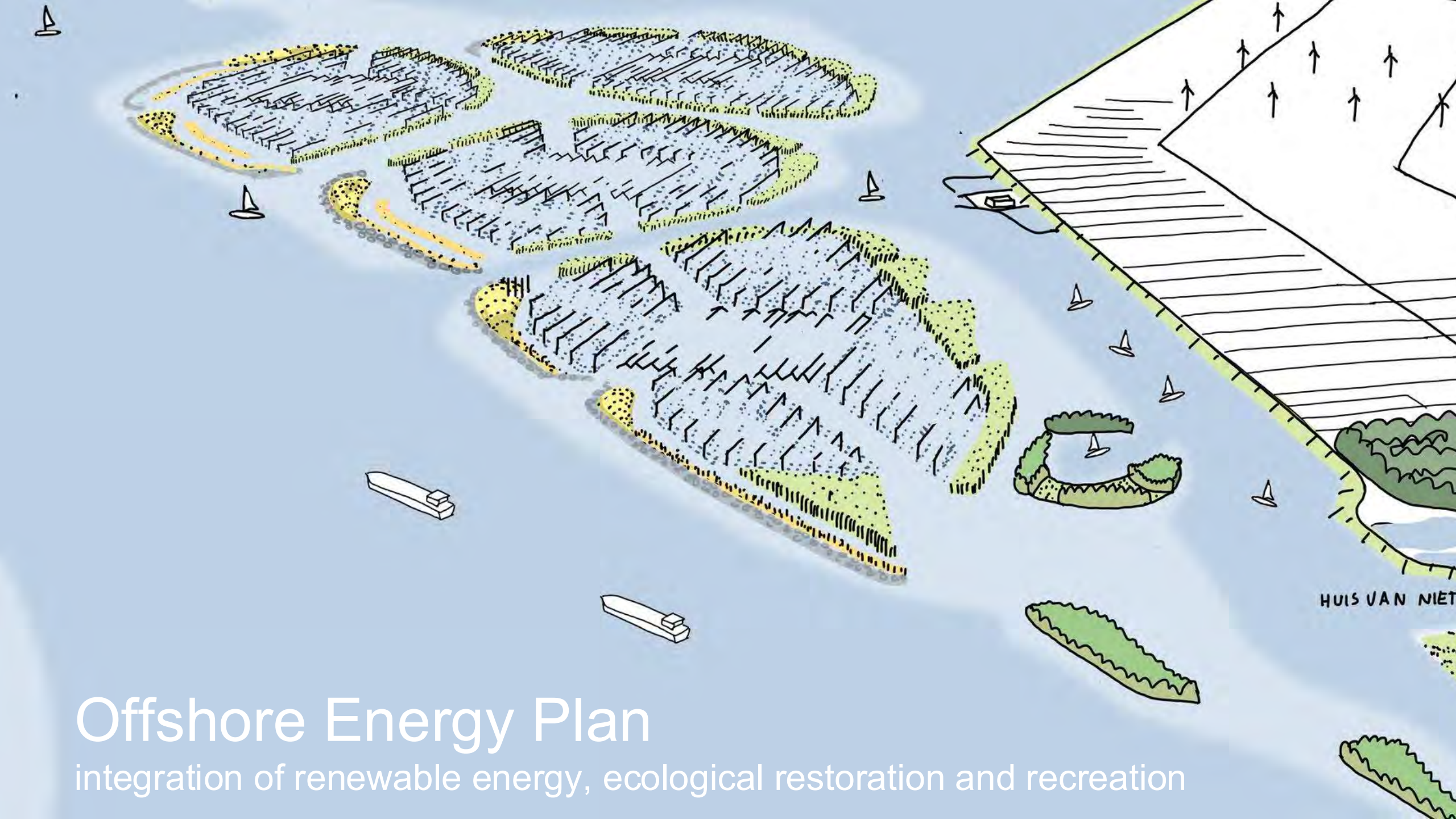
Integration wind park as an *ensemble* of elements







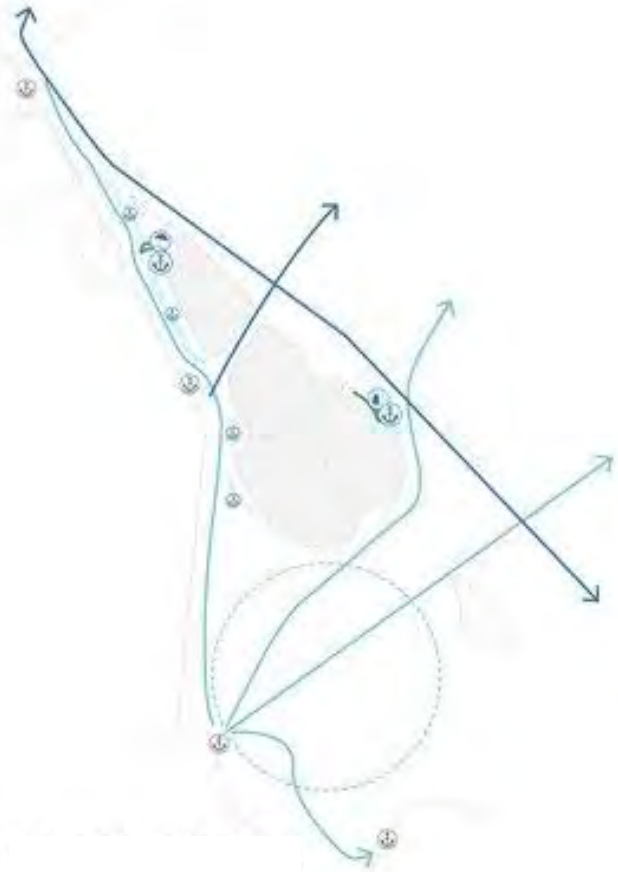
Wind energy park as a cultural landscape



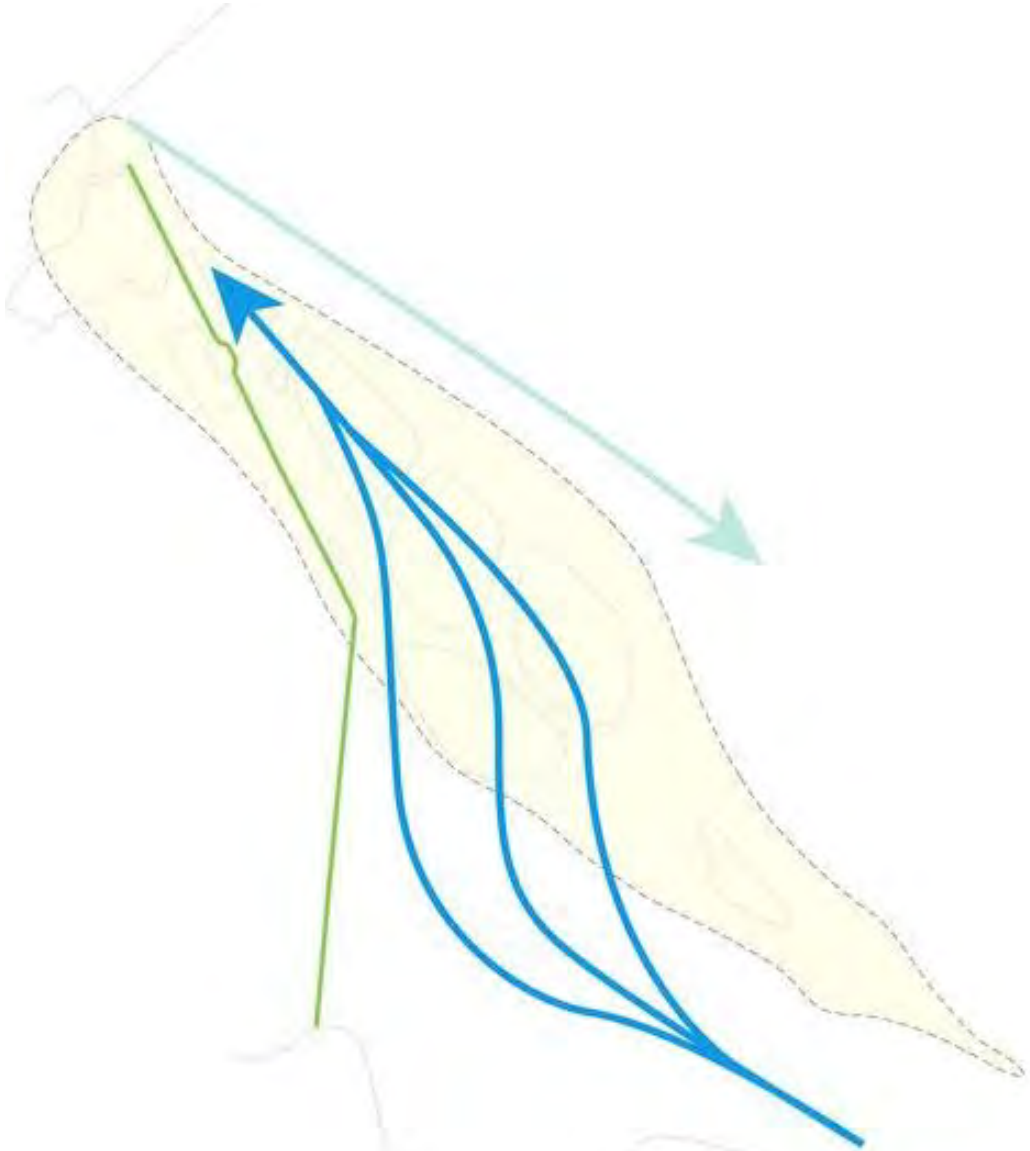
Offshore Energy Plan

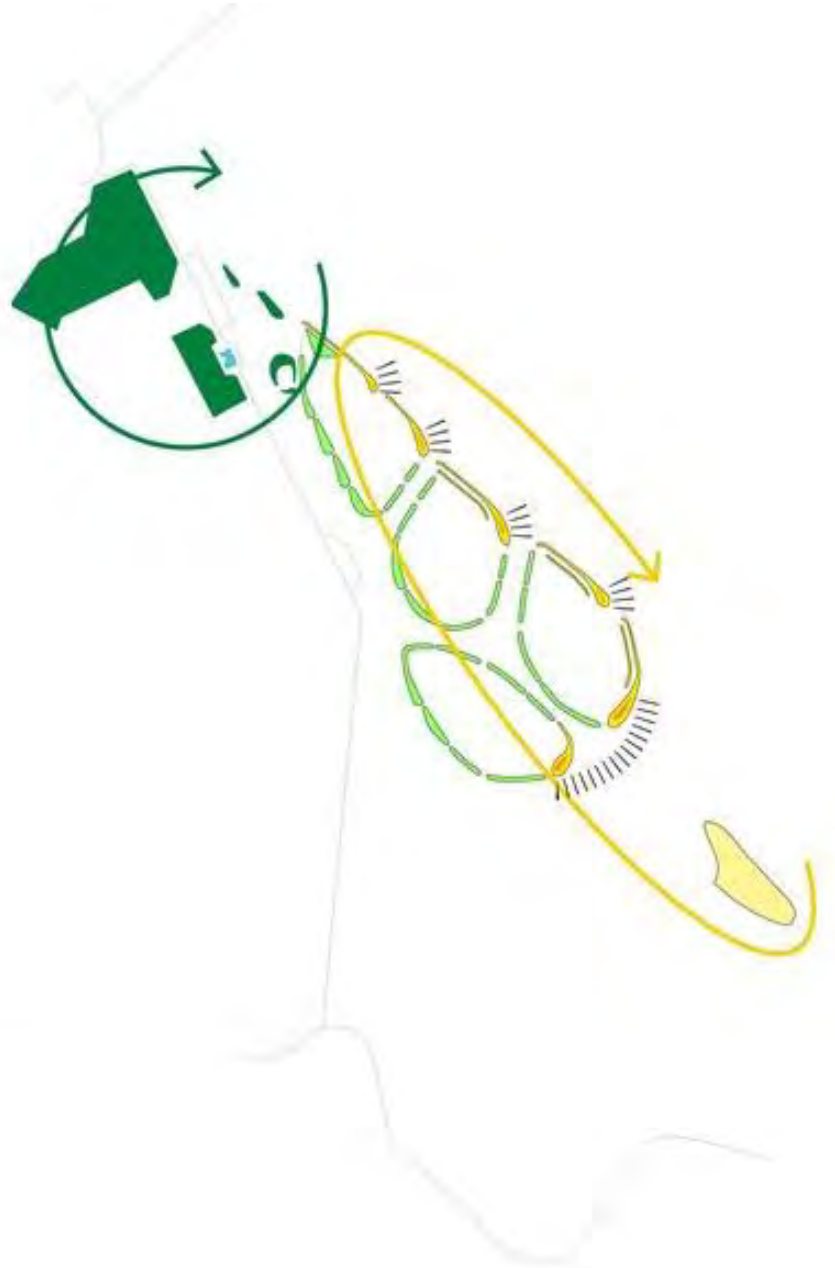
integration of renewable energy, ecological restoration and recreation

Private initiative to restore ecology, produce 1.7 TWh solar energy and promote the regional economy

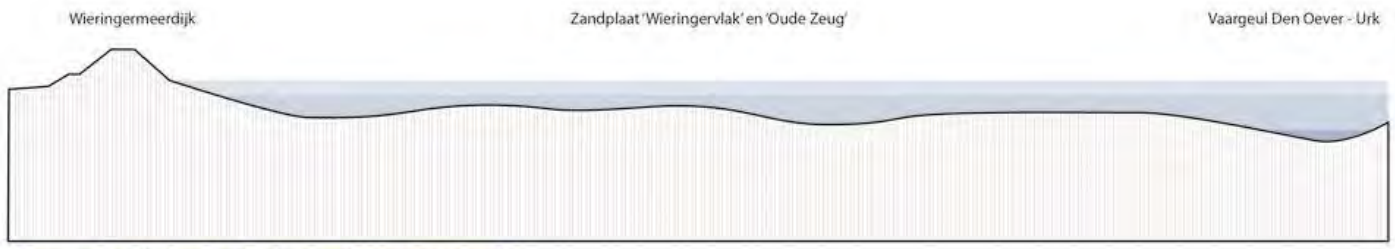


System approach: building on offshore natural processes and the onshore cultural landscape

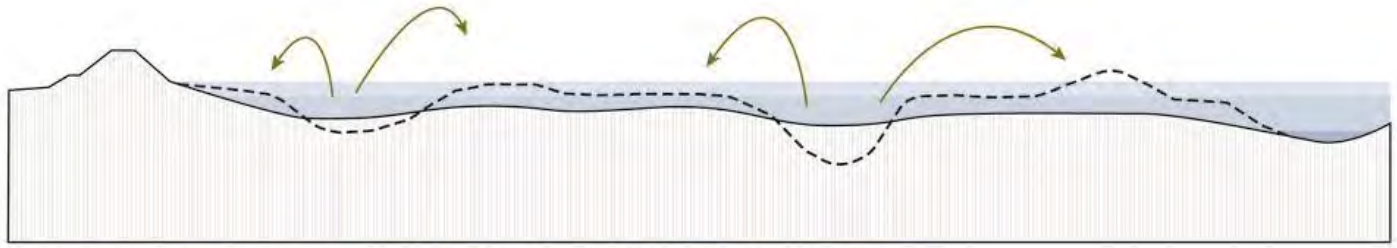




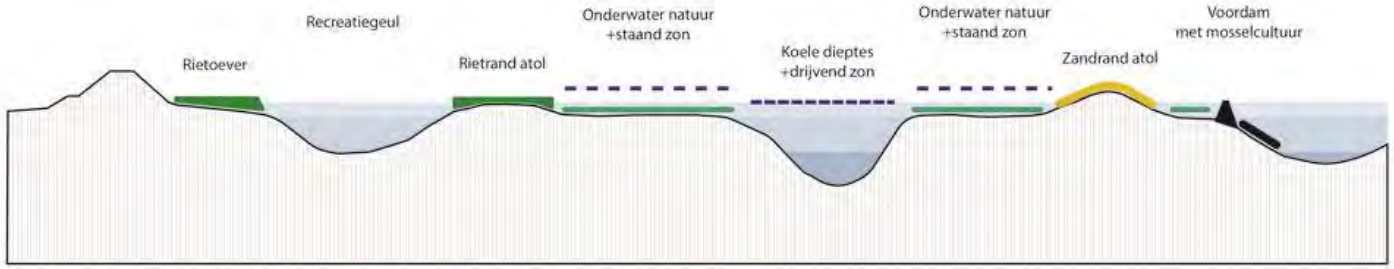
Modulating underwater topography for ecology, solar field installation and nautical recreation



principe profiel van de huidige onderwatertopografie



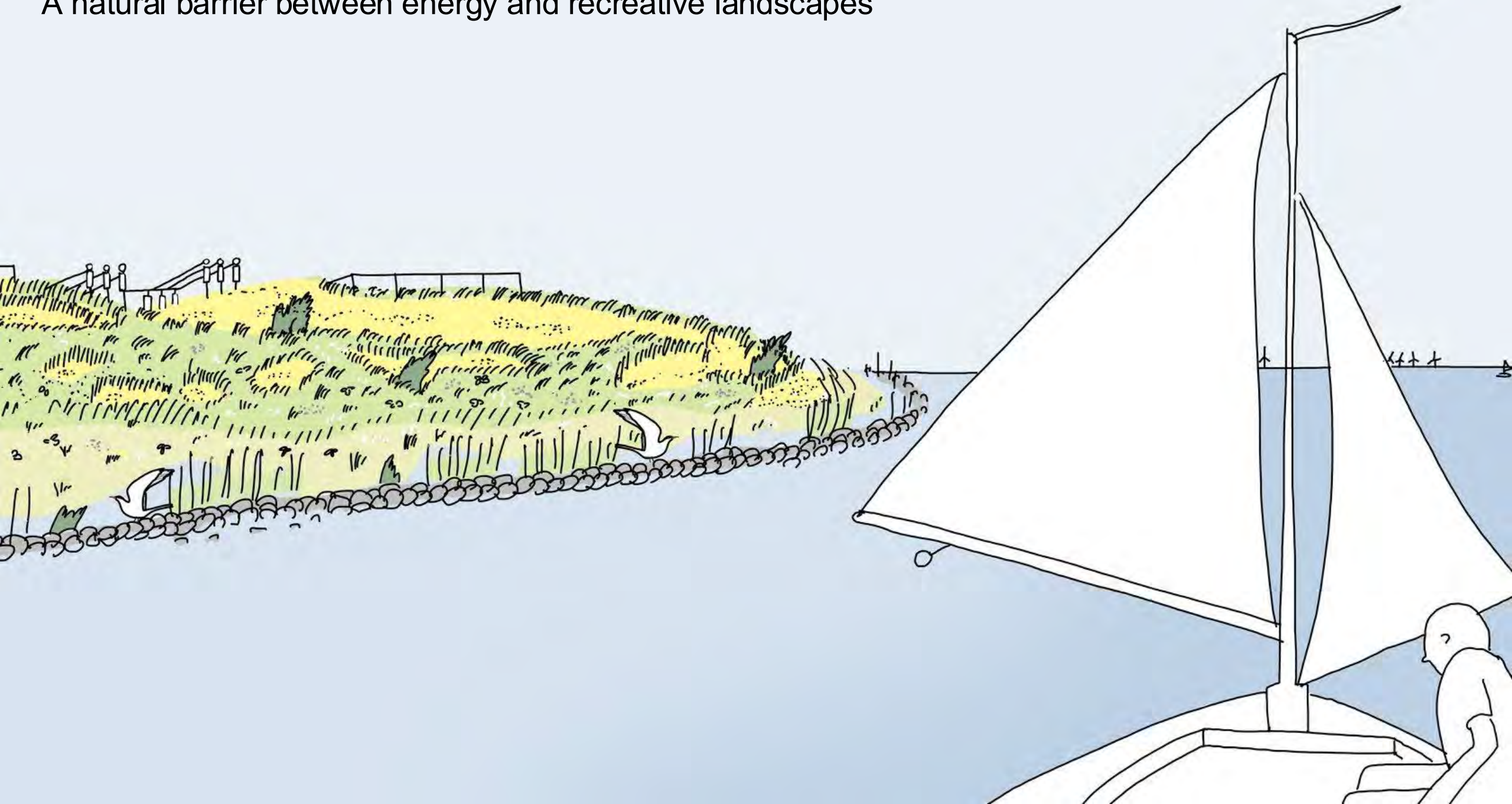
principe aanpassing onderwatertopografie. Diepe delen worden dieper, ondieptes verontdiept.



principe atollen, nieuwe onderwaternatuur met zon en nieuwe recreatievaargeul.

Establishing a relationship with the onshore green infrastructure

A natural barrier between energy and recreative landscapes



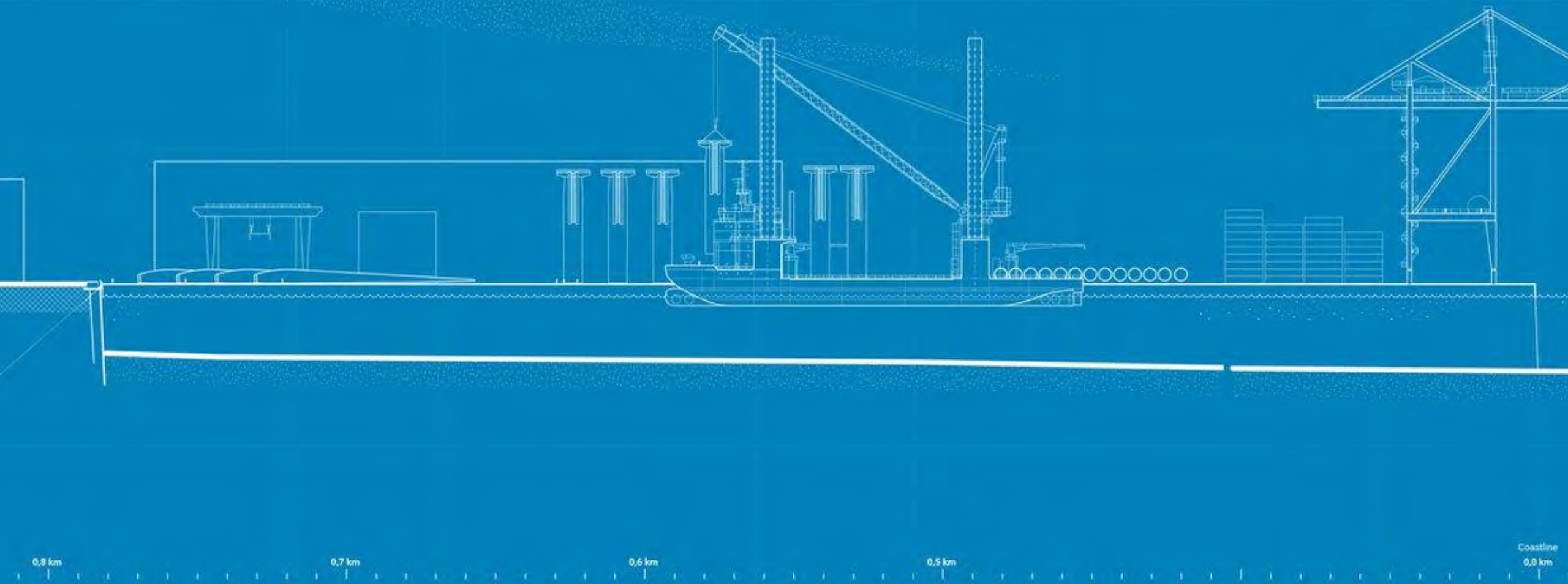
2050 - An Energetic Odyssey

imagining an XXL energy landscape

Energy system thinking at the largest scales of space and time

Opportunities for political reconnection

Designing blueprints for energy landscapes



Designing blueprints for energy landscapes

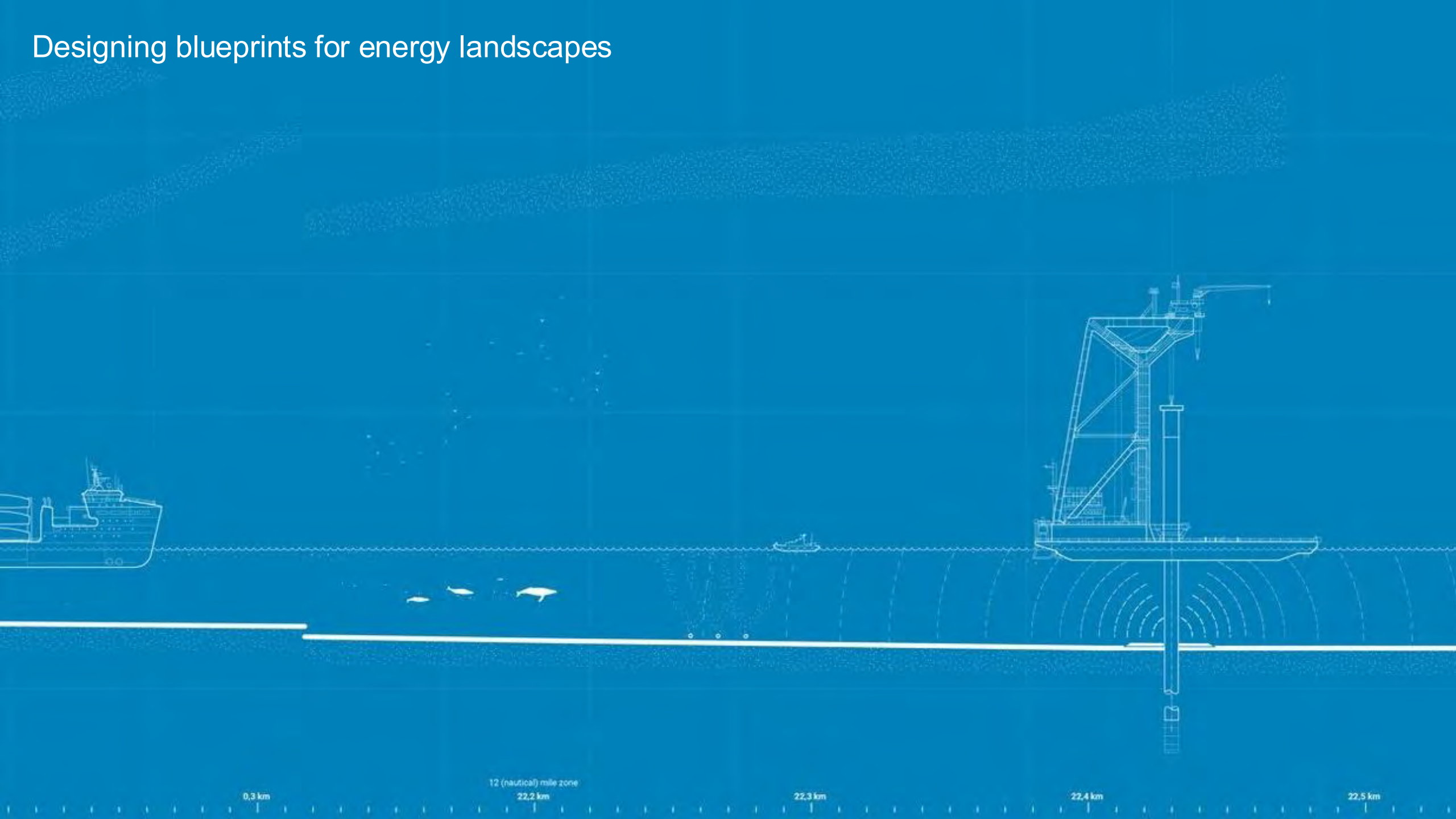


photo credits: Freek van den Bergh

Configuring The Energy Layer:

Landscape's Role in the Energy Transition

CELA – March 28, 2025

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