rethink*rotor 日本

Workshop
WASEDA University x h_da

May 26, 2025

WASEDA University

h_da darmstadt university of applied sciences faculty architecture

member of eut+ European University of Technology

OX2 architekten

rethink rotor

TOKOROLABS RESEARCHERS

WORKSHOP | SCHEDULE

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TOP 1 **Opening Remarks**

- short round of introductions of the individual parties

TOP 2 **Presentations**

- Professor Marcin Orawiec, Ina-Marie Orawiec (h_da / OX2architekten)
- Professor Kang (Seoul National University)
- Professor Kamiya (Waseda University)
- Professor Carla Susana Assuad (Norwegian University of Science and Technology)

TOP 3 **Lunch**

TOP 4 **Students Presentations**

- students from h_da / OX2architekten
  rethink*rotor // blade*stage // power**stage* // Departure to Rotopia // Energy on the Water
- students from Waseda University

TOP 5 **Closing Remarks**

TOP 6 **Campus Tour**

TOP 4

Student Presentations

学生発表

Student Concepts
rethink*rotor

past and current integration into academic studies

CreativeLAB rethink*rotor @ h_da | Integration into Teaching

rethink*rotor
X
h_da
HOCHSCHULE DARMSTADT
UNIVERSITY OF APPLIED SCIENCES

- Used in various teaching formats
- Design, construction & electives
- Real-life research for students
- Interdisciplinary & focused on reuse

CreativeLAB rethink*rotor @ h_da | Formats & Examples

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- Bachelor & Master Design Studios
- Construction courses on blade systems
- Elective: Wind Energy & Rotor Blades
- Students from different semesters

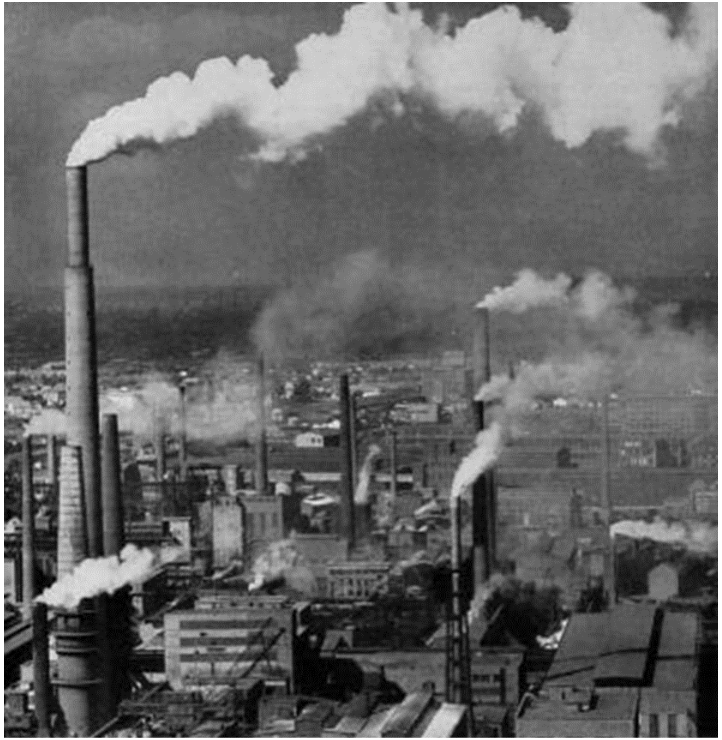
CreativeLAB rethink*rotor @ h_da | Output & Next Steps

- Results feed into research and exhibitions
- Each project adds to our knowledge
- Students shape the future direction

And we are very proud that some of the students will now share their ideas!

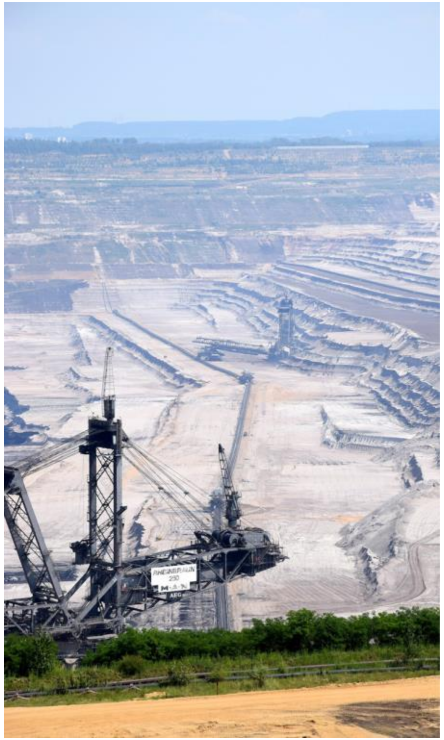
rethink*rotor
blade*stage

Draft project at h_da



- Start of coal mining in the Ruhr area in Germany in the early 1820s
- Since then coal burning is extremely harmful to the climate
- Powerful companies use lobbyism and financial loopholes

blade*stage | Environmental Impact



- Destruction of entire villages and displacement of residents
- Irreparable holes left in the landscape
- Permanent use of pumping stations to keep the area dry

blade*stage | Political Shift

- Recognition of the dangers of climate change
- Shift from coal-facilitating laws to greener solutions
- Demonstrations to save villages from being destroyed

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blade*stage | Political Shift

WASEDA University h_da darmstadt university of applied sciences faculty architecture member of eut+ european university of technology OX2architekten rethink rotor TOKOROLABS RESEARCHERS

What does this have to do with rotor blades?

blade*stage | Kimiko Festival Aachen

- Collaboration with rethink*rotor for a new stage design

- Spontaneous decision and initial renderings for the festival

blade*stage | Kimiko Festival Aachen

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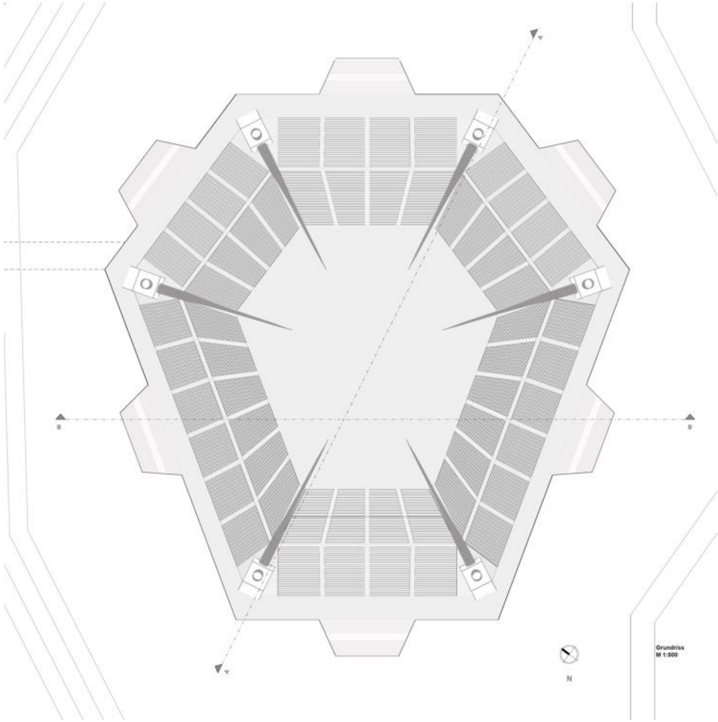
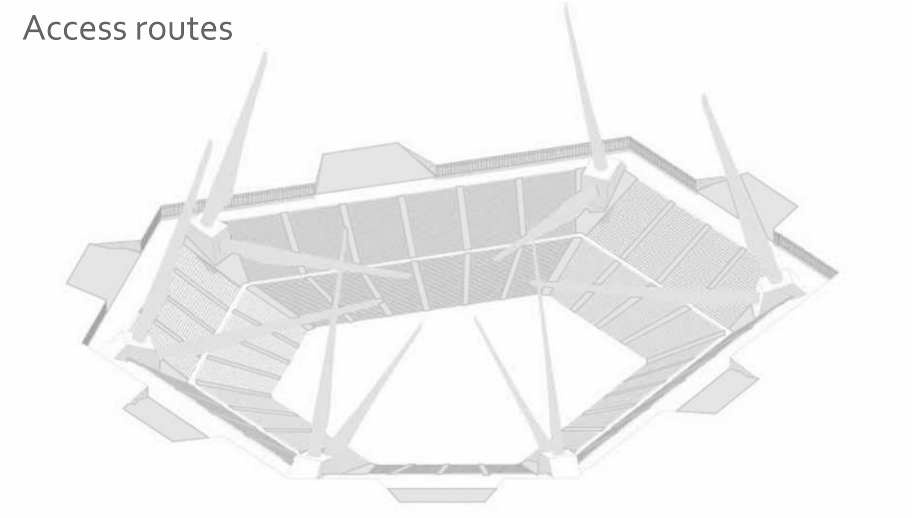
blade*stage
Concepts

blade*stage | blade stadium 12 60

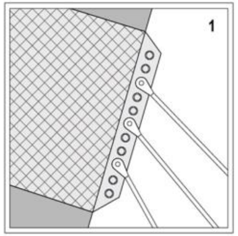
blade*stage | blade stadium 12 60



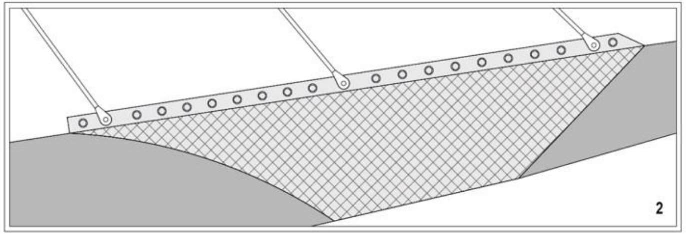
Access routes

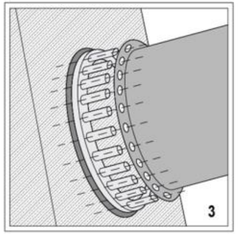


blade*stage | blade stadium 12 60

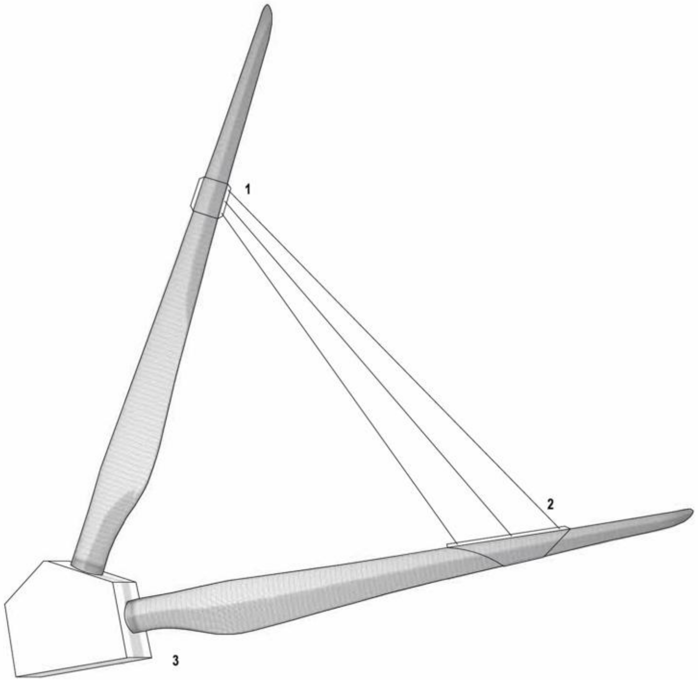


Die Rotorblätter werden mit je einer Halterung aus einem Kunststoff-Metall Verbundgewebe ummantelt. Halterung 1 besteht aus zwei formstabilen Hälften, die an den Enden miteinander verschraubt sind und gelenkige Zugseilanschlüsse besitzen. Halterung 2 hingegen ist einteilig und wird nur an der Oberseite verschraubt und mit Anschlüssen versehen. Die Innenseiten sind mit einem elastischen Kunststoff gefüttert.

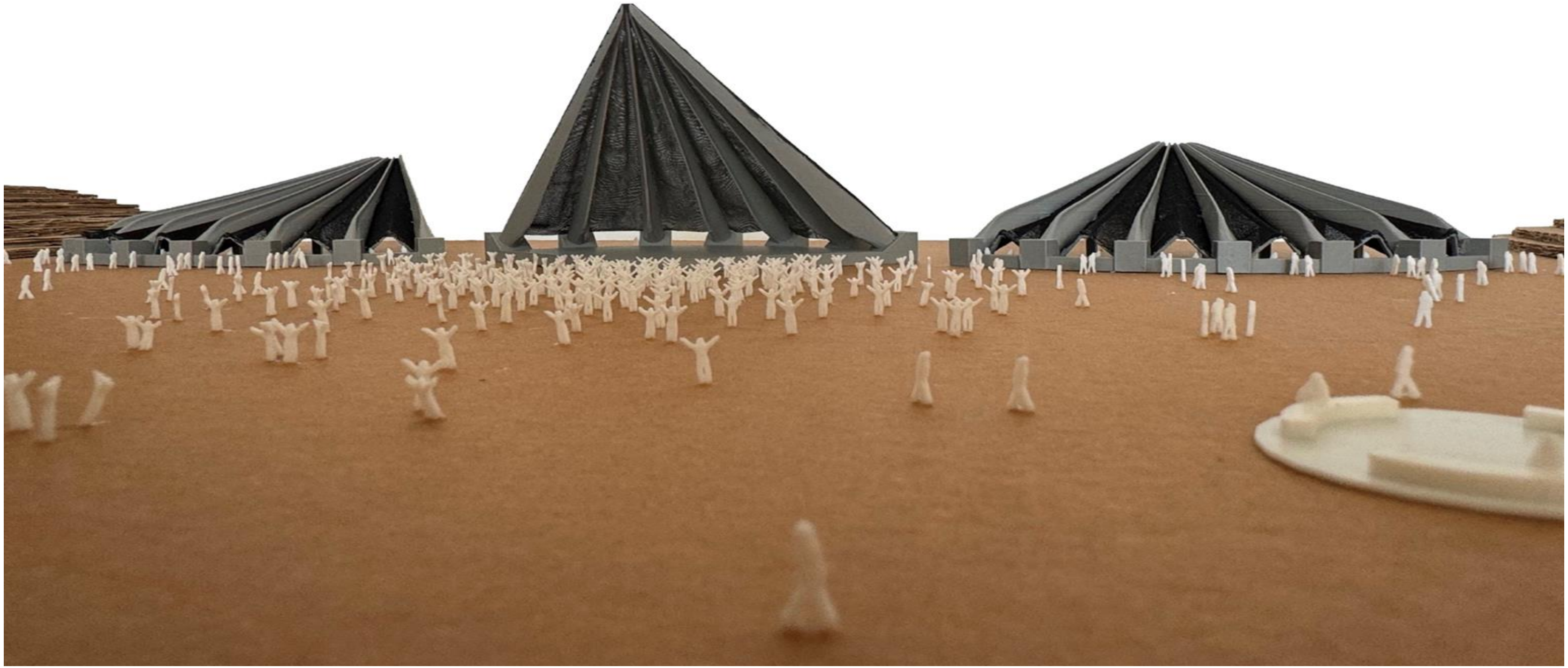




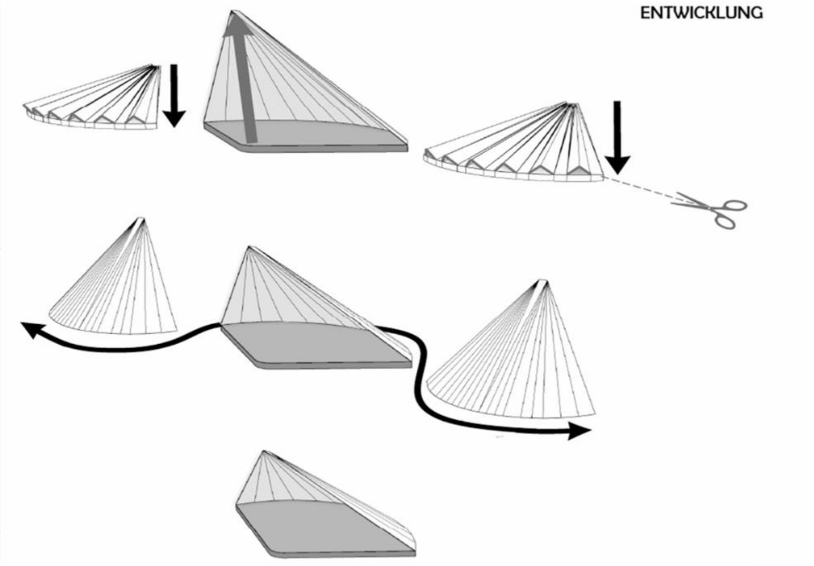
Die "Wurzel" des Rotorblattes wird genau wie bei einem Windrad an einem Gegenstück mit Bolzen befestigt und verschraubt. Bei diesem Anschluss sind Mängel leicht zu erkennen und gut zu erreichen. Das Gegenstück, ein Ring aus legiertem Vergütungsstahl, ist mit der Armierung des Betonfundamentes verbunden und garantiert so eine feste Verankerung.

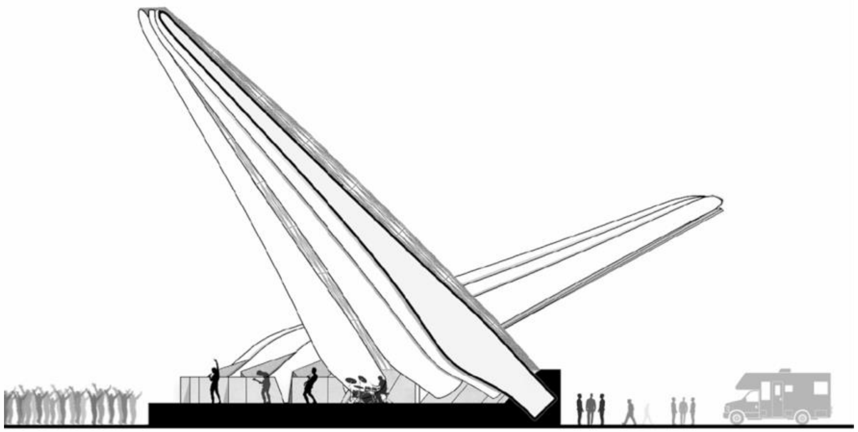


blade*stage | blade wave



blade*stage | blade wave





blade*stage | blade wave

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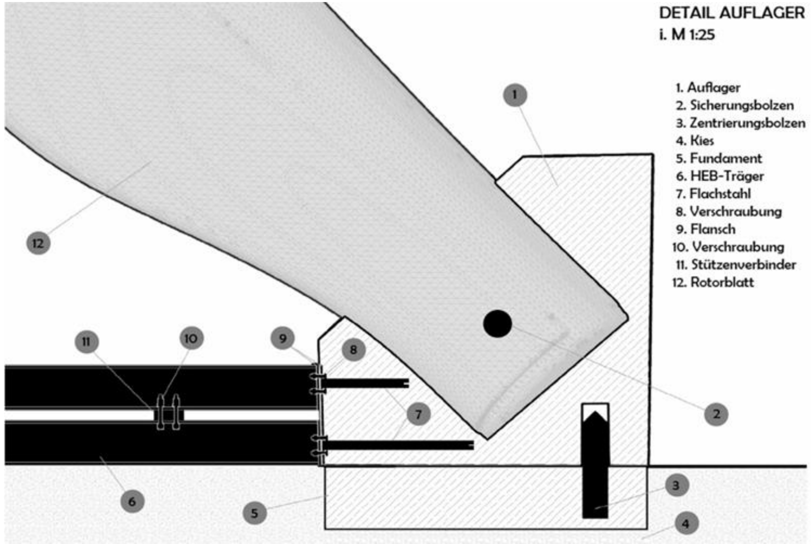
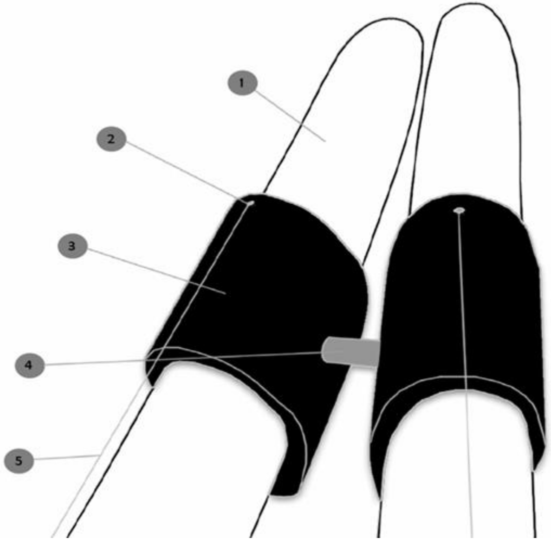


DETAIL AUFLAGER
i. M 1:25

1. Auflager
2. Sicherungsbolzen
3. Zentrierungsbolzen
4. Kies
5. Fundament
6. HEB-Träger
7. Flachstahl
8. Verschraubung
9. Flansch
10. Verschraubung
11. Stützenverbinder
12. Rotorblatt



DETAIL MUFFE
i. M 1:25

1. Rotorblatt
2. Anschluss
3. Muffe
4. Verbindungsbolzen
5. Spannseil

Research Project

power*stage inspired by **rethink*rotor**

current integration of research into academic studies

power*stage | Project Goal & Approach

- Innovative reuse of decommissioned rotor blades and batteries in a circular economy to create a multifunctional open-air stage.
- Combines ecological engineering with cultural and social value to promote sustainability, climate action, and regional transformation.
- Recognized as a model project with the "Cultural and Creative Pilots Germany 2024" award

power*stage
Urban planning & Sociology

power*stage inspired by rethink*rotor

Urban Planning – Sociology - Sustainability

Fields of Study: Urban analysis, typoligization and localization, analizing socio- cultural impacts, defining sutainability criteria

Members:

- Ina-Marie Orawiec
- Vincent Orawiec
- Rick Opgenoorth
- Till Görgen
- Lina Achilles

Analyzing urban tasks

power*stage | analyzing urban tasks

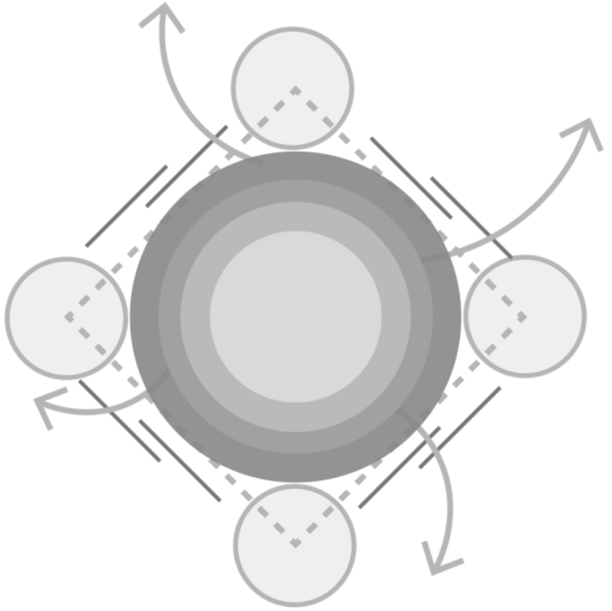
- Rescource-friendly, resilient urban structures
- Promotion of denser, mixed-used regions
- Acieving long term sustainability goals
- liveable, economically efficient and socially just urban structures
- Integrative urban planning
- finding cultural hotspots

location finding and description

power*stage | location finding and description

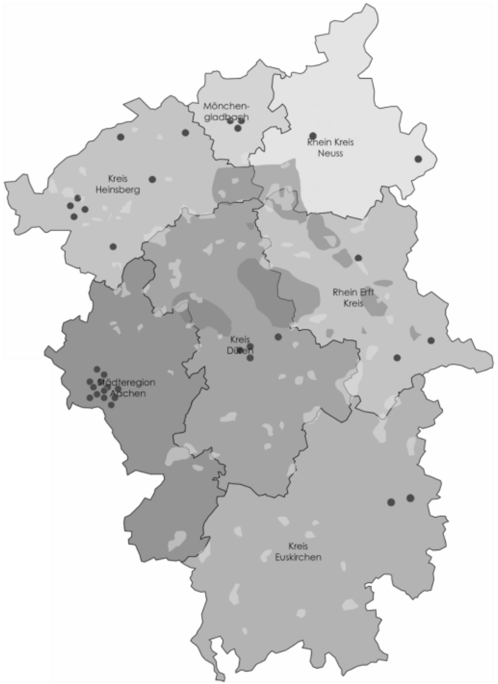
Defining the **study area:**

the **Rhineland region**



power*stage | location finding and description

finding **Attractions**



Cultural events – Open air

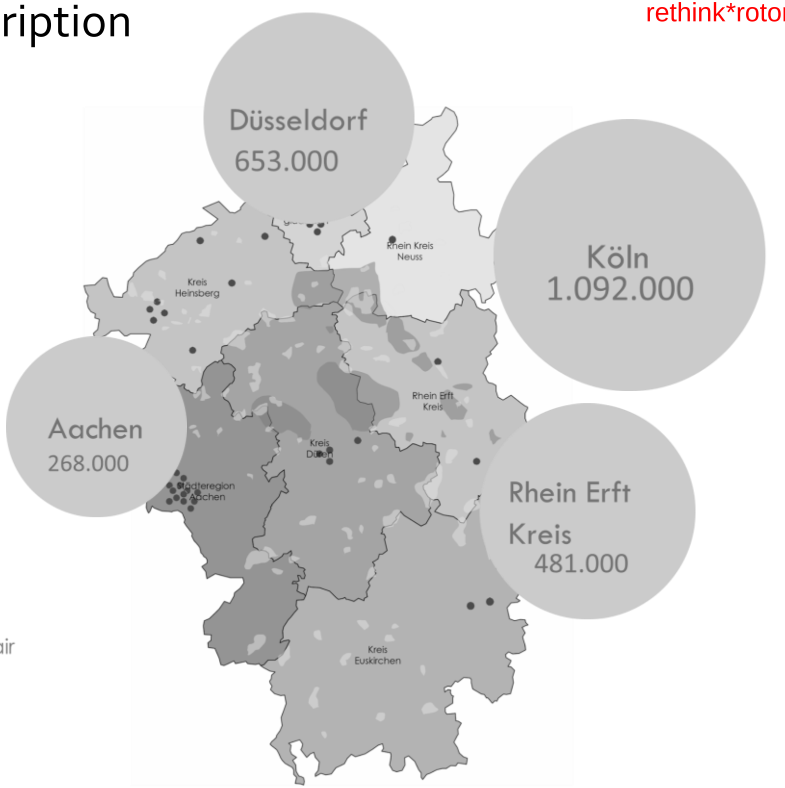
opencast mining

wind turbines

power*stage | location finding and description

rethink*rotor 日本

finding **Attractors**



- Cultural events – Open air
- opencast mining
- wind turbines

power*stage | defining typologies

urban →	Places of permanent temporality in the necessarily unfinished city
suburban →	Transformation of existing monofunctional commercial areas into multifunctional commercial districts
rural →	Military succession landscapes, cultural loss landscapes, open-cast mining

defining sustainability criteria

power*stage | defining sustainability criteria

ecological criteria → ressource conservation, accessibility, waste management, energy efficiency, environmental impact, water consumption

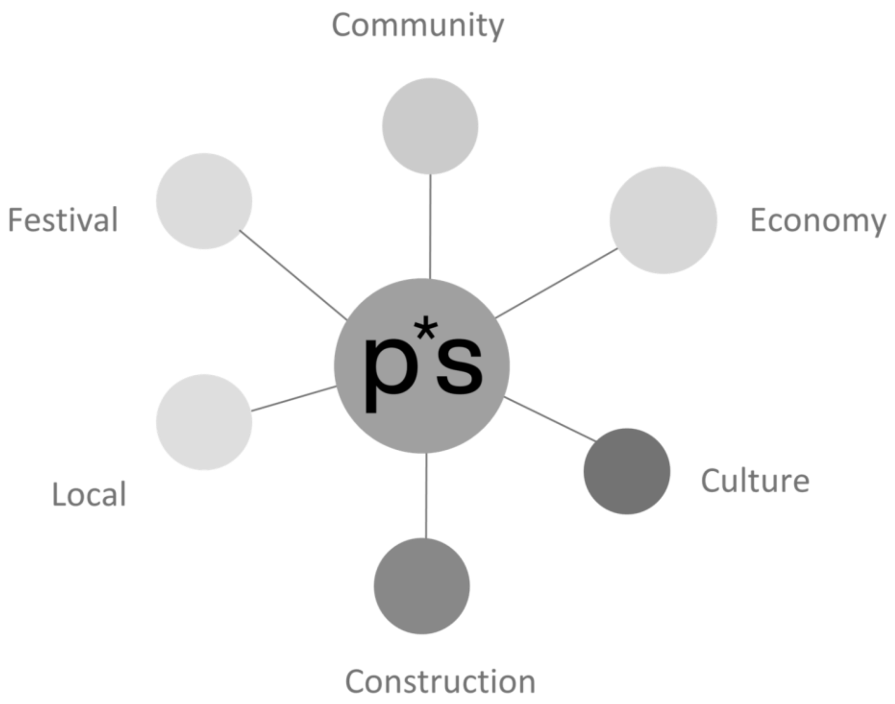
economic criteria → long-term use, local economic development, cost benefit ratio, subsidies and sponsoring

social criteria → education and sensitization, inclusion and accessibility,community development, health and safety

other criteria → innovation and design, flexibility, image and marketing, certification and standards

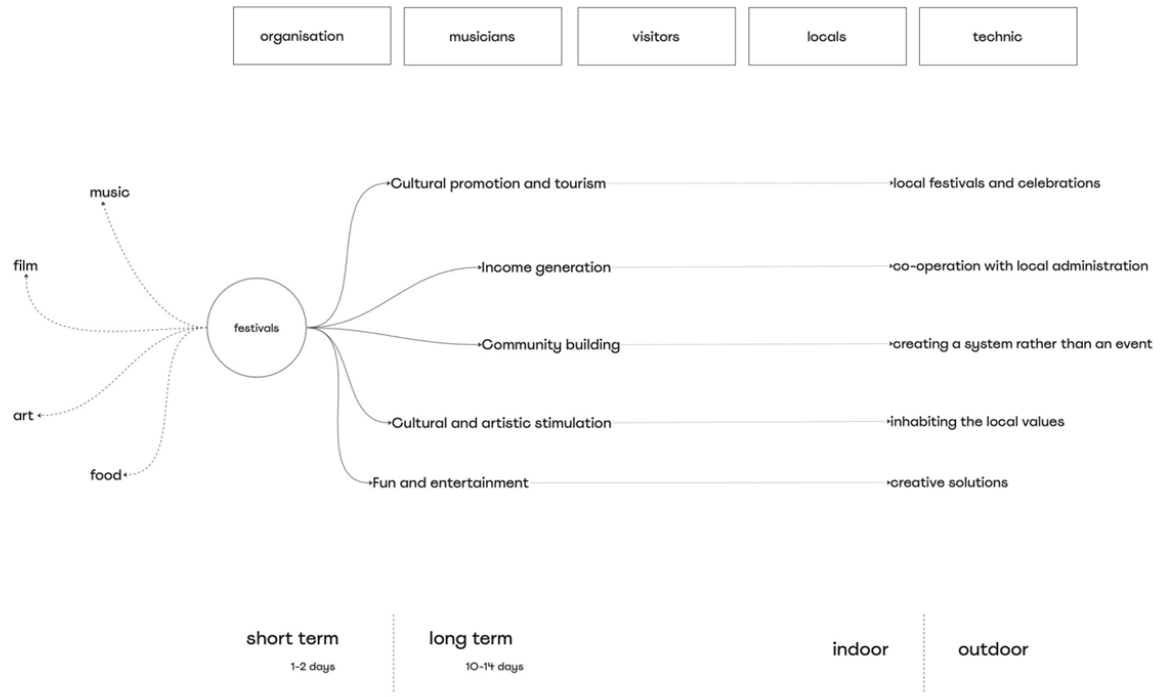
analyzing socio-cultural impacts

power*stage | analyzing socio-cultural impacts



Creating a **system**
rather than an event

power*stage | analyzing socio-cultural impacts



power*stage

Tangible Focus Points

Structural Innovation

load-bearing capacity
fire protection compliance

Reuse of Materials

rotor blades as components
lithium-ion batteries as anchors

Cultural Venue

physical stage infrastructure

Economic

jobs created
cost-efficient material reuse

Intangible Focus Points

Sustainability

promoting the circular economy
reducing waste

Cultural Enhancement

boosting the creative and cultural scene

Festival Success

social connection
audience engagement

Regional Development

strengthening the identity and innovation of the Rhineland

power*stage

Design, Construction & Sustainability

power*stage inspired by rethink*rotor

Architecture – Construction – Structural Design – Sustainability – Energy

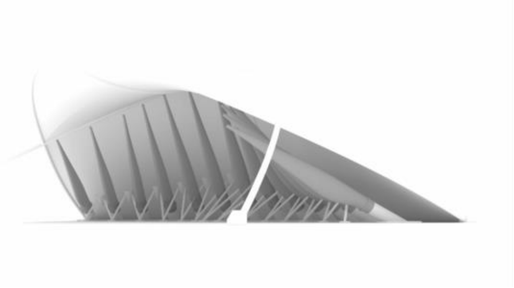
Fields of Study: Mechanical Engineering, Civil Engineering, Architecture, Environmental Engineering

Members:
- Lina Achilles
- Prof. Dr. Andreas Büter
- Savino Daragone
- Michael Freudel
- Niklas Haderlein
- Friedolin Herter
- Jamil Khoder
- Rick Opgenoorth
- Dr. Matthias Oppe
- Sercan Tozan

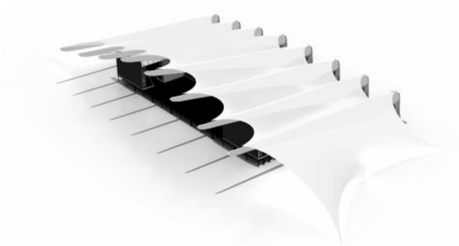
Construction | Analysis

power*stage | Analysis - Student Drafts as fundamental models

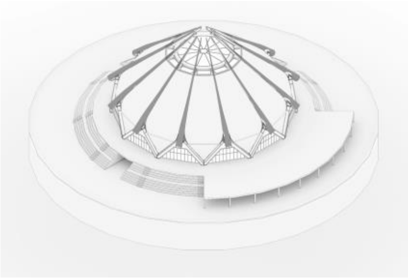
1 - "Fan"



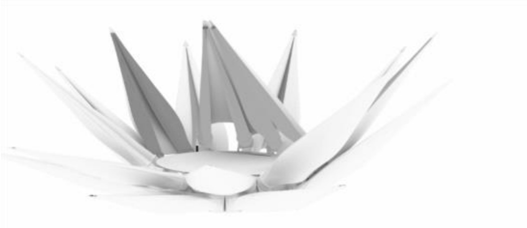
3 - "Seashell"



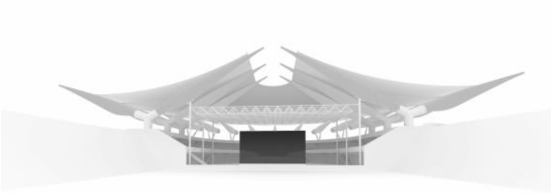
5 - "Dome"



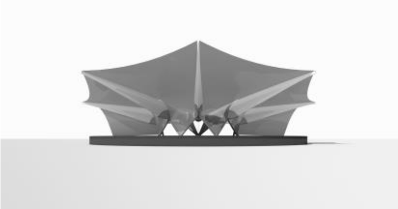
2 - "Water Lily"



4 - "Mine"

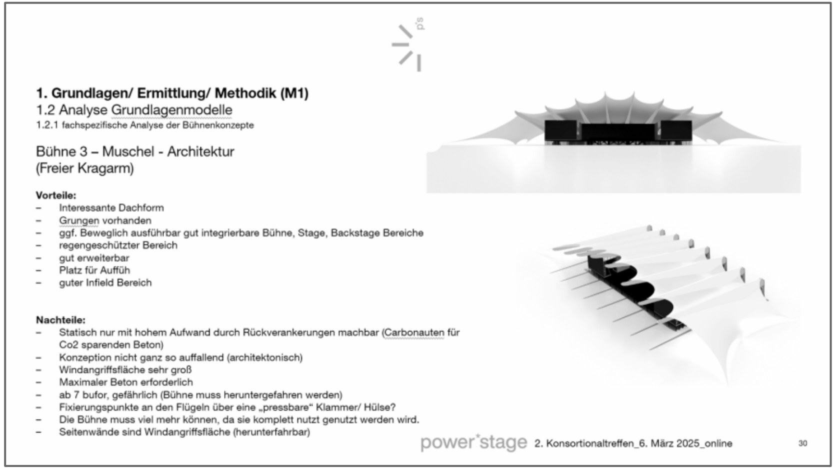


6 - "Kite"



power*stage | Subject-specific analysis of stage concepts

rethink*rotor 日本



Analysis of the fundamental Model No. 3 “Seashell” - pros and cons list

Department of Architecture

Membrane "linearly supported"
Rotor blades then as "bending beams"

Department of Civil Engineering

power*stage | Evaluation matrix

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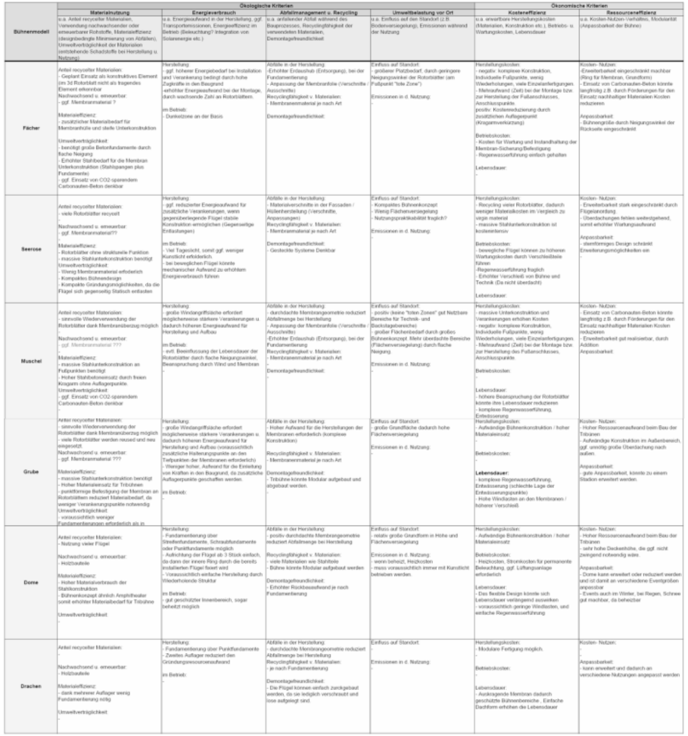


- Evaluation matrix developed as part of a research project
- Supports selection and optimization of stage design models
- Based on ecological and economic sustainability criteria
- Applicable in architecture, urban planning, and engineering contexts

power*stage | Advanced evaluation matrix

rethink*rotor 日本

- Advanced evaluation matrix based on the first qualitative matrix
- Systematic assessment and selection of stage models
- Uses a quantitative approach with weighted scores
- Allows for more objective comparison between different designs

Vergleich der Bühnenmodelle

Kriterium		Gewichtungs-faktor	Fächer Punkte	Fächer Ø pro Kategorie	Seerose Punkte	Seerose Ø pro Kategorie	Muschel Punkte	Muschel Ø pro Kategorie	Grube Punkte	Grube Ø pro Kategorie	Dome Punkte	Dome Ø pro Kategorie	Drache Punkte	Drache Ø pro Kategorie
Ökologische Kriterien	Materialnutzung	1.5	2	2.80		0.00		0.00		0.00		0.00		0.00
	Energieverbrauch	1.5	2											
	Abfallmanagement u. Recycling	1.0	3											
	Umweltbelastung vor Ort	1.0	5											
Ökonomische Kriterien	Kosteneffizienz	1.0	5	3.00		0.00		0.00		0.00		0.00		0.00
	Ressourceneffizienz	1.0	1											
Soziale Kriterien	Nutzerfreundlichkeit	1.0	2	3.00		0.00		0.00		0.00		0.00		0.00
	Bildungswert	1.0	3											
	Sicherheit	1.0	4											
Technologische Kriterien	Innovationsfreundlichkeit	0.5	5	4.00	3	1.75	4	2.50	4	3.00	4	2.50		0.00
	Energietechnik	1.0	5		2		3		4		3			
	Strukturelle Eigenschaften	0.5	1											
Architektonische & konstruktive Kriterien	Maschinenbau	1.0	2	3.00		0.00		0.00		0.00		0.00		0.00
	Statik	0.5	3											
	Design	1.0	4											
Übergeordnete Kriterien	Lebenszyklusbetrachtung	1.5	5	4.00		0.00		0.00		0.00		0.00		0.00
	Nachnutzbarkeit	0.5	1											
Gesamtbewertung	Ø aller Kategorien			3.30		0.29		0.42		0.50		0.42		0.00

Architektur-Konstruktion-Tragwerk-Nachhaltigkeit-Energie

Kriterium		Gewichtungs-faktor	Fächer Punkte	Fächer Ø pro Kategorie	Seerose Punkte	Seerose Ø pro Kategorie	Muschel Punkte	Muschel Ø pro Kategorie	Grube Punkte	Grube Ø pro Kategorie	Dome Punkte	Dome Ø pro Kategorie	Drache Punkte	Drache Ø pro Kategorie
Design	Innovationsfreundlichkeit	1.0	3	4.20	5	5.40	2	4.10	3	5.00	3	5.20	5	6.60
	Soziale / Soziologische Aspekte	1.0	3		4		2		3		3		5	
	Architektursprache	1.5	3		5		3		4		4		5	
	Bildungswert	1.0	3		3		3		4		5		5	
	Reuse / Recycling	1.5	2		3		2		2		2		3	
	Funktionalität	1.5	3		2		4		4		4		4	
Analyse Tragkonzept (Planerischer Teil)	Innovation	1.0	3	3.10	4	3.80	2	3.20	4	3.60	3	4.00	4	4.10
	Material- / Recourcenverbrauch	1.5	3		4		2		2		2		3	
	Konstruktive Tragfähigkeit Rigging (Anhängen Boxen etc.)	1.0	1		1		5		5		5		4	
	Abhängigkeit von Batteriemasse	0.5	3		3		3		3		3		4	
	Komplexität der Kräfte Dachhaut / Tragwerk	0.5	2		4		2		2		4		3	
	Komplexität der Kräfte-/Massenverteilung	1.0	3		3		2		2		4		3	
	Bedarf zusätzlicher Tragwerke (Planungsaufwand, Sonderlösungen)	0.5	3		3		3		3		3		3	
…tive Anforderungen (Praktische Planung / Reali…	Tragfähigkeit	1.0	2	6.00	3	6.40	2	5.70	3	5.40	4	7.70	3	6.60
	Festigkeit	1.5	3		3		3		3		5		3	
	Bauingenieurwesen / Tragwerksplaner	1.0	3		3		2		3		4		3	
	Strukturelle Eigenschaften	1.0	3		3		2		2		4		2	
	Integrierbarkeit von Rigging (Montage Abhangsysteme) Anschlagpunkten	1.5	2		1		4		3		4		3	
	Bedarf Stahlbau (Nachhaltigkeit)	1.0	3		4		2		2		1		3	
	Bedarf Betonbau (Nachhaltigkeit)	1.0	2		4		1		2		3		3	
	Komplexität der Strukturelemente (Anschlusspunkte an Rotorblätter)	0.5	4		2		4		2		4		4	
	Komplexität der Montage (Montage Vor-Ort, Montage Bauteile)	1.0	3		2		4		2		4		2	
	Reuse / Recycling	1.5	3		4		2		2		2		4	
Energietechnik	Innovationsfreundlichkeit	1.0	2	3.60	1	4.70	2	8.40	4	8.80	3	7.90	4	6.70
	Verfügbare Solarfläche Membran	1.0	3		1		5		5		4		4	
	Verfügbare Solafläche Rotorblätter	0.5	1		1		5		5		4		3	
	Zugänglichkeit zu Solarflächen	0.5	2		1		4		4		3		3	
	Bauraum für Solarelektronik	0.5	1		3		5		5		5		3	
	Zugänglichkeit Solarelektronik	1.0	2		3		4		4		4		3	
	Komplexität der Batterieintegration	1.0	1		3		4		4		4		2	
	Integrationsraum / Batteriegröße (Verfügbares Volumen für Batterien)	1.0	1		3		4		4		4		2	
	Zugänglichkeit Batteriesystem	1.5	1		3		4		4		4		3	
	Integrierbarkeit zentraler Betriebsraum (Verteiler, Räumlihckeiten, extern / intern)	1.0	1		1		4		4		4		2	
	Reuse / Recycling	1.5	3		3		4		4		3		5	
Flexibilität	Skalierbarkeit (Bühnengröße, Zuschauer	1.5	2	4.10	2	4.60	4	4.80	3	4.60	2	4.20	5	6.50
	Funktionale Erweiterbarkeit (im Design, Integrierbarkeit Technik, Erweiterbarkeit Speicher etc.)	1.0	2		2		4		4		3		3	
	Rückbaufähigkeit	1.5	3		4		1		1		1		4	
	Standortflexibilität	1.5	4		4		2		2		2		4	
	Nutzbarkeit / Events	1.5	2		2		5		4		5		4	
	Nutzungsvariabilität	1.0	2		3		2		4		3		4	
Gesamtbewertung	Ø aller Kategorien			4.20		4.88		5.53		5.60		5.95		5.98

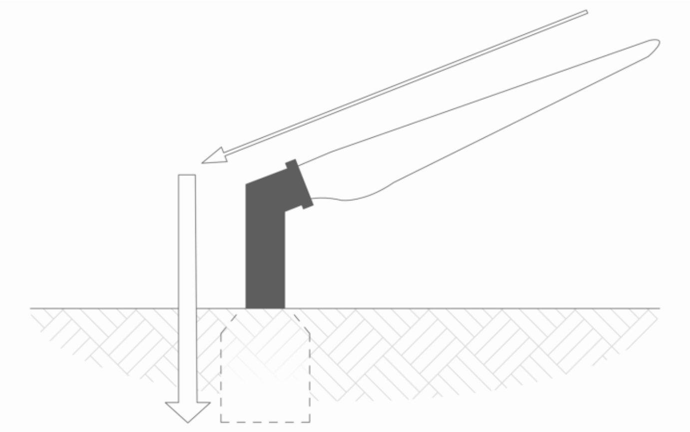
Construction | Structural Concept

power*stage | Structural Principles

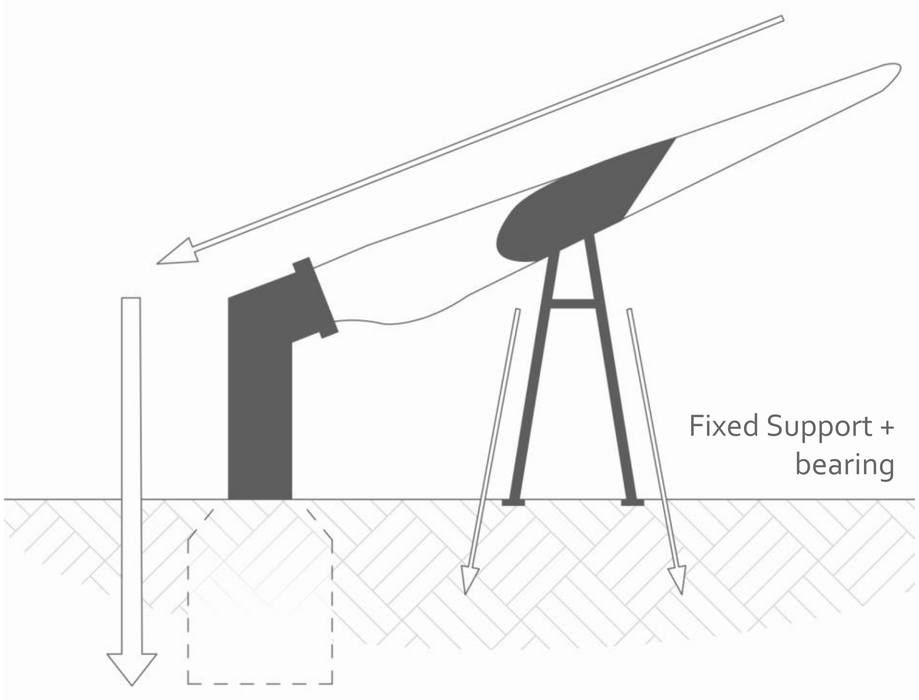

https://www.ematec.com/de/rbc/

Rotor Blade Clamp -
System for Transportation

power*stage | Structural Principles



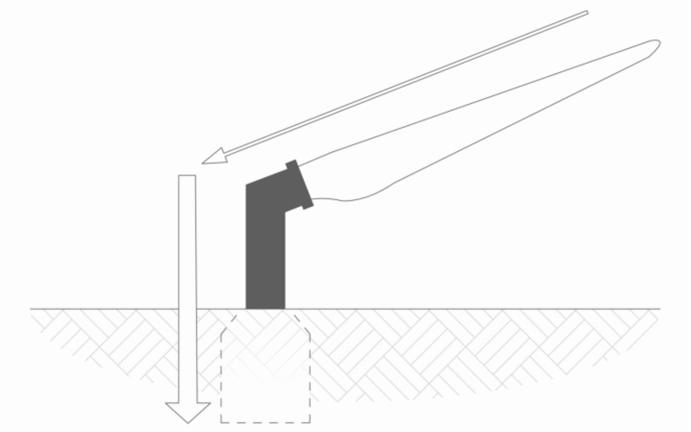
Cantilever Structure with Fixed Support



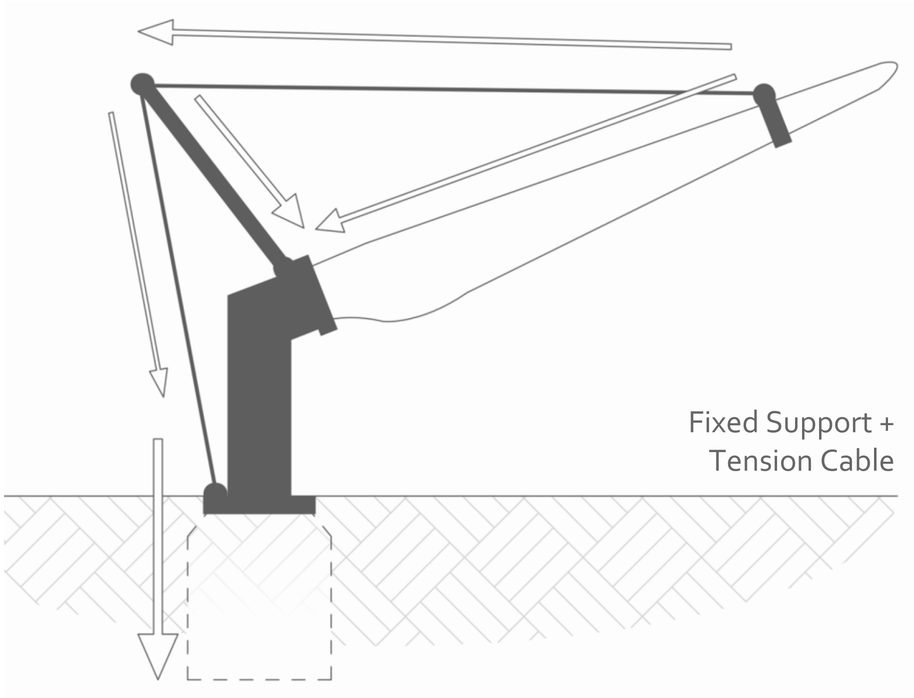
Fixed Support + bearing

Merle Steiner

power*stage | Structural Principles



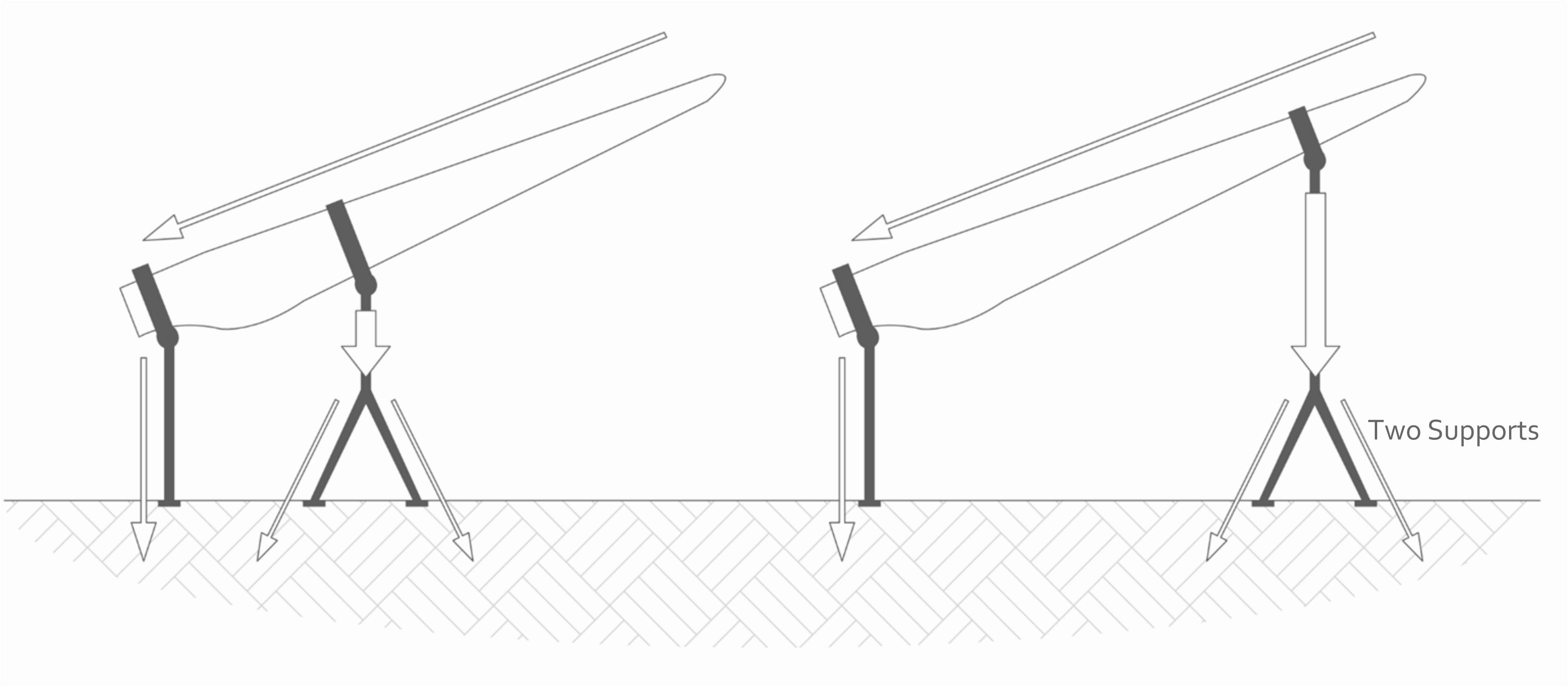
Cantilever Structure with Fixed Support



Fixed Support + Tension Cable

Merle Steiner

power*stage | Structural Principles



Merle Steiner

power*stage | Mechanical Engineering - Calculations

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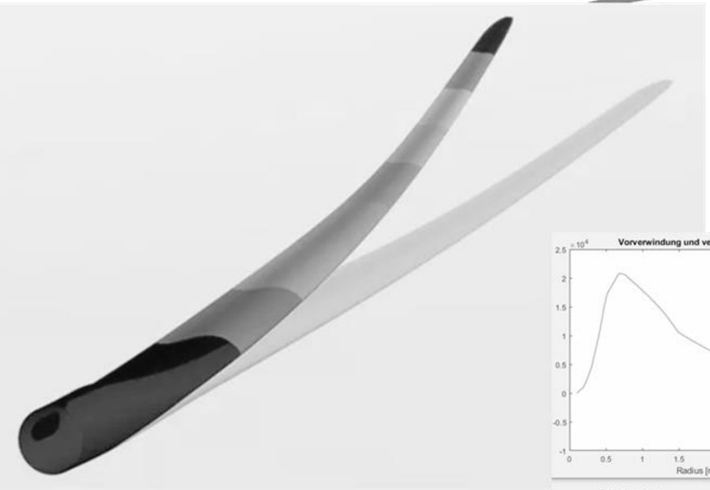

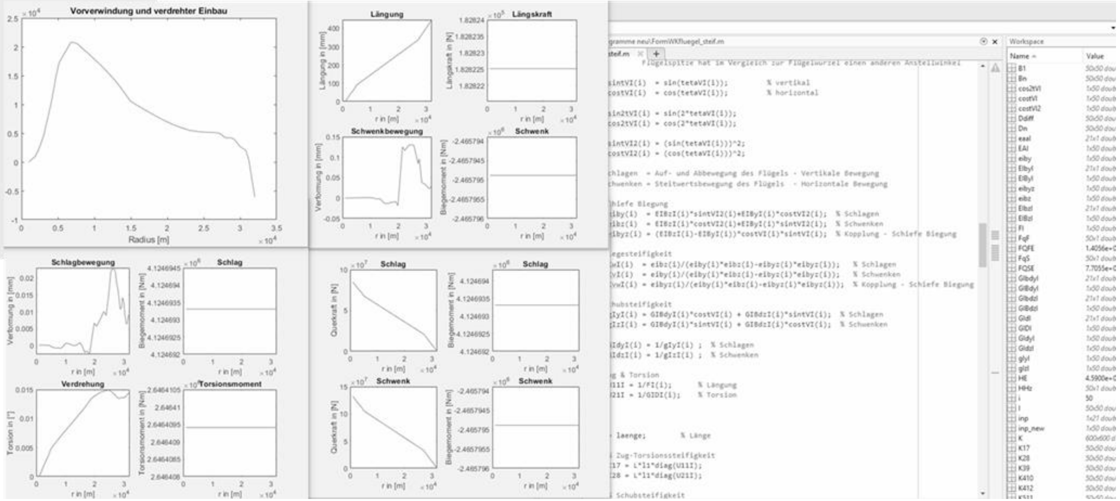

power*stage | Facade principle

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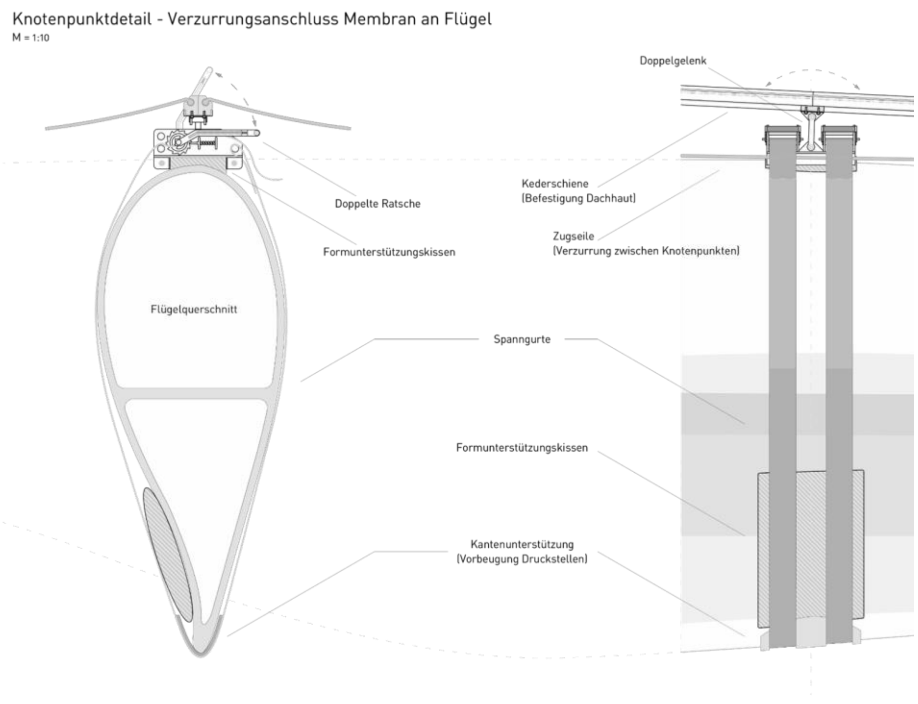
Tensioning with Tie Straps (Membrane Connection)

- High flexibility / adaptability
- “One size fits all” solution
- Simple / flexible installation
- Cost-effective solution that can be adapted to various rotor blade sizes



Philipp Jäger

power*stage

Tools of research

Integrating AI into the power*stage Project

power*stage | From Analog Design to AI-Augmented Research

- Traditional tools: Sketching, modeling, prototyping
- Complexity of reused rotor blades challenges conventional methods
- Need for support in structuring, visualizing, and iterating ideas

power*stage | Challenges That Prompted AI Integration

- Rotor blades have irregular shapes
- Hard to calculate load-bearing behavior
- AI doesn't understand reuse ideas yet
- AI-generated designs are often not realistic

power*stage | Why AI?

- Helps with geometry and idea development
- Speeds up iterations and variations
- Supports teamwork and cross-discipline exchange
- Improves communication and documentation

power*stage | Our Main Goal

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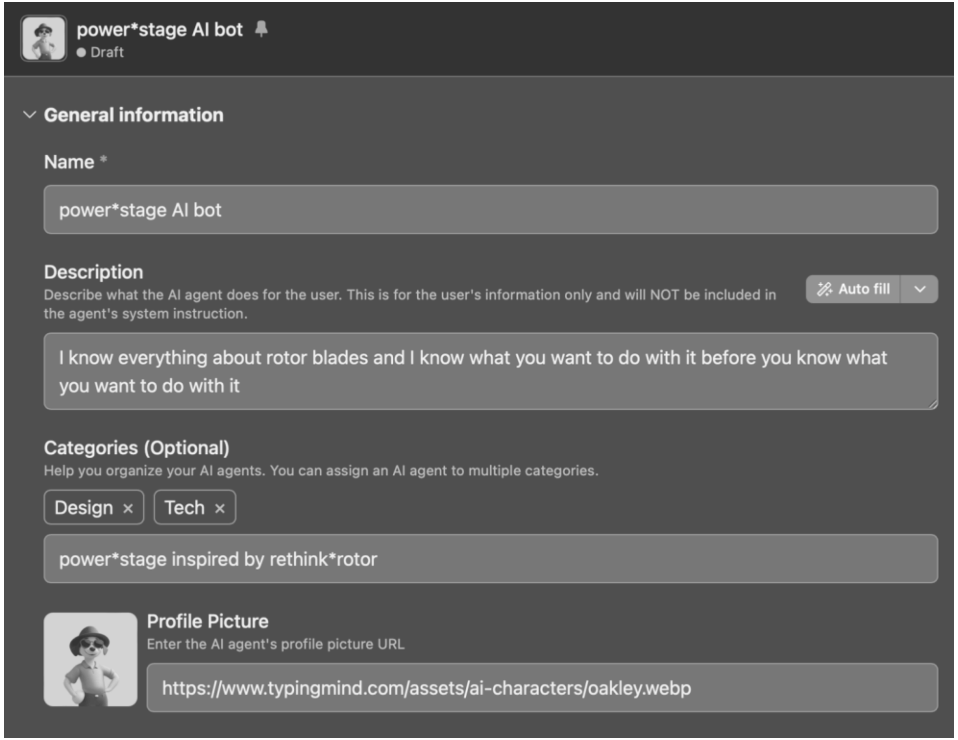


- Understand blade shape and structure
- Create new design ideas
- Turn text into clear image prompts
- Help improve small details in designs

power*stage | Integration into Teaching

- Elective course: “A New Life for Rotor Blades – power*stage tries AI”
- Interdisciplinary student involvement from architecture and interior design
- AI becomes part of academic experimentation and reflection
- The course trains a reusable AI agent for future project phases
- Ongoing feedback from students contributes directly to the research

power*stage | Week 1–4: Understanding Tools & Rotor Geometry

- Introduction to Typingmind and prompt workflows
- Deep analysis of rotor blade shape and structure
- Joint testing: AI ↔ student iterations
- Exploration of language, tone, and detail depth in prompting

Im besten fall sollte an der ursprungsgeometrie der Rotorblätter nicht verändert werden. Wie du bereits sagtest ist die verarbeitung schwierig und schränkt die statischen eigenschaften sehr ein.

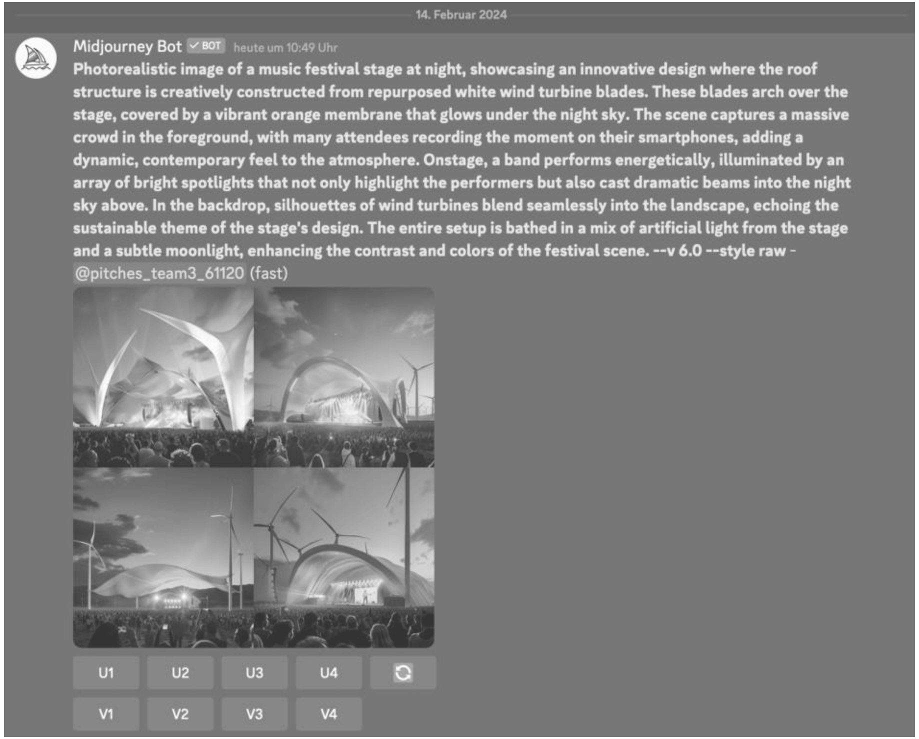
Wenn die ursprüngliche Geometrie der Rotorblätter unverändert bleiben soll, eröffnet das interessante Möglichkeiten und Herausforderungen für deren Anwendung in der Architektur unter der Berücksichtigung ihrer bestehenden strukturellen und ästhetischen Merkmale. Hier sind einige Überlegungen und Ideen, wie solche Blätter verwendet werden könnten:

Konzeptionelle und Praktische Anwendungen

1. **Freitragende Überdachungen**: Die aerodynamische Form und Festigkeit der Blätter können genutzt werden, um freitragende Überdachungen zu schaffen. Diese könnten zum Beispiel für Open-Air-Strukturen wie Bushaltestellen, Marktplätze oder Fahrradunterstände verwendet werden.
2. **Pavillons oder Lauben**: Mehrere Rotorblätter könnten so angeordnet werden, dass sie einen Pavillon oder eine Laube bilden. Dabei nutzen sie die gebogene Form der Blätter zur Schaffung eines geschützten Bereichs.
3. **Fassadenverkleidung**: Die Blätter könnten vertikal oder diagonal an Fassaden installiert werden, um einen modernen, nachhaltigen Look zu erzeugen, möglicherweise mit zusätzlicher Funktion als Sonnenschutz.
4. **Brücken- oder Laufstegstrukturen**: Die Länge und Festigkeit der Blätter erlauben ihren Einsatz als tragende Balken oder Deckstrukturen in schmaleren Brücken oder Gehwegen.

power*stage | Week 5–8: Design Generation and Feedback Loops

- Concept development using AI support
- Generative image production (e.g., Midjourney, LeonardoAI)
- AI-supported design refinements
- Development of a visual vocabulary and design language



power*stage | Week 9–12: Workflow Building & Documentation

- Development of a full design-AI workflow
- Critical review: what worked, what didn't?
- Documenting the training process
- Preparing a reusable AI assistant for future use

power*stage | AI Tools (in Use) in Research

- **ChatGPT & Perplexity:** text support and idea writing
- **Typingmind:** control center for AI prompts
- **MidJourney & LeonardoAI:** image generation
- **Kaedim & Sloyd.AI:** 3D modeling tools
- **BricsCAD & ArkoAI:** structural simulations
- **ClickUp & awork:** project organization

power*stage | Design Workflow & Methodology

- Ping-Pong method: we talk with the AI, it answers, we react
- Prompts are part of the creative process
- We track mistakes and improvements
- Learning is more important than perfect results

rethink*rotor
Departure to Rotopia

Master draft project at h_da

Departure to Rotopia | Master project

Departure to Rotopia | The Location

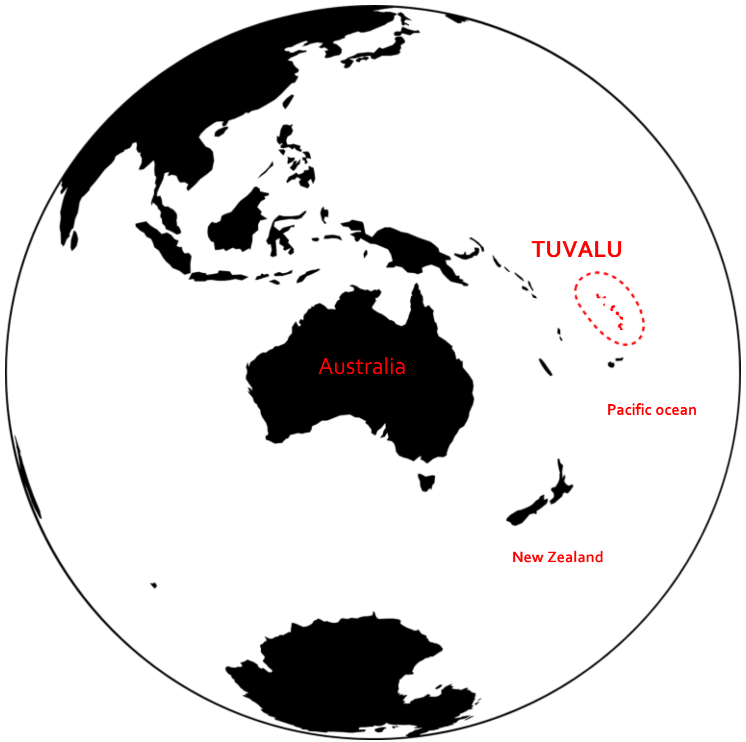
Tuvalu

- Archipelago, consisting of 9 islands
- „fourth smallest country in the world"

Departure to Rotopia | The Location

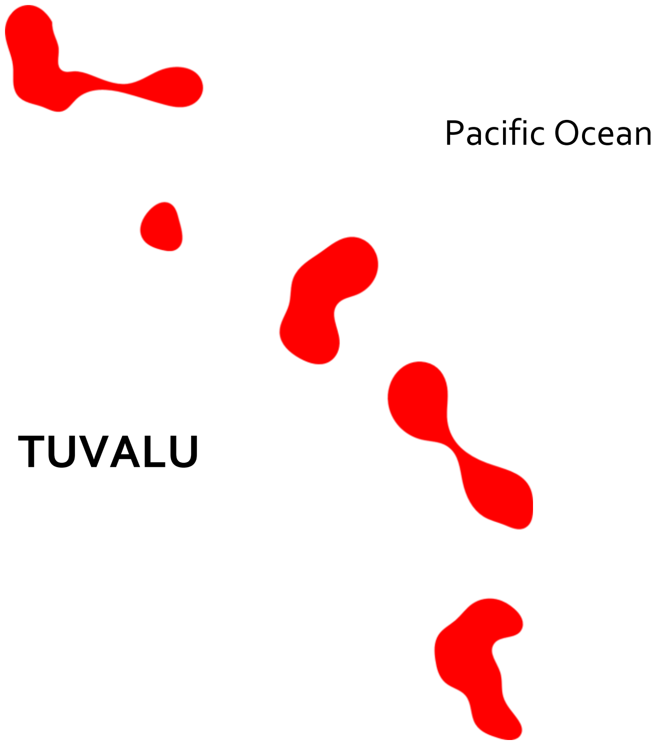
Tuvalu

- approx. 3700km from Australia
- approx. 26km2 total area
- approx. 10,000 inhabitants with a density of 431 inhabitants/km2
- Parliamentary monarchy represented by King Charles 3.



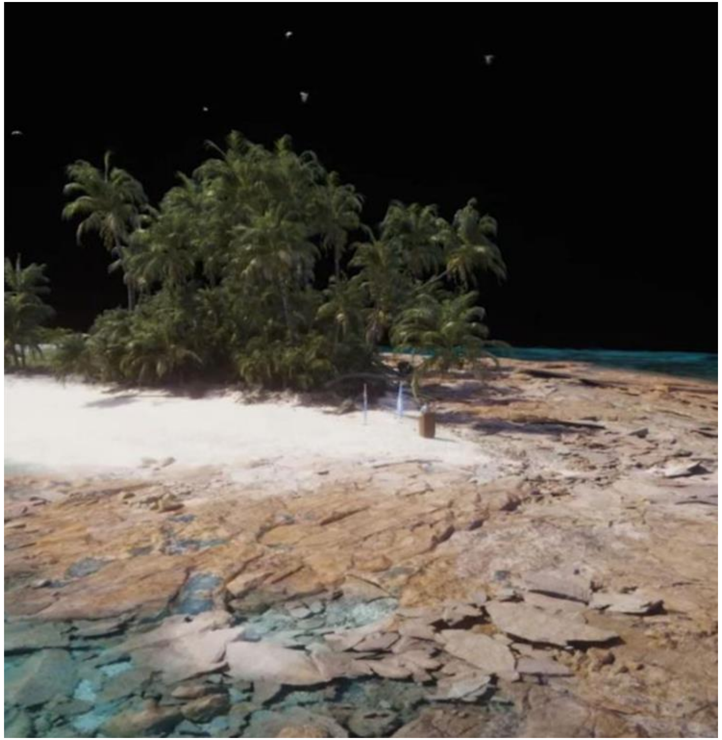
Departure to Rotopia | The Location

- The highest elevation is less than 5 meters. Due to rising sea levels, this state is also in danger of sinking.
- Due to the circumstances, the government tried to apply for asylum for the inhabitants of Tuvalu in Australia and New Zealand.
- Around 300 people were to be resettled each year. However, the application was rejected.



Departure to Rotopia | The Location

Departure to Rotopia | The Location



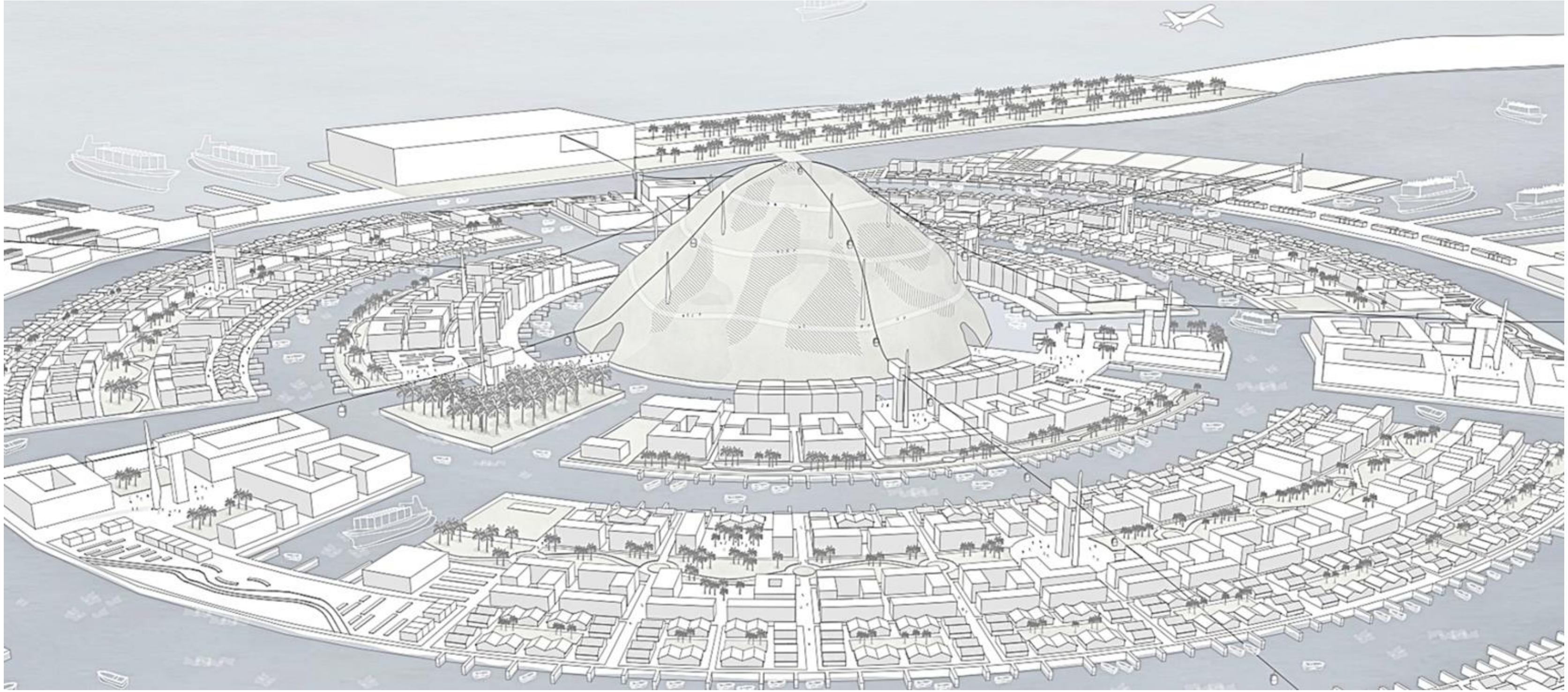
TUVALU

Can we design an adequate replacement for the residents?

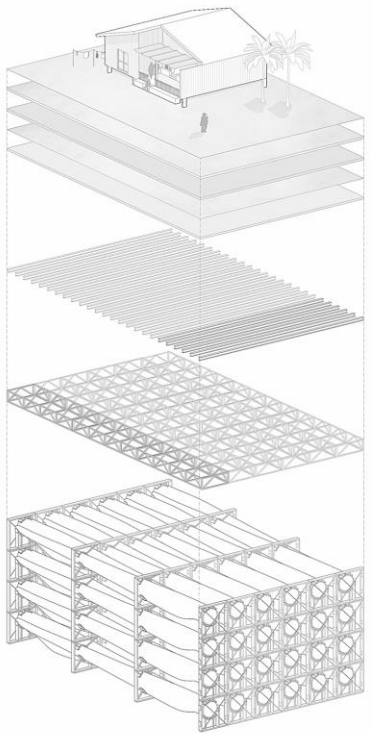
Resident Design | Rotopia

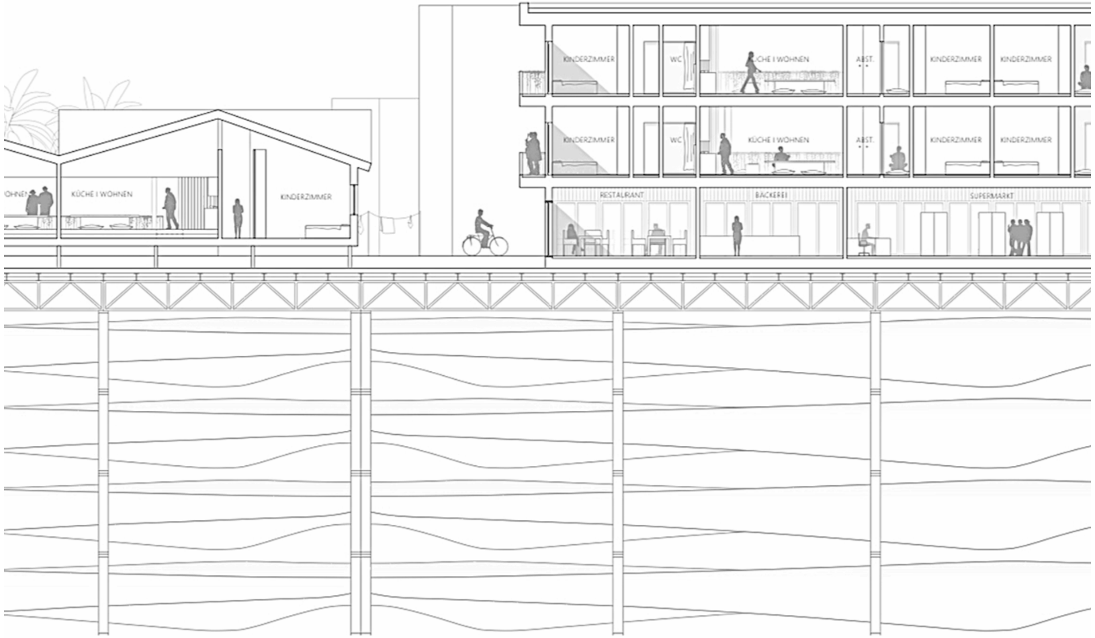
by Sara Sürmeli Priscilla, Hussaini Fatma, Kübra Gülseven

Rotopia | Concept Visualisation

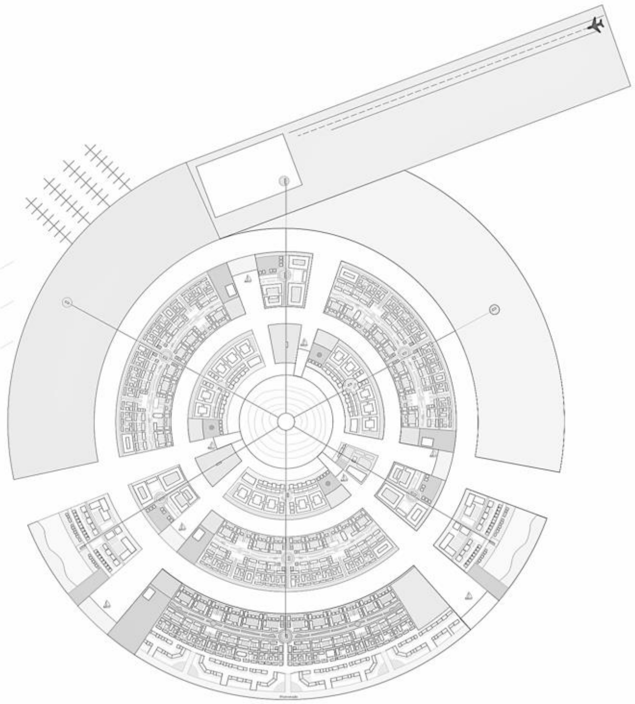


Rotopia | Modularity





Rotopia | Urban planning



Applied strategies:

- appropriate culturally urban planning
- structured zoning
- accessible to all
- lively city edges
- integration of the airport
- representative mountain

Resident Design | Concept Arche Tuvalu

by Felizitas Dochantschi, Giulia Migliorini, Lesley Saszawa

Arche Tuvalu | Concept Visualisation

WASEDA University
h_da darmstadt university of applied sciences faculty architecture
OX2 architekten
rethink rotor
TOKOROLABS RESEARCHERS

Arche Tuvalu | Concept Visualisation

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2023

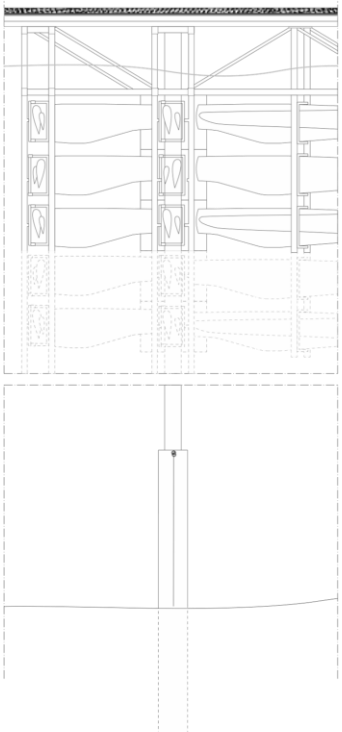
2040

2100

Arche Tuvalu | Masterplan

Arche Tuvalu | Island Construction

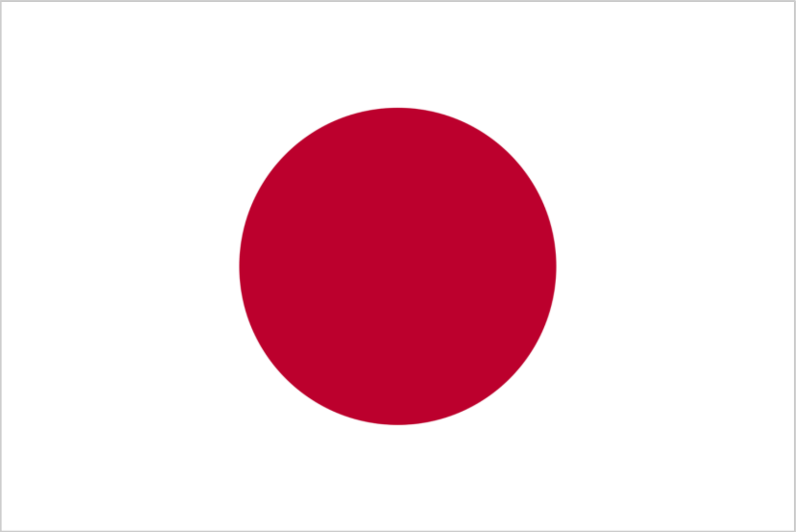
Square	
Plates	4 cm
Filter fleece	
Gravel fill	40 cm
Geo fleece	2 mm
Drainage plate	25 mm
Marine plate	10 cm
Grid	40 cm
Lawn	
Lawn	5 cm
Substrate	1 m
Granules	15 cm
Geo fleece	2 mm
Drain Plate	25 mm
Marine Plate	10 cm
Grid	40 cm
Living	
Bottom slab	80 cm
Blinding layer	5 cm
Capillary breaking layer	40 cm
Drain plate	25 mm
Marine plate	10 cm
Grid	40 cm



A new life for rotor*blades
Energy on the water

Elective subject at h_da

Energy on the water | WASEDA University x h_da

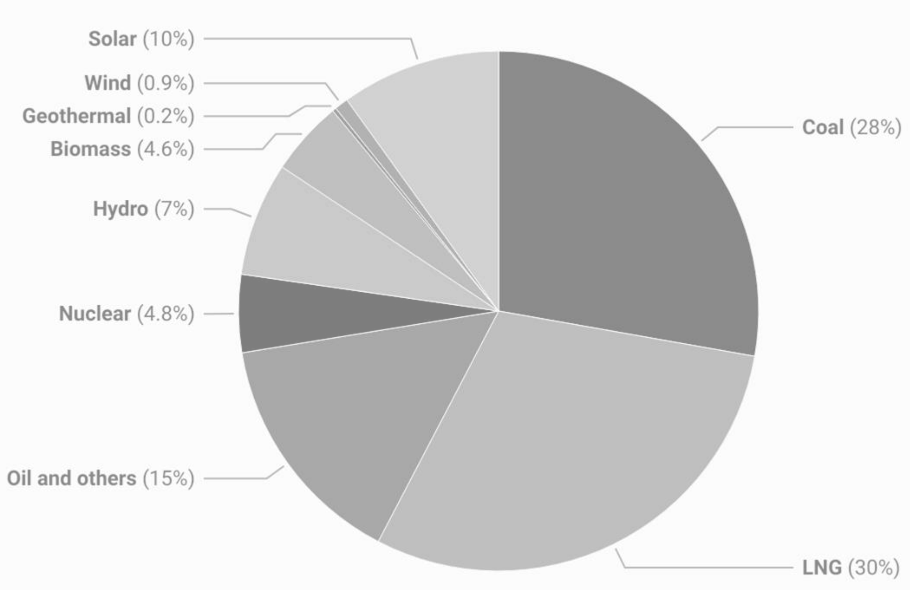


Energy on the water

Analysing the energy supply in Japan

Energy on the water | Energy supply in Japan

- heavily dependent on energy imports (has hardly any natural raw materials of its own
- covers its energy needs with a combination of different energy sources
- vulnerable to price fluctuations and geopolitical risks
- makes the country susceptible to global market changes



Energy on the water | Investment in Renewable Energies

- Plans to make renewable energies as its main source by 2040
- Investing heavily in green hydrogen to partially replace crude oil
- Focus on recycling, circular economy, recovery of metals, further development of raw material extraction in the deep sea areas
- huge potential for geothermal energy due to its volcanic activity
- Basic Energy Plan (2021)
  - Reduction of fossil fuels: share of coal and gas to fall to 41% by 2030
  - Increase in renewable energies: Target: 36-38 % by 2030
  - Nuclear energy revitalisation: In the long term, it should once again account for 20-22 % of the energy mix
- Japan is committed to becoming climate neutral by 2050

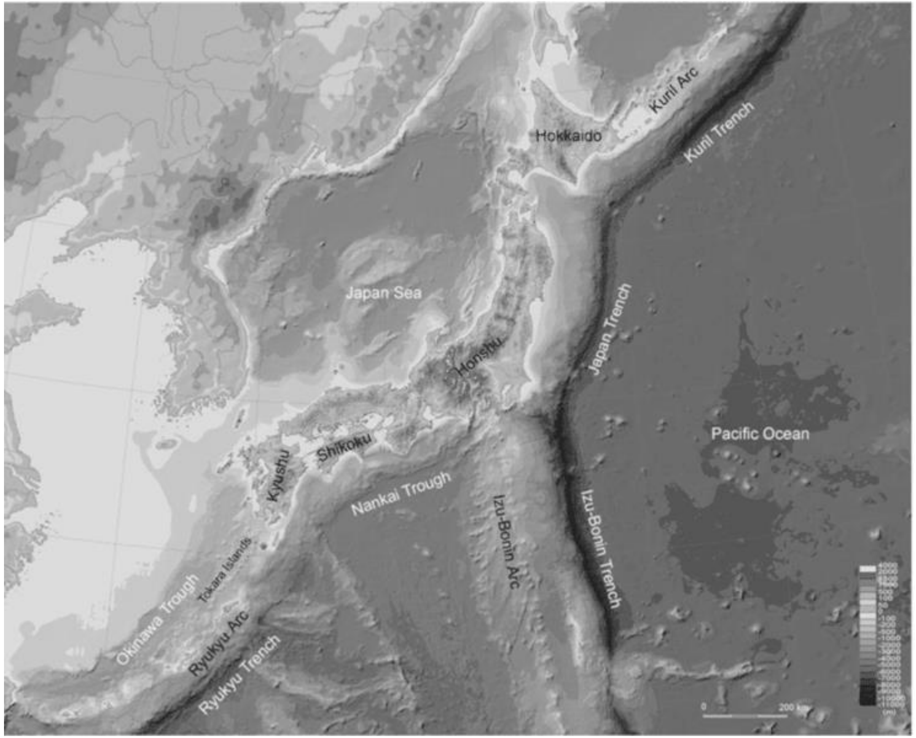
Energy on the water | Comparison

- Philippines
  - Geothermal energy and hydropower approx. 82% of electricity generation
  - Solar and wind energy still underdeveloped
- Indonesia
  - fossil resources (coal)
  - only utilises geothermal potential to a limited extent
- Taiwan
  - High Import dependency (~98 %)
  - Planned phase-out of Nuclear energy by 2025
  - growing share of renewable energies (lack of space)
- South Korea
  - similar Import dependency to Japan (~90 %)
  - Nuclear energy and fossil fuels
  - growing investment in renewable energies

Energy on the water

Analysing geographical, political and technological conditions

Energy on the water | Geographical Framework conditions



- Interface of several tectonic plates, causes high level of seismic activity
- High risk of earthquakes, tsunamis, flooding of coastal areas, land-/rockslides

Energy on the water | In connection with wind power

- Steep, by mountains characterised Landscape and Natural Disasters makes construction of onshore wind turbines difficult
- Ideal conditions for offshore wind power in coastal regions

- Theoretical potential of over 9,000 terawatt hours per year from offshore wind energy

Energy on the water | Political Framework conditions

- Heavy criticism of Nuclear power after disaster in Fukushima (2011)
  - shut down of many Nuclear power pants
  - Increasing dependence on fossil fuels, energy imports
  - recommissioning of nuclear power plants, to stabilise the energy supply
- Plan is to, shut down nuclear power plants completely and expand renewable energies

- Increased focus on diversifying energy sources in order to minimise geopolitical risks
- Possible solution: Offshore wind power, expansion of hydrogen technology

Energy on the water | Technological Framework conditions

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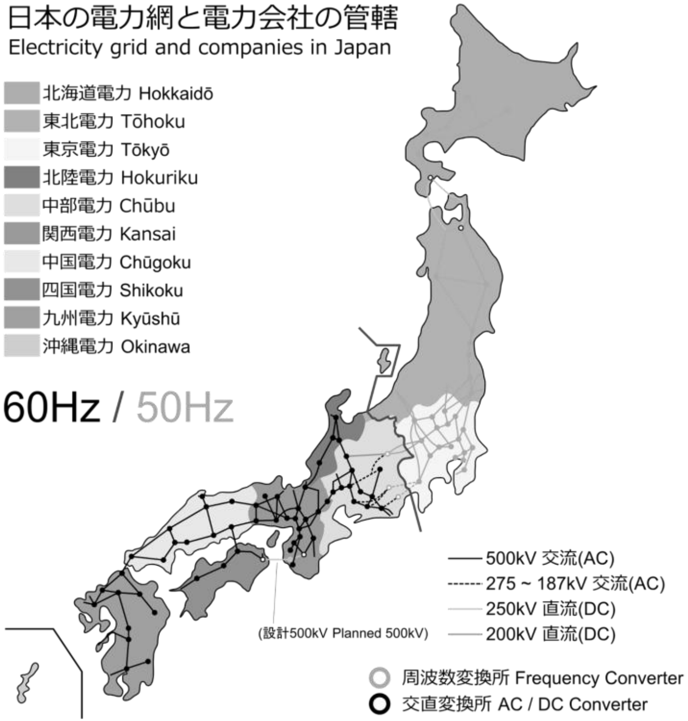

- electricity grid was not originally designed for a high feed-in of renewable energies
- Network infrastructure requires modernisation
    - energy storage, smart grids, load management

Energy on the water | In connection with (Offshore) wind power

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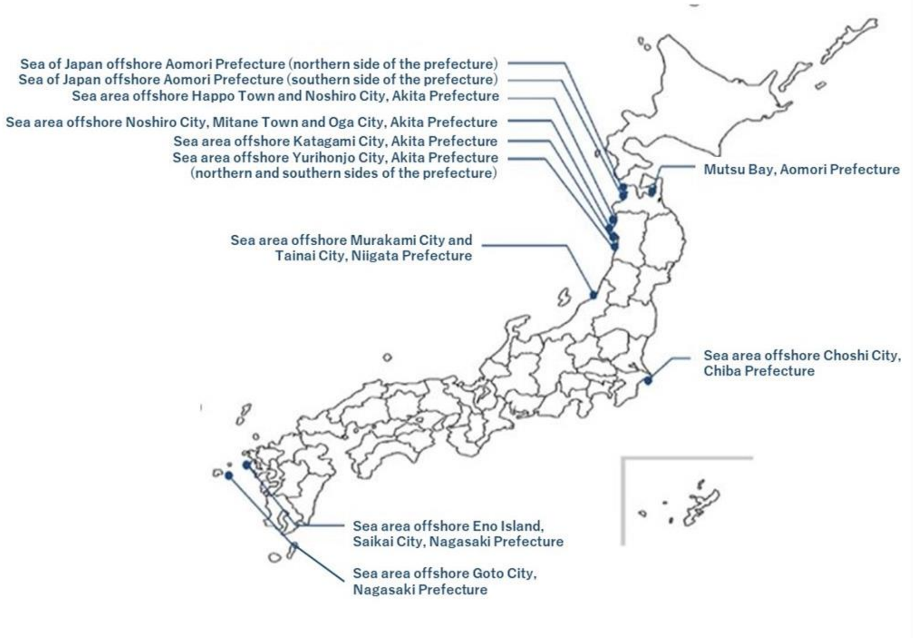
- Increased Investment in offshore wind power, as the technology becomes more mature
- Floating wind turbines, can be installed in deep waters where fixed foundations are not possible
- Could play a central role in Japan's energy supply



Energy on the water

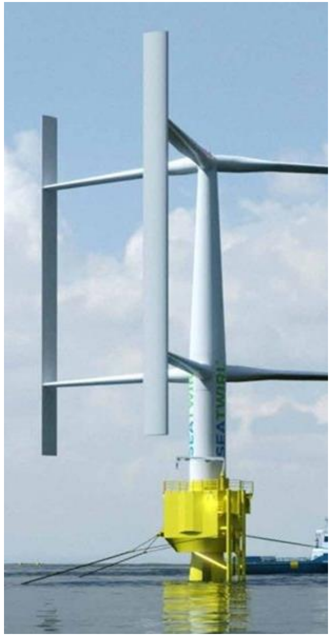
Evaluation of existing concepts for floating platforms

Energy on the water | Evaluation of existing floating platforms

WindFloat (Principle Power)

Hywind (Equinor)

Fukushima Mirai (Japan)

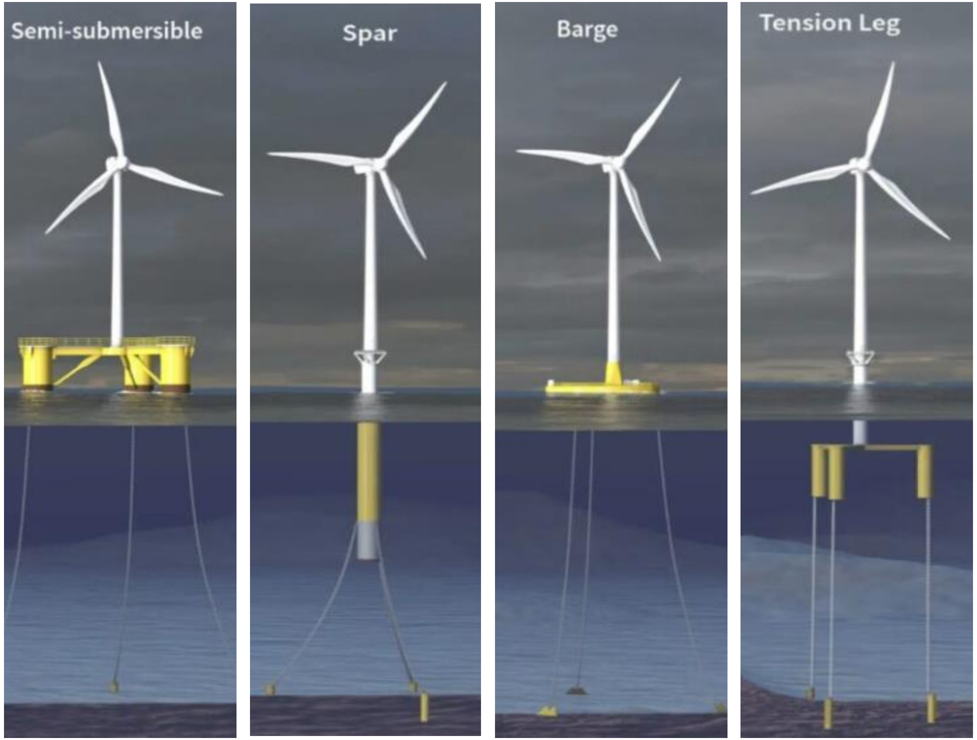


Sea Twirl

Blue SATH

Energy on the water | Floating Platforms: Key Types

- Semi-Submersible Platforms
- Spar Buoy Platforms
- Barge Platforms
- Tension-leg Platform



Energy on the water | Required wind turbines to fully power Japan

- Annual consumption Japan - approx. 950 TWh

= around 31,667 offshore wind turbines, each with a capacity of 8 MW

(calculations depend on Weather conditions, wind speed, efficiency)

Energy on the water | Existing wind Farms in Japan

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- Setana Wind Farm (Hokkaido), since 2004
- Sakata Offshore Wind Farm (Yamagata), since 2005
- Wind Power Kamisu (Ibaraki), since 2008
- Fukushima Floating Wind Turbine (Fukushima), since 2013
- Noshiro Port and Akita Port (Akita), since 2022
- Ishikari Bay (Hokkaido), since 2023

Energy on the water
Student Concepts

Energy on the water | Windfarms

Jil Laske, Nadine Köpke Carrizalez

- Offshore wind farm off Japan’s west coast, with lower tsunami risk
- Floating foundations made from decommissioned rotor blades and recycled rubble
- Dual function as buoyant structure and reuse of wind turbine components
- Triangular shape for stability and efficiency
- Integrated circular rescue station for safety and frequency optimization

Energy on the water | Student Concepts

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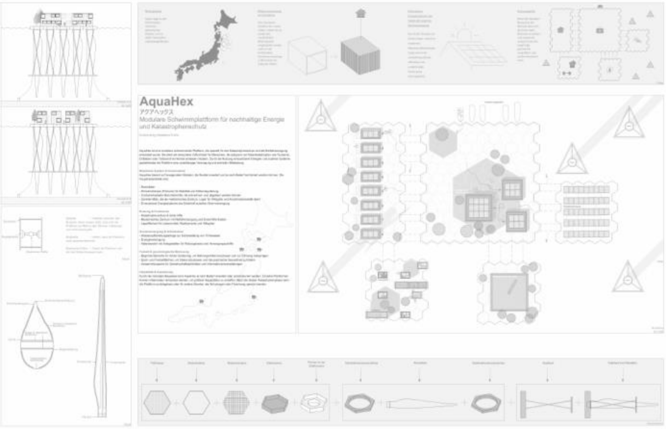
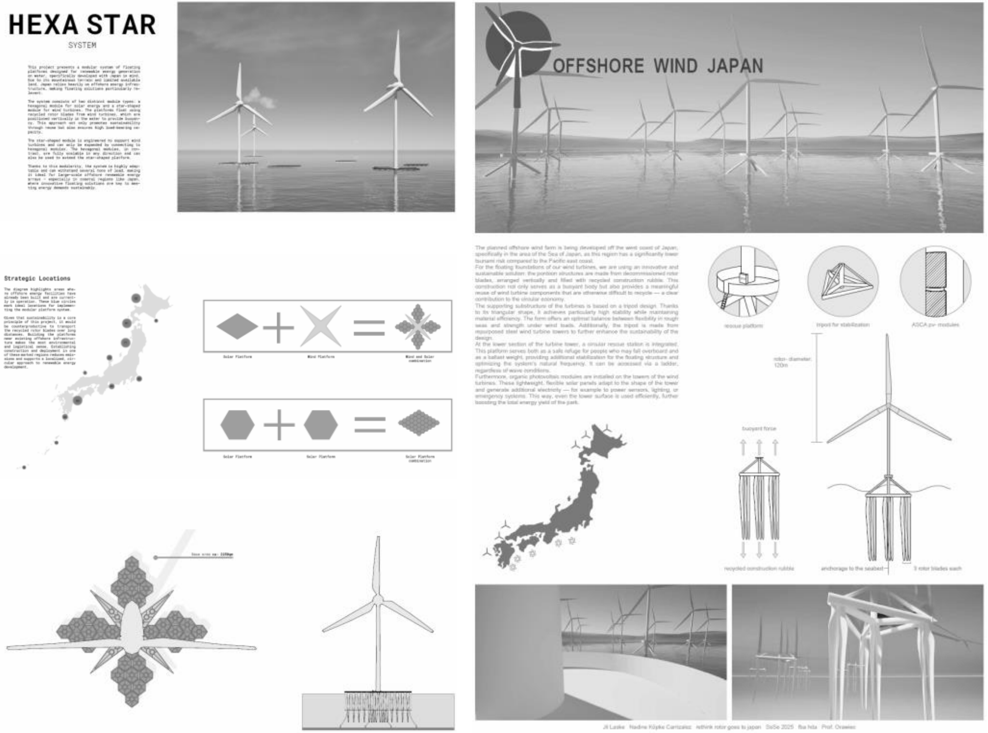
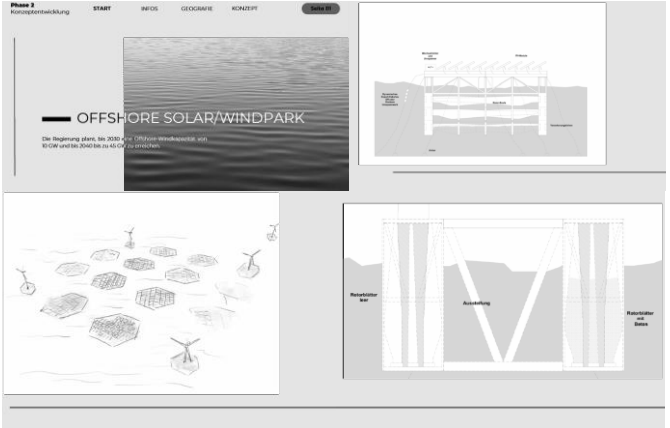
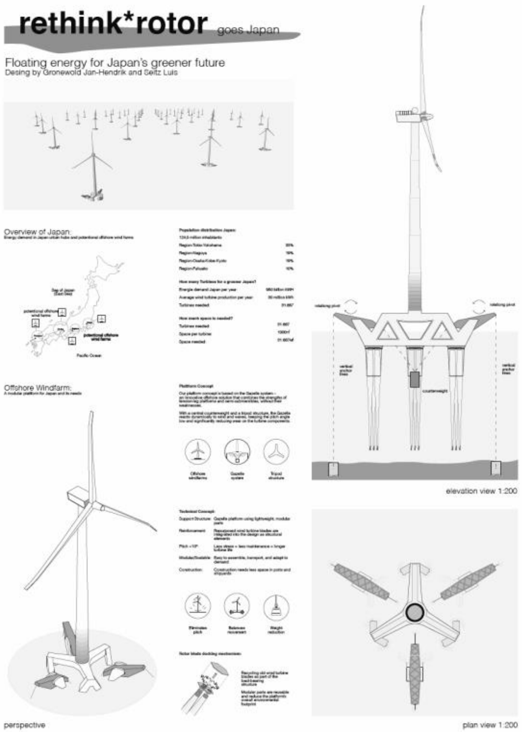


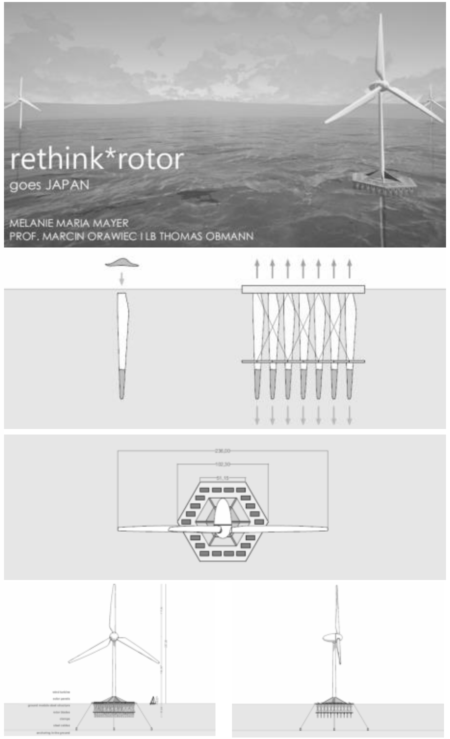
Overview of Student Work from the Course



Energy on the water | Student Concepts



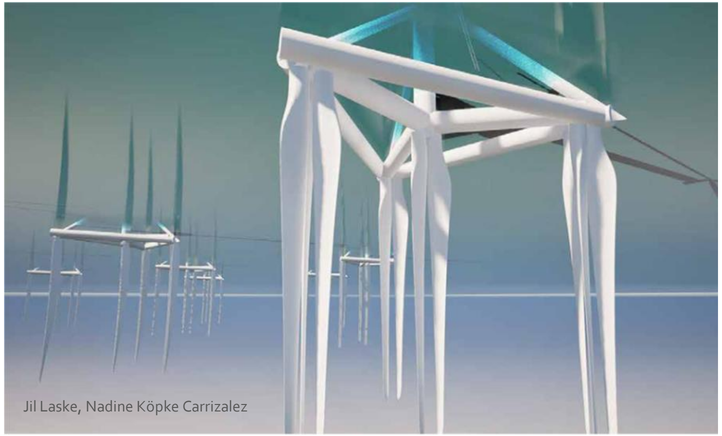




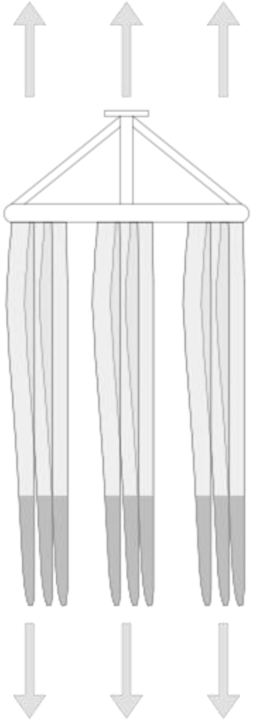
Overview of Student Work from the Course

Student Concepts | Tripod Design

Energy on the water | Offshore Concept: Tripod Design



The supporting substructure of the turbines is based on a tripod design to achieve high stability and low material consumption



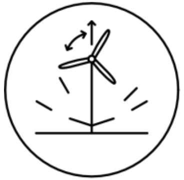
Jil Laske, Nadine Köpke Carrizalez

Energy on the water | Offshore Concept: Tripod Design

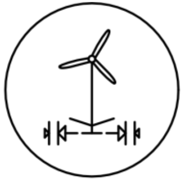
Offshore windfarms

Gazelle system

Tripod structure

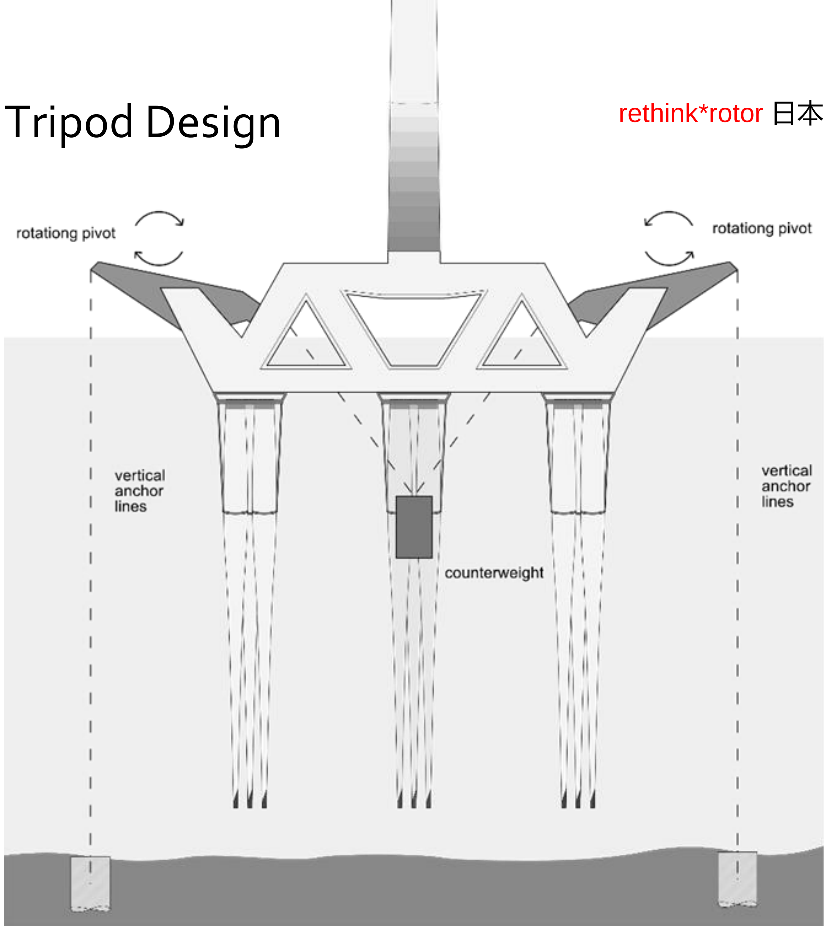


Eliminates pitch



Balances movement

Weight reduction



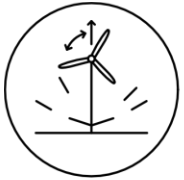
Jan-Hendrik Gronewold and Luis Seitz

Energy on the water | Offshore Concept: Tripod Design

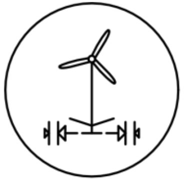
Offshore windfarms

Gazelle system

Tripod structure

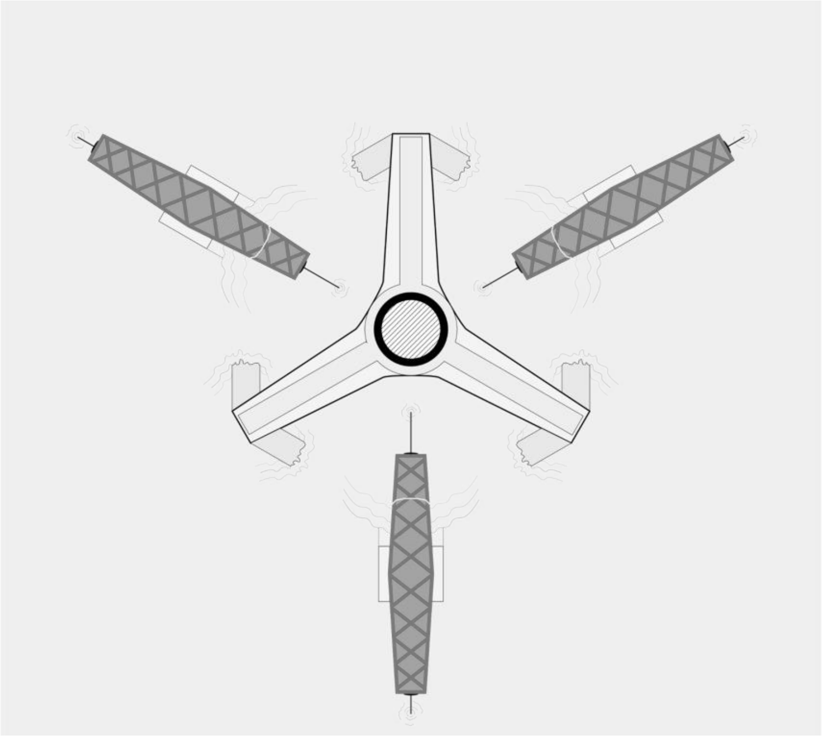


Eliminates pitch



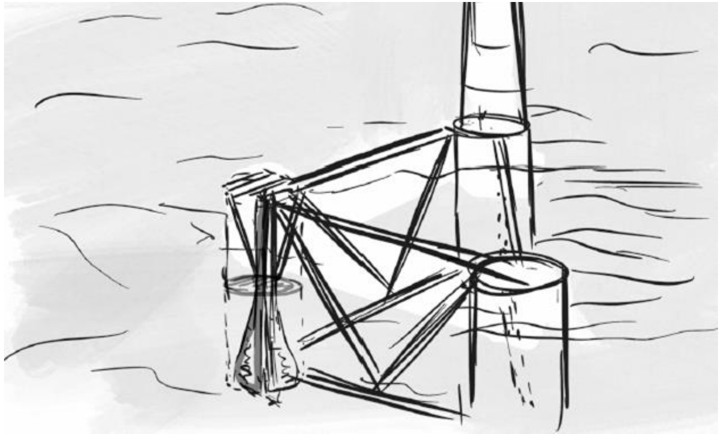
Balances movement

Weight reduction

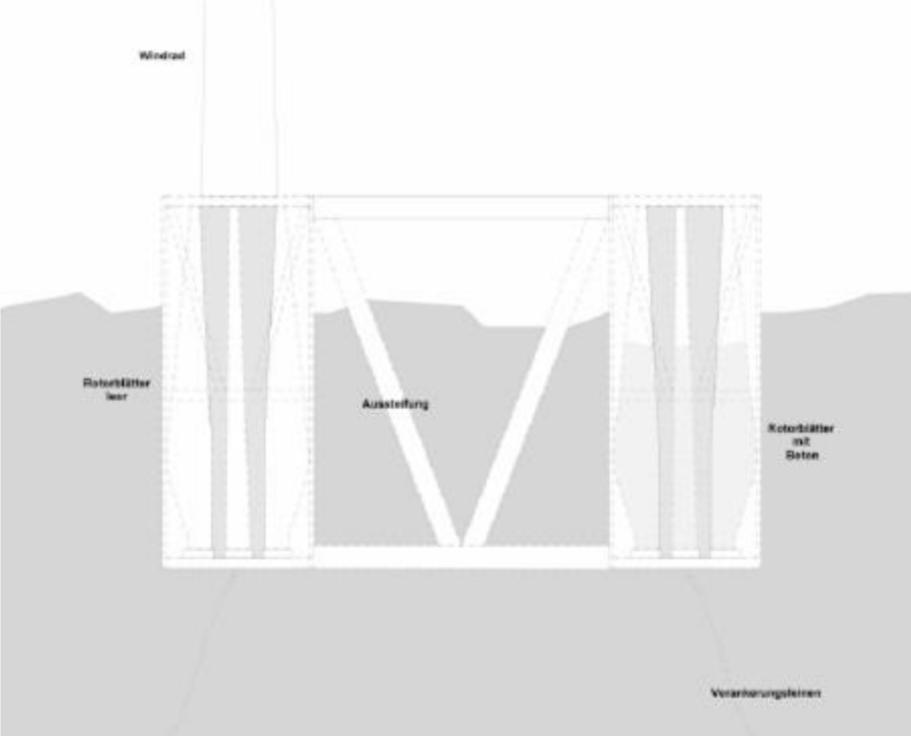


Jan-Hendrik Gronewold and Luis Seitz

Energy on the water | Offshore Concept: Triangular Design



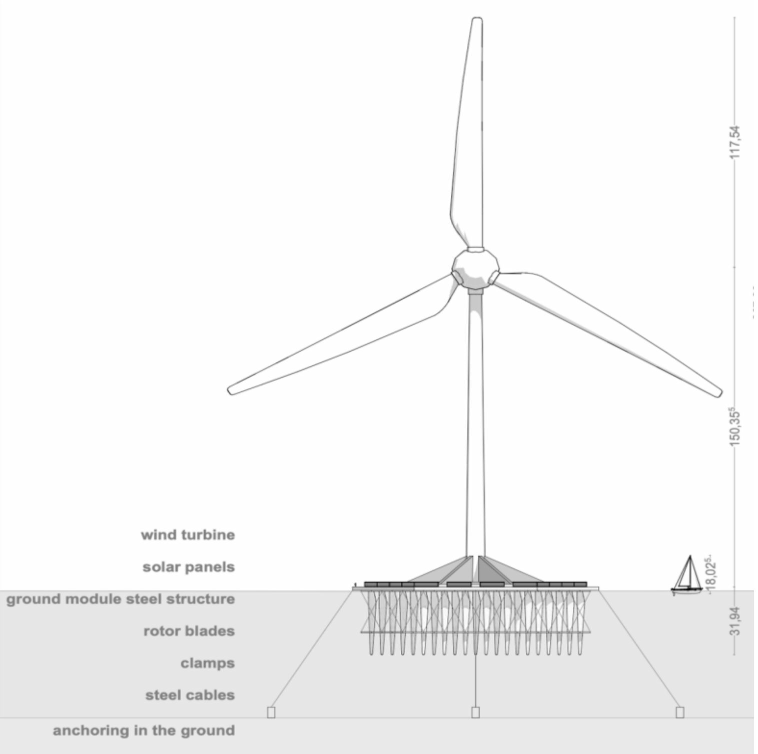
- Typhoon-resistant design
- Reduced surface for wind/wave impact
- Tsunami and earthquake resilience
- Tsunami and earthquake resilience
- Reduced surface for wind/wave impact

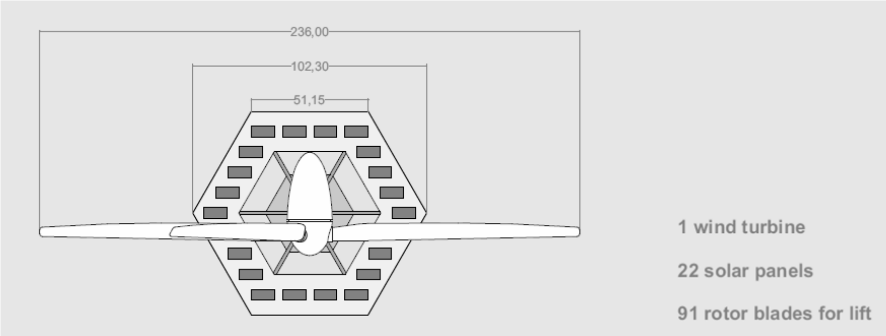


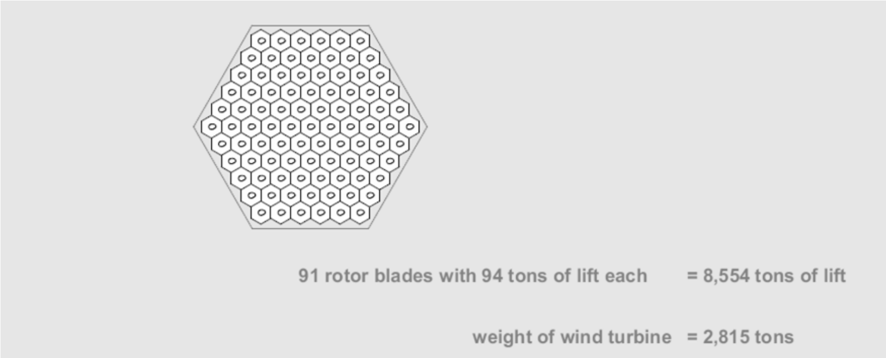
Fatima Ismail, Charlotte Seip

Student Concepts | Hexagon Design

Energy on the water | Offshore Concept: Hexagon Design





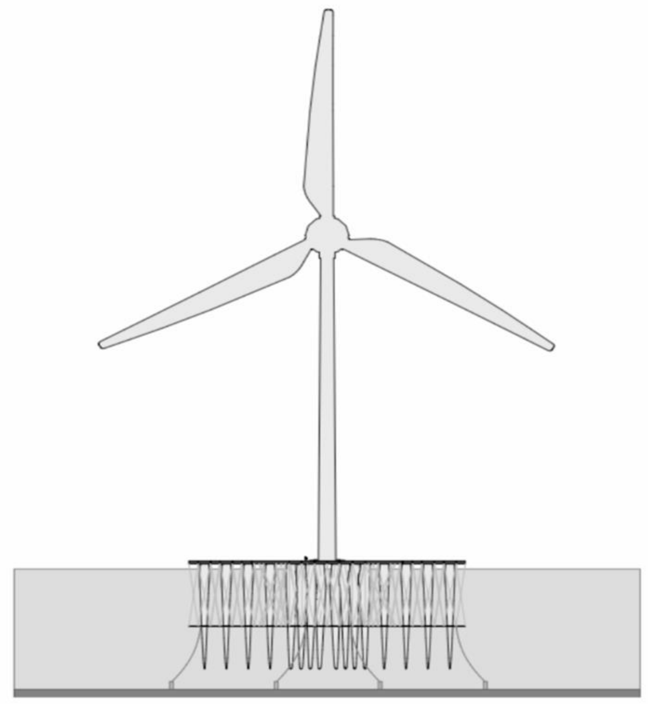


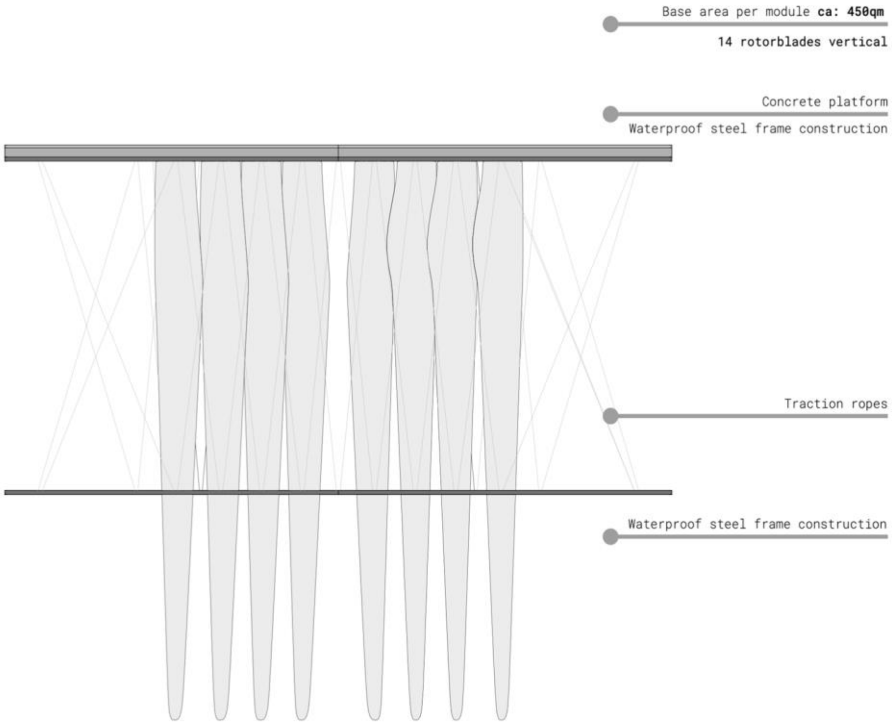
Melanie Maria Mayer

Energy on the water | Offshore Concept: Polygonal Design

Marius Noé

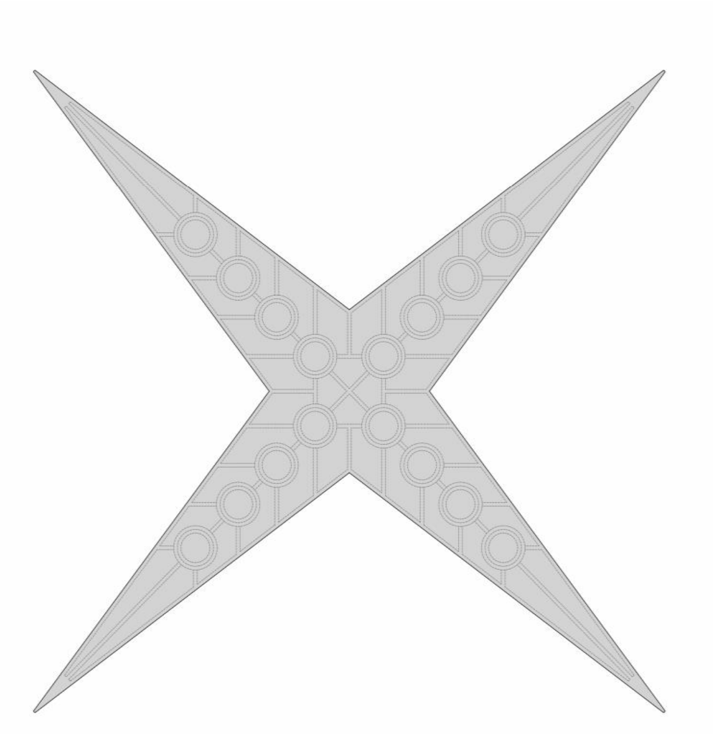
Energy on the water | Offshore Concept: Polygonal Design

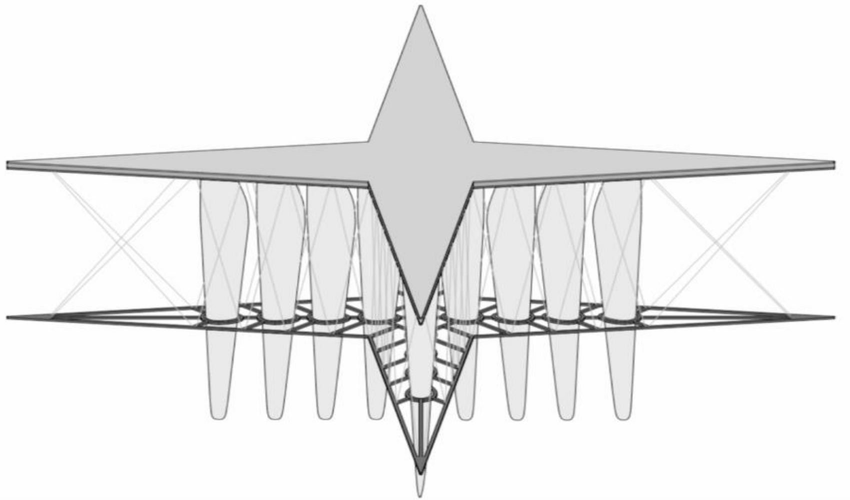


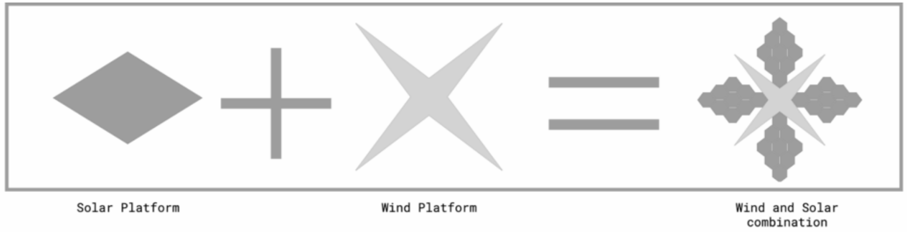


Marius Noé

Energy on the water | Offshore Concept: Polygonal Design



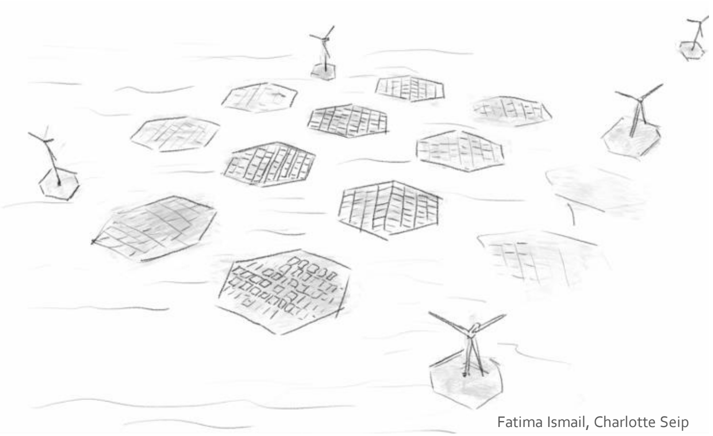




Marius Noé

Student Concepts | Hydrogen - Hexagon

Energy on the water | Student Concepts: Hexagon Platforms



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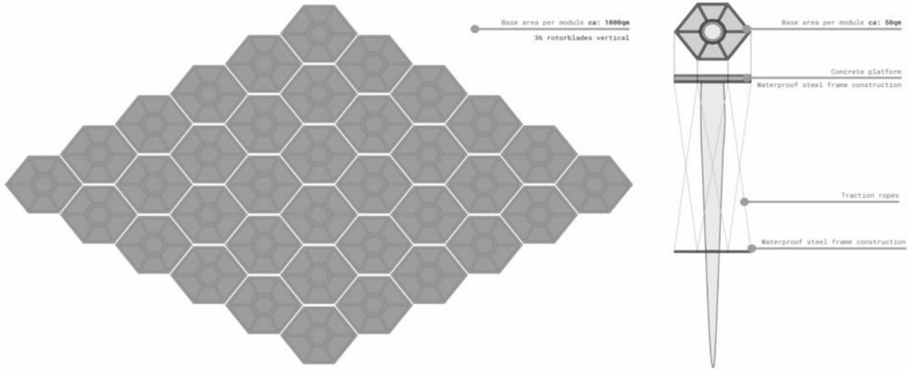
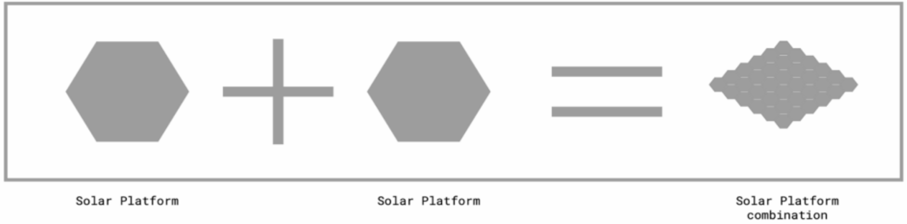


Hexagonal modules can be flexibly expanded and combined as needed.



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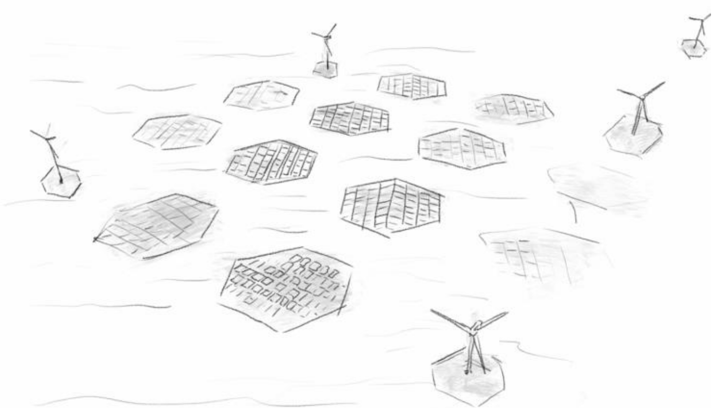
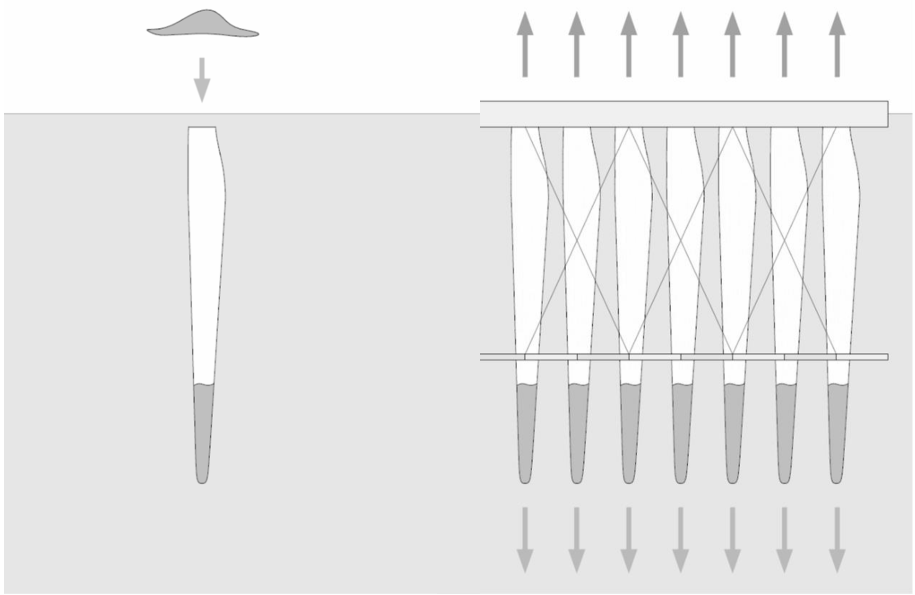


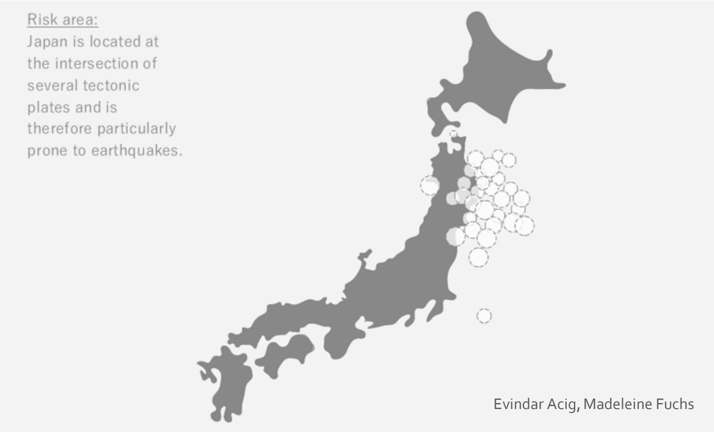
Fatima Ismail, Charlotte Seip



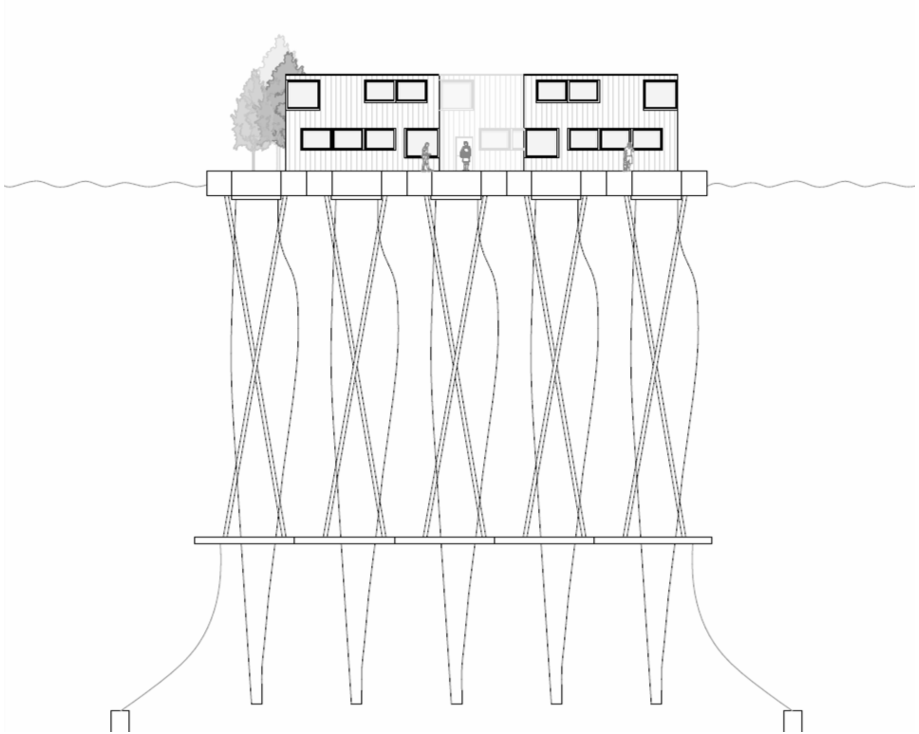
Melanie Maria Mayer

The main components include Rotor blades,- Floating bodies (pontoons) for stability and height regulation.

Energy on the water | Student Concepts: Hexagon Platforms



Evindar Acig, Madeleine Fuchs



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A modular floating platform was specifically designed for disaster relief and emergency response.

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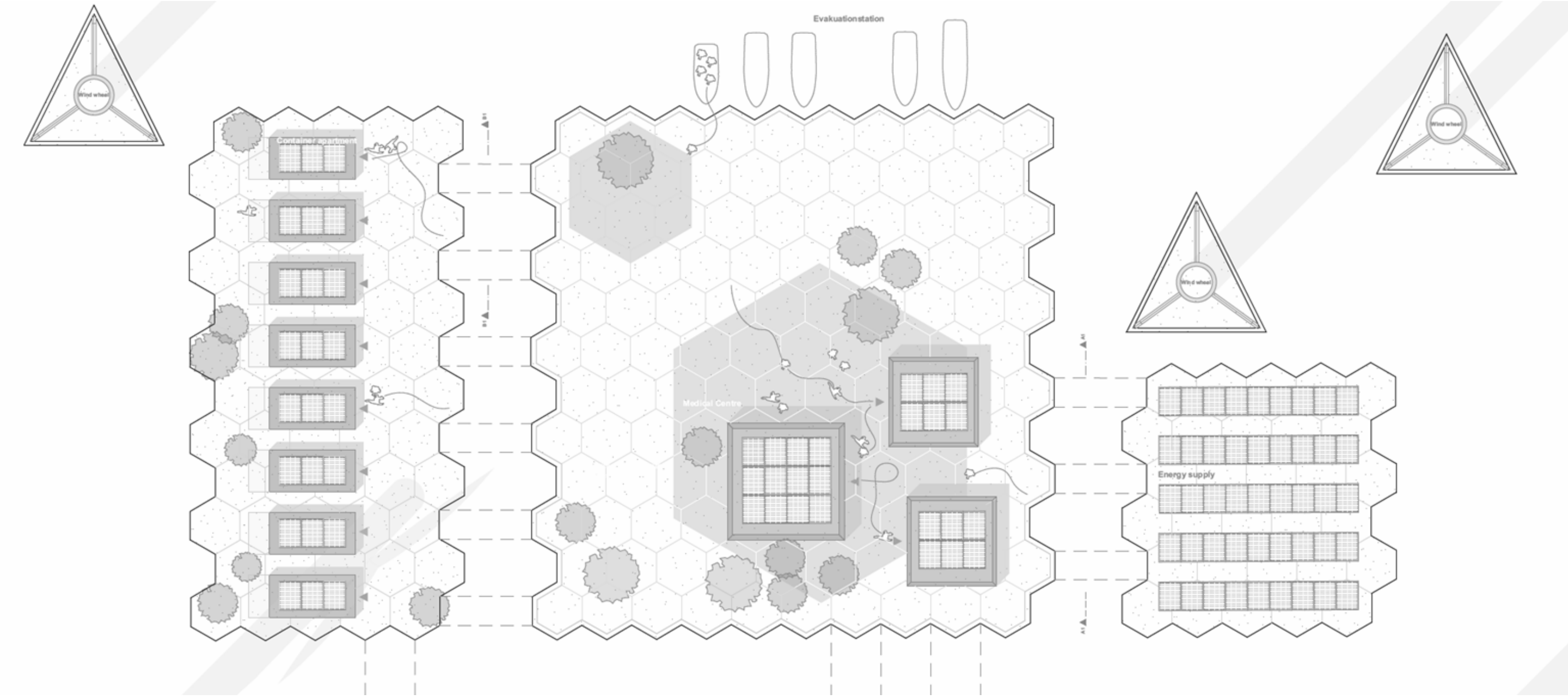

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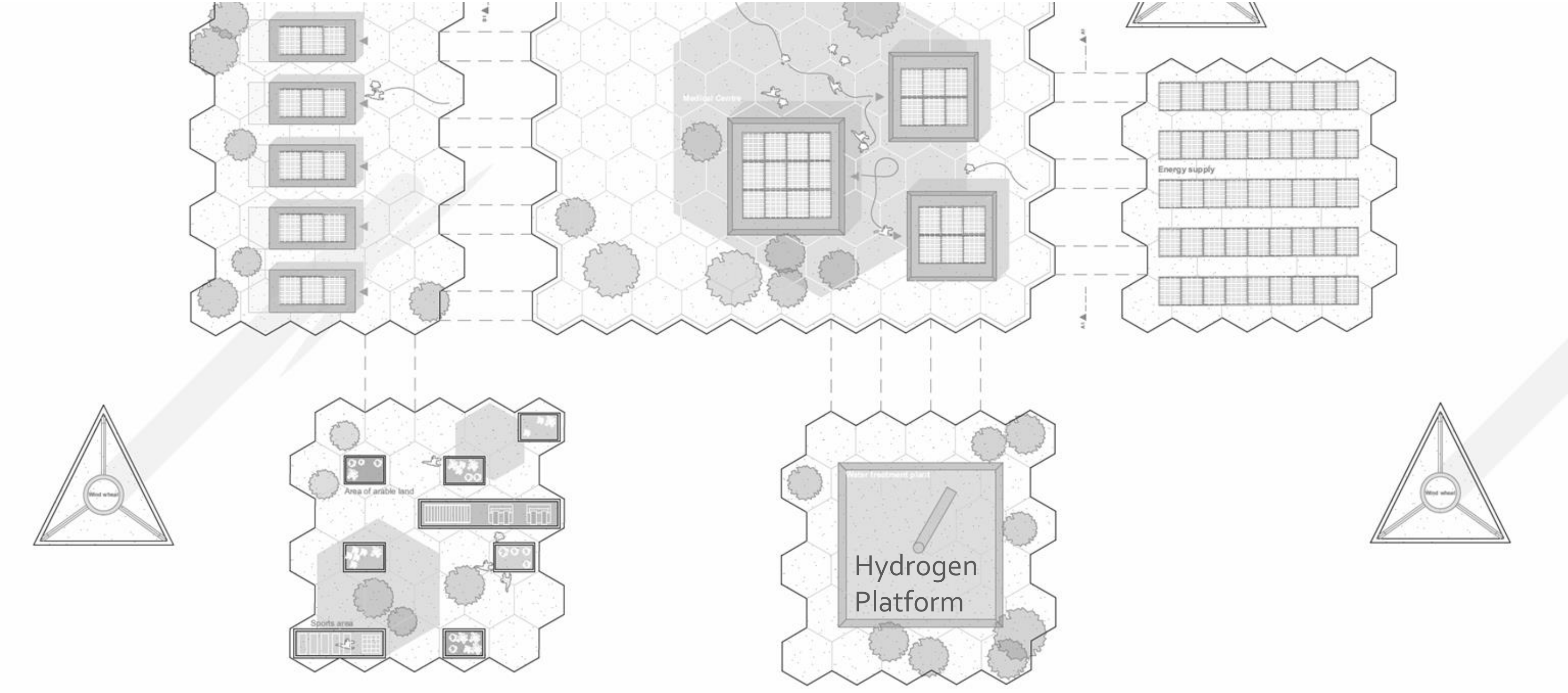
rethink*rotor 日本



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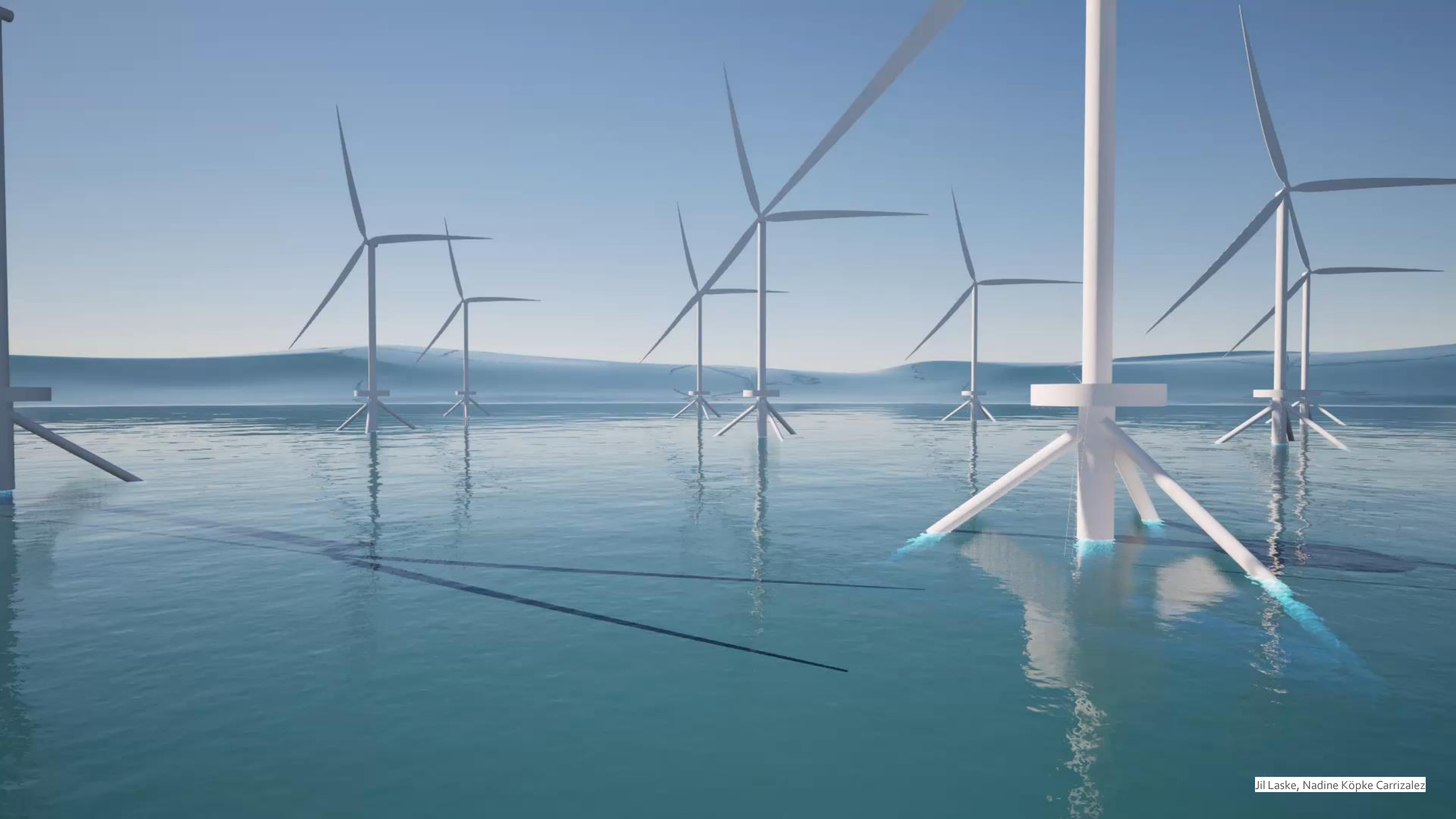
Jil Laske, Nadine Köpke Carrizalez

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