Parisa Vaziri

Rethinking the Architecture of the Renewable-energy Power Plants: Potential Stations to Transform the Social Flows

Supervisors:
Prof. Dr. Guya Bertelli
Prof. Dr. Sören Schöbel-Rutschmann

Coordinator of the Ph.D. program:
Prof. Dr. Alessandro Rocca

POLITECNICO
MILANO 1863
Department of Architecture and
Urban Studies (DASTU)

TECHNISCHE
UNIVERSITÄT
MÜNCHEN
Chair of Landscape Architecture
and Regional Open Space (LAREG)

Technische Universität München
Fakultät für Architektur

Rethinking the Architecture of the Renewable-energy Power Plants:
Potential Stations to Transform the Social Flows

Parisa Vaziri

Vollständiger Abdruck der von der Fakultät für Architektur der Technischen Universität München zur Erlangung des akademischen Grades eines

Doktor-Ingenieurs

genehmigten Dissertation.

Vorsitz: Prof. Dr. Charlotte Bundgaard

Prüfer*innen der Dissertation:

1. Prof. Dr. Sören Schöbel-Rutschmann
2. Prof. Dr. Guya Grazia Maria Bertelli

Die Dissertation wurde am 07 . 04 . 2021 bei der Technischen Universität München eingereicht und durch die Fakultät für Architektur am 19 . 03 . 2021 angenommen.

Rethinking the Architecture of the Renewable-energy Power Plants: Potential Stations to Transform the Social Flows

Rethinking the Architecture of the Renewable-energy Power Plants: Potential Stations to Transform the Social Flows

PhD Candidate:
Parisa Vaziri, M.Sc.

Joint Doctoral Program in:

Architectural, Urban and Interior Design (Cycle XXX)

Polytechnic University of Milan

Department of Architecture and Urban Studies (DAStU)

Supervisor:

Prof. Dr. Guya Bertelli

Landscape Architecture and Regional Open Space (LAREG)

Technical University of Munich

Faculty of Architecture

Supervisor:

Prof. Dr. Sören Schöbel-Rutschmann

POLITECNICO
MILANO 1863

TECHNISCHE
UNIVERSITÄT
MÜNCHEN

To Houshang and Manijeh,
my beloved parents

Acknowledgment

I would like to thank my supervisors, Prof. Dr. Guya Bertelli and Prof. Dr. Sören Schöbel-Rutschmann for giving me the opportunity to work on this topic and providing me with both academic and personal support during my PhD study. Their support and the constructive discussions, have been always a source of inspiration.

I appreciate my mentors, Prof. Stefano Stabilini from Polimi and Prof. Dr. Agnes Förster from TUM, for their guidance and time. I am grateful to Prof. Dr. Dr. Rolf Kuhn who gave me the opportunity to work on this topic at IBA study house and opened this path for me.

I thank my dear friends who emotionally supported me. I admire the warm-hearted supports of Yuting, Mali, Pamela, Tina, George, Alex, Vero, Eleonora, Constanza, Thomas and Natascha. Many thanks to Asli, my accountability partner. I am grateful of Olga and her scientific writing group for all the fruitful exchanges.

Thanks to Andrej whose dance constantly inspires me to liberate my dreams to create such spaces for a playful life, for connection, joy and peace.

Last, but not least, I would like to thank my family, in particular my parents, that despite the geographical distance, they were always there for me with their support and unconditional love.

Contents

Notes on terminology and terms

Flow: however, in Science and technology, flow is relating to the movement of material and in psychology is a certain state of mind, this thesis uses the word *Flow* for physical movement of wind, sun and water energy an also for activities and mood of people physically and emotionally.

Transformation: in this thesis *transformation* of flow means transforming the state of flow (energetic or social) from the existing to another state that is intended by the designer. This transformation happens through a *Station*.

Station: in this thesis a *Station* is a place, however still, can change and transform certain flows. *Stations* are not only a functional and physical building, but more important in this thesis, they are atmospheres for transformation of social flows.

Flow-station model: *Flow-station model* is the hypothesis defined by the author of the present thesis. *Flow-Station model* has a structure and is supposed to give a new perspective to read and analyze the social renewable-energy projects.

Renewable energy: The energy that is produced using the sun, wind, etc., or from crops, rather than using fuels such as oil or coal.[1]

Archetype: the original model or a perfect example of something.[2]

[1] Definition of renewable energy from the Cambridge Business English Dictionary © Cambridge University Press

[2] Definition of archetype from the Cambridge Academic Content Dictionary © Cambridge University Press

Abstract

English*| *Italiano*| *Deutsch

Abstract *English*

Despite the increasing demand for environmentally friendly energy production, we are currently confronted with a lack of systematic design approaches for areas of renewable-energy plants. The need for such an approach remains largely unaddressed, and there are only a small number of realized projects for renewable- energy with spatial and social value as reliable references.

Although renewable-energy installations take up huge areas of landscape, they have not received enough attention from the architecture community. Near residential areas aesthetics has always been one of the main obstacles to the social acceptance of the energy plants. Although aesthetics, social and spatial issues are the subject of architecture, there is no framework or systematic studies for the task of connecting designers and architects with renewable-energy. As a result, planning is usually mono-functional and does not create a place that attracts people and offers the experience of an attractive space with social value. The main objective of the present work is to design innovative investment technologies for renewable-energy architecturally in such a way that they can develop social effectiveness. The concepts of atmospheres according to Gernot Böhme and the space of flows according to Manuel Castells are used as the key to identify socially effective spaces.

The lack of renewable-energy projects with social value is a problem that sets limits to this research topic and makes it seem a challenge to create a framework or typology for this architectural task. To link the two concepts of energy and architecture, it is first necessary to have a common language, as it could be defined by an archetype that conveys the meaning of the two concepts *"transformation of social and physical flows"* with an easily understandable idea: *"Station"*. Thus, two methodological

challenges arise: first, to find a common linguistic level in the fields of energy and architecture; second, to use this linguistic connection to generate new knowledge to meet the social challenge.

To develop a strategy for designers and planners that can transform social flows, atmospheres of places and facilities of renewable-energies are identified and classified. The method includes *research through design*, abductive thinking, and qualitative clustering as well as a systematic formation of categories of perception and interpretation. Due to the current lack of realized renewable-energy projects that are architecturally designed for social effectiveness, the data will be obtained from the creative ideas of international designers, artists and architects who participated in the 2014 Land Art Generator Initiative (LAGI) biennial competition with the motto: *"Renewable Energy can be beautiful"*.

The 64 concepts of the competition will be analyzed by interpreting the atmospheric, social and energy information they contain as ideas of *flows* and *Stations*. The projects are thus identified abductively with an atmospheric term and grouped into nine categories - clusters - according to similarities. This clustering provides a framework, or, in the sense of Christopher Alexander, a pattern language for atmospheric and meaningful spaces of renewable-energy production, which, in addition to the energetic aspects, are decidedly oriented towards social aspects. The *Flow-station model* combines the concepts of energy production and architecture and thus gives the planning a holistic view. *Station* and *flow* become keywords to generate further ideas and categories, depending on the location of a project, that connect existing and desired physical and social flows.

The generated categories are finally evaluated by a design study. This test shows how the categories presented can be a tool for architects to design a *"social power plant"*. The concrete case shows how energy generation

plants can be used to regenerate an inhabited urban landscape and revitalize the adjacent social housing. The result of the work provides new insights for spatial planning and can inspire designers and architects to participate in this movement of transforming energy production in the landscape, which is crucial for the future.

Abstract *Italiano*

Nonostante la domanda di produzione di energia rispettosa dell'ambiente sia in crescita, ci troviamo attualmente di fronte a una mancanza di approcci sistematici di progettazione per le aree degli impianti a energia rinnovabile. La necessità di un tale approccio rimane in gran parte non affrontata, e come riferimenti affidabili ci sono solo pochi progetti realizzati per l'energia rinnovabile che abbiano valore spaziale e sociale.

Sebbene gli impianti a energia rinnovabile occupino enormi aree di paesaggio, non hanno ricevuto abbastanza attenzione da parte della comunità architettonica. L'estetica delle aree residenziali è sempre stata uno dei principali ostacoli all'accettazione sociale degli impianti energetici. Sebbene l'estetica, le questioni sociali e spaziali siano l'oggetto dell'architettura, non esiste un quadro o uno studio sistematico per il compito di collegare progettisti e architetti con le energie rinnovabili. Di conseguenza, la progettazione è di solito monofunzionale e non crea un luogo che richiami le persone e offra l'esperienza di uno spazio attrattivo con valore sociale. L'obiettivo principale del presente lavoro è quello di progettare architettonicamente tecnologie di investimento innovative per le energie rinnovabili, in modo tale che siano in grado di sviluppare efficacia sociale. I concetti di atmosfere secondo Gernot Böhme e lo spazio dei flussi secondo Manuel Castells sono utilizzati come chiave per identificare gli spazi socialmente efficaci.

La mancanza di progetti di energia rinnovabile con valore sociale è un problema che pone dei limiti a questo tema di ricerca e fa sembrare una sfida il creare una cornice o una tipologia per questo compito architettonico. Per collegare i due concetti di energia e architettura, è necessario innanzitutto avere un linguaggio comune, come potrebbe essere definito da un

archetipo che trasmetta il significato dei due concetti "trasformazione dei flussi sociali e fisici" con un'idea facilmente comprensibile: "stazione". Sorgono così due sfide metodologiche: in primo luogo, trovare un livello linguistico comune nei campi dell'energia e dell'architettura; in secondo luogo, utilizzare questa connessione linguistica per generare nuove conoscenze per affrontare la sfida sociale.

Al fine di sviluppare una strategia per progettisti e pianificatori che sia in grado di trasformare i flussi sociali, vengono individuate e classificate le atmosfere dei luoghi e delle strutture di energia rinnovabile. Il metodo prevede la ricerca attraverso la progettazione, il pensiero abduttivo e il clustering qualitativo, nonché la formazione sistematica di categorie di percezione e di interpretazione. A causa dell'attuale mancanza di progetti di energie rinnovabili realizzati e architettonicamente progettati per l'efficacia sociale, i dati saranno ottenuti dalle idee creative di designer, artisti e architetti internazionali che hanno partecipato al concorso biennale *Land Art Generator Initiative* (LAGI) 2014 con il motto: *"Le energie rinnovabili possono essere belle"*.

I 64 concetti del concorso saranno analizzati interpretando le informazioni di atmosfera, sociali ed energetiche in essi contenute come idee di flussi e stazioni.

I progetti sono così identificati in modo abduttivo con un termine atmosferico e raggruppati in nove categorie - cluster - secondo le similitudini. Questo raggruppamento fornisce un quadro, o, nel senso di Christopher Alexander, un linguaggio di riferimento per gli spazi atmosferici e significativi della produzione di energia rinnovabile, che, oltre agli aspetti energetici, siano decisamente orientati verso gli aspetti sociali. Il modello *Flow-Station-Model* combina i concetti di produzione di energia e di architettura, dando così alla progettazione una visione olistica. *Stazione* e *flusso* diventano parole chiave per generare ulteriori idee

e categorie, a seconda della localizzazione di un progetto, che collegano i flussi fisici e sociali esistenti e desiderati.

Le categorie generate vengono infine valutate da uno studio di progettazione. Questo test mostra come le categorie presentate possano essere uno strumento per gli architetti per progettare una *"centrale elettrica sociale"*. Il caso concreto mostra come gli impianti di generazione di energia possano essere utilizzati per rigenerare un paesaggio urbano abitato e rivitalizzare le abitazioni sociali adiacenti. Il risultato del lavoro fornisce nuovi spunti per la pianificazione del territorio e può ispirare designer e architetti a partecipare a questo movimento di trasformazione della produzione di energia nel paesaggio, che è cruciale per il futuro.

Abstrakt *Deutsch*

Trotz des steigenden Bedarfs an umweltfreundlicher Energieerzeugung sind wir heute mit einem Mangel an systematischen Gestaltungsansätzen für Flächen von Anlagen für erneuerbare Energien konfrontiert. Die Notwendigkeit eines solchen Ansatzes bleibt weitgehend unbeantwortet, und es gibt nur eine kleine Anzahl realisierter Projekte für umweltfreundliche Energie mit räumlichem und sozialem Wert als verlässliche Referenzen.

Obwohl die Anlagen für erneuerbare Energien riesige Flächen in der Landschaft beanspruchen, haben sie von Seiten der Architektur bisher nicht genügend Aufmerksamkeit erhalten. Bei der Errichtung in der Nähe von Siedlungen war die Ästhetik schon immer eines der Haupthindernisse für die soziale Akzeptanz der Anlagen. Obwohl Ästhetik, soziale und räumliche Fragen Gegenstand der Architektur sind, gibt es für die Aufgabe, Gestalter und Architekten mit der erneuerbaren Energie in Verbindung zu bringen, keinen Rahmen und keine systematischen Studien. Daher sind die Planungen in der Regel monofunktional und schaffen keinen Ort, der Menschen anzieht und die Erfahrung eines attraktiven Raumes mit sozialem Wert bietet. Das Hauptziel der vorliegenden Arbeit besteht darin, innovative Anlagetechnologien für erneuerbare Energien architektonisch so zu gestalten, dass sie in der Lage sind, auch soziale Wirksamkeit zu entfalten. Als Schlüssel zur Identifizierung sozial wirksamer Räume werden die Konzepte der Atmosphären nach Gernot Böhme und des Raums der Ströme nach Manuel Castells verwendet.

Der Mangel an Projekten erneuerbarer Energien mit sozialen Wert ist ein Problem, das diesem Forschungsthema Grenzen setzt und es als Herausforderung erscheinen lässt, für diese architektonische Aufgabe

einen Rahmen oder eine Typologie zu schaffen. Um die beiden Begriffe Energie und Architektur miteinander zu verbinden, bedarf es zunächst einer gemeinsamen Sprache, wie sie durch einen Archetypus definiert werden könnte, der die Bedeutung der beiden Konzepte "*Transformation sozialer und physischer Ströme"* mit einer leicht verständlichen Vorstellung vermittelt: *"Station"*. So ergeben sich zwei methodische Herausforderungen: erstens, eine gemeinsame sprachliche Ebene in den Bereichen Energie und Architektur zu finden; zweitens, anhand dieser sprachlichen Verbindung auch neues Wissen zur Bewältigung der gesellschaftlichen Herausforderung zu generieren.

Um eine Strategie für Gestalter und Planer zur Transformation sozialer Ströme zu entwickeln, werden Atmosphären von Orten und Anlagen erneuerbarer Energien identifiziert und klassifiziert. Dabei umfasst die Methode sowohl *Forschung durch Entwurf,* abduktives Denken und qualitative Clusterung, als eine systematische Bildung von Kategorien zu Wahrnehmungen und Interpretationen. Aufgrund des bisherigen Mangels an realisierten, zugunsten sozialer Wirksamkeit architektonisch gestalteten Erneuerbare-Energie-Projekten werden die Daten aus den kreativen Ideen internationaler Designer, Künstler und Architekten gewonnen, die 2014 an dem von der *Land Art Generator Initiative* (LAGI) gemäß dem Motto *„Erneuerbare Energien können schön sein"* aller zwei Jahre durchgeführten Wettbewerb teilgenommen haben.

Die 64 Konzepte des Wettbewerbs werden analysiert, indem die darin enthaltenen atmosphärischen, sozialen und energetischen Informationen als Ideen von *Strömen* und *Stationen* interpretiert werden. Die Projekte werden also abduktiv mit einem atmosphärischen Begriff identifiziert und nach Ähnlichkeiten in neun Kategorien - Cluster - zusammengefasst. Diese Clusterung liefert einen Rahmen, oder, im Sinne Christopher Alexanders, eine Mustersprache für atmosphärische und sinnstiftende Räume der erneuerbaren Energieerzeugung, die neben den energetischen

dezidiert auf soziale Aspekte ausgerichtet sind. Das *Ströme-Station-Modell* verbindet die Konzepte von Energieerzeugung und Architektur und gibt so der Planung eine ganzheitliche Sichtweise. *Station* und *Strom* werden zu Schlüsselwörtern, um je nach Standort eines Projekts weitere Ideen und Kategorien zu generieren, die bestehende und gewünschte physikalische und soziale Flüssen verbinden.

Die generierten Kategorien werden schließlich durch eine Entwurfsstudie evaluiert. Dieser Test zeigt, wie die vorgestellten Kategorien ein Werkzeug für Architekten sein können, um ein „soziales Kraftwerk" zu entwerfen. Am konkreten Fall wird gezeigt, wie sich mit Energieerzeugungsanlagen eine bewohnte Stadtlandschaft regenerieren und der angrenzende Sozialwohnungsbau revitalisieren lässt. Das Ergebnis der Arbeit gibt neue Erkenntnisse für die räumliche Planung und kann Gestalter und Architekten dazu inspirieren, sich an dieser die Zukunft entscheidenden Bewegung der Transformation der Energieerzeugung in der Landschaft zu beteiligen.

1
Introduction

Motivation

Problem and the research questions

Methodology

Objectives

1.1 Motivation

In recent times, the world has become increasingly aware of the significant potential of Renewable-energy Sources (RES) as a replacement for non-renewable fossil fuels (Droege, 2006).

According to the United Nations, this era is defined by climate change and this is a critical time that we are living in. An immediate action is essential rather than adaptation in the future to the impacts of the past. One measure to decrease the speed of climate change, is the replacement of the fossil fuels with renewable-energy[1]. Renewable-energy is usually considered as one of the potential solutions to mitigate the worst effects of global warming in any climate change debates. That is because RES emit no carbon dioxide and other greenhouse gases footprint that contribute to the rising temperature (Nunez, 2019).

According to the statistics (Einig and Zaspel-Heisters, 2015; Fuchs et al., 2019) the renewable power plants occupy considerable area of landscape and due to their intrinsic function, they must be exposed to the infinite flows of nature. Furthermore, in comparison with fossil fuels, much larger areas must be allocated to produce renewable-energy e.g. solar, wind, water, and biomass (Stremke and van den Dobbelsteen, 2012).

[1] https://www.un.org/en/sections/issues-depth/climate-change
visited on 12th September 2020

Next page

Fig. 1.1: The Persian horizontal windmill, integrated to the architecture.
(Photo by author, January 2008)

The large scale of this expansion appears in the landscape, in a bold and expressive way. As an architect, the author of the present dissertation would call the concept of renewable-energy as a new matter and material that is not like any other components of spatial spaces. However, up to now the global approach to renewable-energy power plants were quite industrial and technological, renewable-energy power plant is also a matter of architecture and design (Turnbull, 2012).

Following the importance of the presence of this new matter and material in the landscape, the roll of the architects comes to the foreground. Architects can contribute in this crucial field by giving cultural and aesthetic values to these spaces. Today, the architectural design is not just about function and form, rather is more about seeking for a meaningful space and interactive quality of a space. Architecture today, is taking care of the well-being of people and their connection with the environment and nature (Schöbel, 2012). For this humanistic and social aspect, in contrast to industrial and technological approach, architecture has enough tools to connect and merge technologies, spatial elements and sense of space together (Morris and Ferguson, 1993).

There are some projects across the world working on this connection and one of them is a social project from IBA Fürst-Pückler-Land[2] to work on the acceptance of Lusatia citizens in Germany for construction of renewable-energy power plants across the whole Lusatia landscape. The above projects have been extensively involved with the role of architects and aesthetic aspect of the design in renewable-energy to get the acceptance of the society and were a source of inspiration for the author to start the investigations in this area (Kuhn,1999).

Going deeper through the understanding and design of the renewable power plant from architectural point of view, is related to the author's background and traditional architectures in Iran. According to the personal experiences during travels across Iran and visiting different old towns and villages (Pirnia and Memarian, 2004; Haeri Mazandarani, 2009), while studying Architecture at Tehran University was a source of curiosity and desire for understanding sustainable architecture and urbanism for the author. This stood as a considerable motivation to pursue further studies through sustainable architecture at Polimi(Bertelli, 2011).

Previous page

Fig. 1.2: The Persian horizontal windmill, in human scale.
(Photo by author, Jan 2008)

Previous page

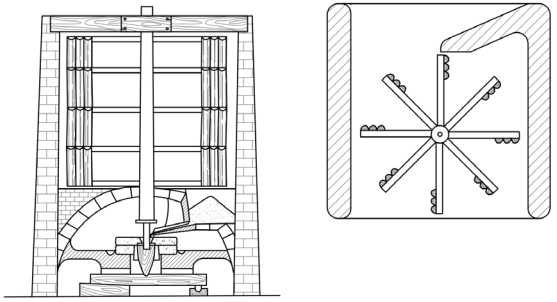
[2] http://www.iba-see2010.de
(visited on 21th July 2020)

There was a strong motivation to understand the secrets behind the unforgettable sensible architectures. There was a curiosity to decodify why some spaces capture the attention and offer an atmosphere which is simply meaningful and invites a person to think. The experience provoked my interest to investigate how an architecture can communicate to the environment, to integrate with the flows of nature, to sit and connect to the earth, interact with the sun and sky, as well as calling the people to the explore the space. It inspires people to interact not only with the space but also with each other. The explorations have continued to the thinking of the architecture that is a part of the nature, involving the people versus standing against the environment and in communication with the society.

Back to the intention of this section and renewable-energy, due to the long history of Persian architecture, no wonder that the oldest integrated windmills are built in Iran which are shown in Figs. 1.1 and 1.2.

For more than a thousand years, windmills (Asyab-i-badi, in Persian language) still stand, and each single individual is still rotating. Nashtifan is the name of this tiny village in eastern Iran at the border with Afghanistan with this powerful architectural culture (Fig. 1.3). These old windmills are made of wood integrated to a clay and straw structure. The windmills are on the roof of the houses that by means of harvesting the wind energy for rotating a grindstone, the mill grain produces flour (Gillis, 2015). These wonderful structures wisely on purpose were planned to be on the highest point of the town to exploit the maximum solid breezes of the zone, as well as protecting the town from the strong destructive winds.

Fig. 1.3: The Persian horizontal windmill, the first practical windmill.
Photo: Kaboldy's own work, CC BY-SA 3.0



Another example of the ingenuity and the impressive technical achievements that reached to a perfect harmony with the natural environment and living spaces is Shooshtar's hydraulic system depicted in Fig. 1.4. Far from harming the environment, as it so often happens in our time, this project has greatly enhanced the natural beauty of the site; in a way it has been created, showing a perfect example of interaction between the man and the nature. There are no single elements: bridges and dams, canals, built areas or gardens, but only one ensemble.

Previous page

Fig. 1.4: An overview of a part of the collection of Shooshtar mills and waterfalls, Iran. (Photo by author, February 2008)

Fig. 1.5: Scale of a man in comparison to a regular wind turbine.
Photo: UCS, https://blog.ucsusa.org

Fig. 1.6: A solar farm covering a large area in landscape.
Photo courtesy of SunEnergy
https://news.mit.edu

1.2 Problem and the research questions

Architects usually deal with designing a living space for people. But how to design and deal with the rigid industry of renewable-energy? Being out of scale, different material and limiting forms, color and working with time and movement of natural flows are just some problems that may separate the clean energy power plants from the area of the architectural work (Koolhaas and Mau, 1998).

Dealing with fluctuations of air, sound and light, the fluidities of water, the with fluctuations of air, sound and light, the fluidities of water, the entropic tendencies of matter in the movements of people are all part of Architecture (Crysler et al., 2012). Although the renewable-energy power plants are dealing with the flows mentioned in The SAGE Handbook of Architectural Theory, they have not received enough attention from the architects. Therefore, the design is not an inviting place to attract people and offer the experience of a pleasant space with social connection (Gehl et al., 2004). So, the main question here is how architecture can transform this renewable industry from the engineering mode (Figs. 1.5 and 1.6) to a living space? The problems of renewable-energy spaces from architectural point of view are summarized in the following:

- Mono functional
- Out of human scale
- Not livable, not accessible
- Lack of aesthetics
- Layout from engineering logic
- Technological approach as a global language.

Therefore, according to the above-mentioned problems, the following questions are of interest:

- What kind of atmospheres and moods a renewable-energy power plant can radiate?

- What does a renewable-energy power plant mean in architecture?
- How renewable-energy production can get easier the acceptance of society?

1.3 Methodology

The method or research for this thesis is research by design, abductive reasoning and qualitative analysis and clustering via interpretations and perceptions (Groat and Wang, 2013; Jenner et al., 2004). Research by design addresses the method, which is based on qualitative assessments. Therefore, it is possible to cluster and analyze the required data from an international non-governmental organization called "Land Art Generator Initiative" or "LAGI". It offers, amongst other activities, since 2010, biennial competitions for Architects, Artists, Landscape Architects etc. Following the idea "renewable energies can be beautiful", and publishes the result in the web and in the books. (Monoian and Ferry, 2018).

The interpretation and perception start by *Flow-station model* as the hypothesis to read the atmospheric character of the space and then clustering the results to create a new knowledge out of the analyzed data (the data is limited in LAGI projects from 2014 biennial competition). The procedure will be elaborated in Chapter 4.

Based on a qualitative research it is viable to cluster very different designs regarding their construction of atmospheres, to find similarities, types and finally, on a higher level, 'archetypes' of social transformations in renewable energy project ideas. At this stage, the current state of the research is abductive analysis and clustering the collective data. Examples of such data are the atmospheres and social occupancies visualized in the design projects that may stand for the idea of flow and station. Testing the final clusters by designing a pilot project is the last objective to be achieved. This test can be a proof for a possible approach to design a cultural renewable-energy power plant by giving the design tools to architects and planners in their design process.

1.4 Objectives

Occupying a remarkable amount of space and land by renewable-energy power plants comes together with a bold social and spatial impact in urban and landscape (see Chapter 2).

The fundamental objective of the present thesis is to address a classified approach as a missing link to include the aspect of social and human well-being into the planning of the renewable-energy power plants and getting notice of architects, planners and artists in this crucial issue.

Speaking about the society and remarkable amount of space should be referred to the role of the architecture as the constant vivid actor of a space (this architecture in the present thesis is called *Station*, see Chapter 4). Thereby, one of the main objectives is to find an architectural language to read the renewable power plants as social places and meaningful atmospheres for conscious transformations.

Conclusion

The ancient architectural approach to renewable-energy spaces and transforming the natural flows not only to another form of energy, but also, to the dynamic of social daily life, is motivational to rethink about the current global engineering approach to build renewable-energy power plants.

The current power plants usually are mono functional, and they usually cover lands out of human scale and without integrating to human activities. Therefore, the objective of the present thesis is mainly, addressing the missing link between a renewable-energy power plant and its integration to dynamic of social flows.

According to the lack of realized projects, in the field of renewable-energy, with social and spatial value, we need to design a method and analyzing reliable data to get to a systematic approach that can be proposed to architects, designers and planners who will be supposed to build new renewable-energy power plants in future.

Main references

Peter Droege. The renewable city: a comprehensive guide to an urban revolution. Chichester, UK: Wiley-Academy, 2006.

Sven Stremke, and Andy van den Dobbelsteen. Sustainable energy landscapes: designing, planning, and development. CRC Press, 2012.

Jessie Turnbull. Toyo Ito: forces of nature. Chronicle Books, 2012.

Sören Schöbel. Windenergie und Landschaftsästhetik. Jovis Verl., 2012.

Charles R. Morris, and Charles H. Ferguson. How architecture wins technology wars. Harvard Business Review, Vol. 71, no. 2, pages 86–96, 1993.

Rolf Kuhn. Internationale Bauausstellung (IBA) Fürst Pückler Land in der Lausit. Landschafts Architekten, 1999.

Mohammad Karim Pirnia, and G.H. Memarian. Styles of iranian architecture. Tehran:Sorush Danesh, 2004.

Mohammadreza Haeri Mazandarani. House, culture, nature. Tehran:Ministry of Rouds and Urban Developement. [in Persian], 2009.

Guya Grazia Maria Bertelli. OC-Open City International Summer School: Between the city and the river, Architecture of urban relations. Maggioli, 2011.

Christopher C Gillis. Still Turning: A History of Aermotor Windmills, Vol. 27. Texas A&M University Press, 2015.

Rem Koolhaas, and Bruce Mau. S, m, l, xl. Monacelli Press, 1998.

Greig Crysler, Stephen Cairns, and Hilde Heynen. The SAGE handbook ofarchitectural theory. Sage, 2012.

Linda N Groat, and David Wang. Architectural research methods. John Wiley & Sons,2013.

Bryan Jenner, Uwe Flick, Ernst von Kardoff, and Ines Steinke. A companion to qualitative research. Sage, 2004.

Elizabeth Monoian, and Robert Ferry. land art generator initiative. In: Gobster, Paul H.; Smardon, Richard C., eds. Visual resource stewardship conference proceedings: landscape and seascape management in a time of change; 2017 November 7-9; Lemont, IL. Gen. Tech. Rep. NRS-P-183., pages 1–19, 2018.

Jan Gehl, and Lars Gemz, et al. Public spaces-public life. Arkitektens Forlag. 2004.

2
Current state of renewable-energy power plants

Facts

Renewable story: "Energiewende"

Renewable industry: creative technology

Renewable architecture: engineering mode

Critiques

Social acceptance

The gaps

Lack of "Baukultur" as a principal

Lack of a pattern language for renewable design

2.1 Facts

2.1.1 Renewable story: ``Energiewende''

The term Energiewende was first contained in the title of a 1980 publication by the German Öko-Institut, calling for the complete abandonment of nuclear and petroleum energy (Schmitz and Voß, 1980). The term *Energiewende* or energy transition in German language, means an alternative, clean, affordable, safe - in short, sustainable way of generating and using energy. This means turning away from traditional electricity and heat generation, primarily through fossil and nuclear power, and a move towards renewable energies and energy efficiency.

In order for the step into a new energy age to succeed, the climate targets agreed at the climate conference in Paris to be achieved by the year 2050 and, among other subjects, electricity generation to be almost free of greenhouse gas emissions, there are still many steps to follow. This cannot be achieved with just one measure. The solution approaches must encompass all areas and successfully meet a large number of practical and political challenges (Appunn et al., 2020)

2.1.2 Renewable industry: creative technology

Although we hear about the solar and the wind power as the most popular renewable energies, there are many ways and different technologies to convert the flow of light and wind to flow of electricity or heat or another kind of energy (Khaligh and Onar, 2017). There are many ways and ideas to employ those technologies to adapt and integrate to the design. In LAGI Field Guide Renewable-energy (Ferry and Monoian,

Next page

Fig. 2.1: A view to the German Pavilion at the 2015 EXPO Milano.
Designed by SCHMIDHUBER.
(Photo by author)

2012), the current and latest technologies are listed according to different kinds of the natural flows. There are dozens of proven methods for harnessing the power of nature in sustainable ways. Some interesting examples that may be applicable as a medium for public art installations include the organic thin films that are flexible and offer interesting hues and textures, piezoelectric generators that capture vibration energy, concentrated photovoltaics that allow for interesting play with light, and custom solar laminations that can be printed on (Figs. 2.1 and 2.2).

The possibilities are endless, and new designs that can be artistically integrated into residential and commercial projects are constantly coming into the market all over the time.

The desirable future that we would like to see is the one in which we are surrounded by the most diverse ecosystems of renewable-energy technologies and landscapes, each a reflection of local culture and context. The technologies discovered till now have the power to save the world from the most catastrophic impacts of the climate change. According to the handbook of LAGI, the latest technologies in renewable-energy are as follows:

- Thermal: direct non-concentrating, solar pond, parabolic trough, linear Fresnel reflector, dish Stirling, solar power tower, photovoltaic thermal (PVT)
- Solar photovoltaic: photovoltaic solar cell, crystalline silicon, amorphous silicon ,thin-film non-silicon, perovskite, multi-junction, dye-sensitized solar cell, organic photovoltaic, thermophotovoltaic (TPV), concentrator photovoltaic (CPV), luminescent solar concentrator, emerging photovoltaic and other solar power like photoelectrochemical cell (PEC), thermoelectric, solar updraft tower, artificial photosynthesis, experimental solar
- Wind: onshore horizontal axis wind turbine, offshore horizontal axis wind turbine, vertical axis wind turbine, concentrated wind, high altitude wind power and airborne, vortex induced vibration resonant wind generator, emerging wind
- Water: geothermal, dammed reservoir, run-of-the-river ,micro and pico hydroelectricity, vortex hydroelectricity, tidal stream generator, barrage tidal, ocean marine current, surface following, point absorber wave energy generator, and

other wave energy generators, osmotic power, ocean thermal energy conversion.

The technology and science for efficiency in production, politics and economy is already advanced and is very fast growing, while the matter of social, well-being, atmospheric and meaningful aspects is missing in the general approaches to design and build renewable-energy power plants. Today is the time for transition from smart design to higher level of conscious design and moving from the performance design to the experience design (e.g. the conscious city- Itai Palti 2016, see Chapter 3). It is important to point out the fact that meaningful places do not necessarily have to be pleasant spaces, i.e. they may not fulfil all of the Gehl's Twelve Quality Criteria for protected, comfortable and enjoyable spaces. Detailed explanations will be given in Chapter 3.

2.1.3 Renewable architecture: engineering mode

Renewable-energy for electricity production is quite a new field of study. The regular renewable-energy power plants are usually in engineering mode. However, different layouts sometimes turn them into funny and interesting from only from the top view (Fig. 2.3). Despite the efforts invested to develop such layouts, the architectural aspects of the renewable-energy power plants are missing. These remarkable landmarks are quite important to be addressed from a scientific point view. Therefore, more studies are essentials to investigate the architectural characteristics of these plants.

2.2 Critiques

2.2.1 Social acceptance

We must look at the solutions outside the synthetic industrial engineering paradigm of the twentieth century and avoid the emergence of a *"renewable-energy resource curse"* for those who live in regions rich in solar, wind, geothermal, and water resources (Sena, 2015).

Previous page

Fig. 2.2: Hexagonal organic photovoltaic modules Produced by OPVIUS and installed in the German Pavilion at 2015 EXPO Milano. Designed by SCHMIDHUBER. (Photo by author)

Fig. 2.3: A panda-shaped PV project built by Panda Green Energy. Photo: UNDP www.pv-magazine.com

Renewable-energy power plants have not been fully accepted by society to have them in their nearby landscape, neighborhood, and houses. Solar cells can be screwed onto roofs, but you can also put them outdoors, as is often seen not only in countries like Italy or Germany. However, as an example, Germany is a comparatively densely populated country and agriculturally usable area measured by its population size is rather scarce. Solar systems on farmland are therefore not welcomed by the whole population (Pomrehn, 2020).

It is essential to consider the social aspects that influence the acceptance of climate-friendly technologies, such as renewable-energy. In a nutshell, the potential economically and practically usable part of the renewable-energy sites depend on complex economic, regulatory and technical constraints, together with the questions of acceptance. As an instance, integrated PV, that merges with the buildings, traffic routes and vehicles, or uses areas in addition to agriculture or water surfaces in flooded opencast mines, will have slightly higher electricity generation costs than simple open space power plants (see Fig. 2.4). In turn, integrated PV avoids

Fig. 2.4: Applications for the integrated PV renewable-energy plants (Wirth, 2020).

conflicts of land usage and creates synergies by replacing a building facade, using the substructure of a noise barrier or increasing the range of electric vehicles. In this way the acceptance rate of the society increases (Wirth, 2020).

While the public has a positive attitude towards renewable-energy in general, individual projects regularly face resistance from the local community. People tend to resist change in their environment, out of a personal fear for a loss of quality of life. Instead of disregarding local views, both rational and emotional parts of the local debate should be taken seriously.

Since a disproportionate share of negative impacts of a development, such as a wind energy park, is for the local community, a strategy for sharing benefits may be employed. The importance of taking the social side of renewable-energy projects into account is widely recognized. Considering that the success of projects depends to a large extent on their social acceptance, it is important to have clear insight into what would be the social implications of deploying and diffusing these renewable-energy technologies.

Social acceptance is recognized as an important issue shaping the widespread implementation of renewable-energy technologies and the achievement of energy policy targets. Furthermore, it is commonly assumed that 'social attitudes' need to change to make more radical scenarios about the implementation of renewable-energy technologies feasible. For instance, Devine-Wright (2008), critically summarized the existing social research on the acceptance of renewable-energy technologies, and provides a novel classification of personal, psychological and contextual factors that combine to shape public acceptance. He points to the need for more systematic research on public acceptance driven by coherent theoretical frameworks drawn from psychology and other social science disciplines, explicit definitions of concepts, the use of innovative methodological tools and a greater emphasis upon symbolic and effective aspects (Assefa and Frostell, 2007; Moula et al., 2013).

Consequently, that needs new kind of design tools and strategies. Thanks to the scientists that invent new technologies for better efficiency and more environmental friendly products (Schöbel-Rutschmann, 2000). What we need more, is improving spatial and social value to the space of renewable-energy power plants, which is the subject of present thesis.

2.3. The gaps

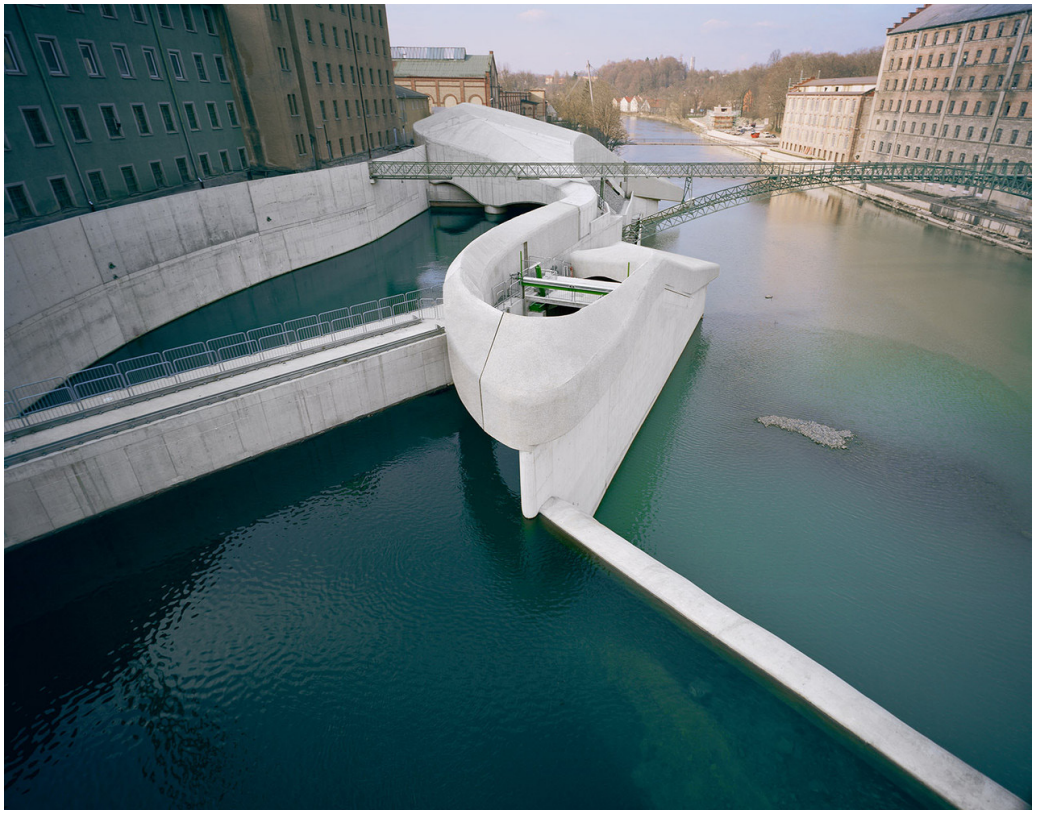
2.3.1 Lack of "Baukultur" as a principal

Since a disproportionate share of negative impacts of a development, such as a wind energy park, is for the local community, a strategy for sharing benefits may be employed. The importance of taking the social side of renewable-energy projects into account is widely recognized. Considering that the success of projects depends to a large extent on their social acceptance, it is important to have a clear insight into what would be the social implications of deploying and diffusing these renewable-energy technologies[3].

One of the good examples realizing this concept is the Copenhill project in Denmark. The architect of this project Bjark Ingels emphasizes on the importance of clean technology and how these technologies must be integrated into architecture. He argues that new

industrial projects must also break from traditional paradigms and question established concepts in order to be reintegrated into communities as clean, attractive and multi-use spaces. Ingels suggests that clean technologies hold exciting possibilities for public spaces (Stamp, 2020). By 2017 the plant will treat 400,000 tons of waste per year and supply a minimum of 50,000 households with electricity. The most innovative use of the power plant is that, not only it converts trash into energy, but also includes a roof-top ski slope (Fig. 2.5) There are also some good examples for Hydro power plants like the Hydro-electric Power station from Becker architects in Kempten, in Germany (Fig. 2.6).

Becker mentions the "rock formations washed out by the river in the immediate vicinity



Previous page

[3] http://www.climatepolicyinfohub.eu (visited on 14th July 2020)

Previous page

Fig. 2.5: BIG opens Copenhill power plant topped with rooftop ski slope in Copenhagen.
Photo: www.dezeen.com

Fig. 2.6: Hydro-electric PowerStation by Becker architekten, Kempten, Germany (2010)

Photo by: Brigida González
www.archdaily.com

of the power plant site with their sometimes-bizarre appearances" as an important further source of inspiration but on the other hand, as its architect notes the ambiguity was wanted: "Almost every viewer finds his own metaphor". To meet the requirements, the client - the regional energy producer called some architects to a competition. The Kempten-based office Becker architekten won this with an unusual approach: the planners put a streamlined concrete sculpture over the weir, inlet and turbine house.

In addition, there are some projects integrated with the pathways and bike tracks in the Netherlands, Germany, and south Korea (Figs. 2.7, 2.8 and 2.9), nevertheless, the existing creative projects that have been built already, are still not enough for providing data for this research.

Lack of projects with social and aesthetic character, led this thesis to borrow the data from unrealized projects from the Land Art Generator Initiative (LAGI). Since 2010, LAGI has been inspiring the world with a new vision for the design of our clean energy future. LAGI has created a network of thousands of professionals around the world and across disciplines from the art of architecture, renewable-energy science, engineering, and land use planning to proactively address the visual impact of post-carbon infrastructures on the constructed and natural environments. In Chapter 4, examples of the LAGI 2014 submissions will be shown.

2.3.2 Lack of a pattern language for renewable design

The current approach to the renewable power plants as an economic and industrial space, has hindered the artistic point of view to grow in this field. The pattern language of Christopher Alexander and its impact on architectural design and urban planning can be followed also in the renewable field. Based on the importance of having structure and characterizing the components of design, the lack of this principal can be seen in renewable-energy power plant design, as well (Alexander, 1977).

One of the gaps is the lack of defined typology or language for cultural renewable-energy power plants. And this is due to the lack of renewable projects with artistic, cultural, and atmospheric points of view. There is a need for a practical way to approach a meaningful and atmospheric space. There is a need to understand the connection between the

essence of renewable-energy, its physical characters and the mood and atmosphere that it provides for people. There is a need for a pattern language that can show the possible approaches for attracting people to meaningful activities in the renewable power plants.

Conclusion

The research through the current state of renewable-energy power plants in this chapter, reveals the importance of spreading widely all over the glob. Also the facts shows the advancement in engineering disciplines as a creative technology. Likewise, in the architectural field, the approach is usually technological rather than atmospheric and artistic. Thereby, however the technology is improving for the optimum result, the settings and appearance of the renewable-energy power plants stay in engineering mode. Therefore, building new power plants has been faced the challenge of social acceptance. Accordingly, lack of "Baukultur" and a classified pattern language has been concluded as the main gaps between social and technological aspect of renewable-energy power plants.

Main references

Kurt Schmitz, and Alfred Voß. Energiewende?: Analysen, Fragen und Anmerkungen zu dem vom ÖKO-Institut vorgelegte "Alternativ-Bericht". [German], 1980.

Kerstine Appunn Freja Eriksen Julian Wettengel. Clean energy wire. https://www.cleanenergywire.org, 2020.

Alireza Khaligh and Omer C. Onar. Energy harvesting: solar, wind, and ocean energy conversion systems. CRC press, 2017.

Previous page

Fig. 2.7: Solar power bikeway, the Netherlands 70 Meters long.
Photo: www.solaroad.nl

Fig. 2.8: The first solar cycle lane in Erftstadt, Germany: a 90-meter track made up of 150 solar modules that look like cobblestones.
Photo: Rupert Oberhauser / Alamy Stock

Fig. 2.9: The bike lane, covered in solar panels in the middle of a highway in South Korea:
32 km long between two cities
Photo: www.itsmysun.com

Robert Ferry, and Elizabeth Monoian. A field guide to renewable energy technologies. Land Art Generator Initiative, 2012.

Harry Wirth. Recent Facts about Photovoltaics in Germany, Fraunhofer ISE, download from https://www.pv-fakten.de, version of January 7, 2020

Sören Schöbel-Rutschmann. Semantik sozialer freiraumplanung. pages 187-191, [German],2000.

Christopher Alexander. A patern language: towns, buildings, construction. Oxford university press, 1977

3
Relevant state of the art

About flow

Flow state and social flow in psychology

Space of flows in architecture and social studies

Transformation of flow in renewable-energy

About atmospheric design

Effects of atmosphere

Quality criteria of urban public space

Meaningful form and activity

3.1 About flow

3.1.1 Flow state and social flow in psychology

A flow state, according to the positive psychology, is the mental state in which a person performing some activity is immersed entirely in a feeling of energized focus, full involvement, and enjoyment in the process of the activity. A flow state appears as complete absorption in what one does, and a resulting transformation in one's sense of time. (Csikszentmihályi, 1990).

The above is more perceivable when explained using the cognitive abilities of people e.g., attention. In most of the situations, one can decide where to focus the attention on, except the cases related to basic bodily feelings like pain and hunger. However, in a state flow people are fully absorbed in the task that they have in hand paying no attention to any other distractions like time, people and even the basic bodily desires. This phenomenon happens as the whole attention is paid to the task in hand and there exist no more attention for any distraction (Csikszentmihályi and Csikszentmihályi, 1992).

Csikszentmihályi described the flow state as the "*optimal experience*" in that one gets to a level of high gratification from the experience where achieving this experience can be considered personal and "depends on the ability" of the individuals (Csikszentmihályi and Csikszentmihályi, 1992). Depending on the capacity and desire to cope with the challenges in order to achieve the ultimate goals, one is not only leaded to the optimal experience, but also to life satisfaction (Csikszentmihályi, 1990). Csikszentmihályi also studied the creativity of athletes, artists and other people and realized that the flow states more probably happen when the individuals can choose their activity freely with a

clear goal and high challenges where they receive an immediate performance feedback. When there is a balance between challenges and the individual skills, flow states are likely to occur otherwise non-flow feelings, e.g., anxiety or boredom will be experienced (Csikszentmihályi, 1997; Jackson and Csikszentmihályi, 1999).

Regarding the social flow, in the earlier literature the researchers have been mostly focused on creative individuals performing alone, however later researchers noted that some of the most enjoyable flow experiences occur during social interactions (Walker, 2010). According to the hypothesis of a survey from Walker, social flow is more enjoyable than solitary flow and that means interaction, rather than an action.

3.1.2 Space of flows in architecture and social studies

In the social studies by Manuel Castells, it is airport, train station, intermodal transfer areas, telecommunication infrastructures, harbors and computerized trading centers that are the significant building types of the space of flows (Castells, 2011) (see Fig. 3.1). After those studies, Stadler explained the space of flow with its three main characters; the medium through which things flow, the things that flow, and the nodes among which the flows circulate (Stadler, 2006).

In the architectural discipline, as a cross-reference to other science, we can borrow the concept of *"flow"* and *"Station"* from the theory of *"the space of flows"* and *"Stations"* as the significant building types of the space of flows, elaborated by Castells.

Despite the aforementioned studies, existing knowledge on energy flow in natural ecosystems has not yet been fully explored in spatial planning and design. The existing knowledge on energy flow in natural ecosystems has also not yet been explored fully in spatial planning and design (Stremke and Koh, 2010).

Previous page

Fig. 3.1: Airport as a significant building type of the space of flows (Palma De Mallorca Airport, Photo by author, December, 2018)

energy as an example, one realizes that conversion of wind energy into linear motion of a body has been utilized extensively, particularly for transportation across water surfaces. A large sail-ship of the type used in the 19th century would have transformed wind energy at peak rates of a quarter of a megawatt (MW) or more (Sorensen, 2007). Flow-driven converters, e.g. wind turbines, are also one of the most common technologies in renewable-energy area. These systems are powered by wind energy and generate mechanical energy that sends energy to the electrical generator for making electricity (Salameh, 2014).

The kinetic energy carried by the wind flow is converted into the rotational motion of the wind turbine's blades, which rotates the generator installed within the turbine. The produced electricity flow is next transformed into electric volts which are finally transferred to the grids (Fig. 3.2).

Fig. 3.2: Transformation of the wind flow into a renewable-energy form by converting the rotational motion of the turbine's blades into electricity using a generator Courtesy of NC Sustainable Energy association

3.2 About atmospheric design

3.2.1 Effects of atmosphere

In architecture and spatial design, atmosphere refers to the sensory qualities that a space radiates. Atmosphere is an immediate form of physical perception and is recognized via the sensibility of the emotions. Architects in turn, use the term *"atmosphere"* to recall that architecture and space is designed and constructed for people to use and experience. Peter Zumthor considers architectural atmospheres as *"this singular density and mood, this feeling of presence, well-being, harmony, beauty, etc. Under whose spell I experience what I otherwise would not experience in precisely this way"* (Zumthor, 2006). Riedel Friedlind, also considers "*atmosphere*" referring to the feelings or moods that basically escapes an individual body and instead depends fundamentally to the overall situation in which bodies are situated (Riedel, 2019).

The significance of immaterial elements, e.g. light, sound and smell are studied by Böhme (Böhme, 1995), which leads into the atmosphere concept in architecture, and he compares it with that in urban planning.

Böhme focuses on the development of a new aesthetic and concerns those options for action that are not taken into consideration (Böhme, 2016). He distracts the attention from the things that you see and pays it to what you feel. He talks about new humanism in architecture, in which the people stand with their experiences and feelings in the foreground. Furthermore, he clarifies from a philosophical-anthropological perspective that atmosphere is an important part of the architecture (Böhme, 2017). According to the above discussions, the meaning of atmosphere can be interpreted as the primarily perceived object.

3.2.2 Quality criteria of urban public space

The quality criteria of urban public space from Jan Gehl is structured around three main themes: protection, comfort, and enjoyment. First, without basic protection from cars, noise, rain, and wind, people will generally avoid spending time in a space. Protection from these things is critical for a space to be regularly used.

Second, without elements that make walking, standing, sitting, seeing, and conversing comfortable, a place generally will not invite anyone to spend time there. Options for play and exercise can also make the space more inviting to people of all ages.

Finally, great public spaces tend to offer positive aesthetic and sensory experiences, take advantage of local climate conditions (for example, offering shade in warmer cities), and provide human-scale elements so that the visitors do not feel lost in their surroundings (Gehl Institute, 2017).

The twelve quality criteria of Gehl are important in sense of having classified many necessities in planning. The lack is the point of the atmospheric and the meaningful message and mood that the space can radiate. The first two aspects of protection and comfort are essential in any kind of planning. The third aspect of enjoyment, however tries to include the aesthetic and sensory experiences, still sounds general and cannot give a direction to a designer.

The Gehl's criteria is important to take into the account. But a space to transform a social flow, needs to be meaningful in relation to the atmosphere created by form and

activities.

3.2.3 Meaningful form and activity

Despite the classical view of urban design with emphasis on physicality of the space like Cullen (Cullen, 1961), there are other points of view such as Alexander (Alexander, 1977) with emphasis on psychology of place. According to Montgomery (Montgomery, 1998), this is the romantic subjective view of urban design when designers rely on their senses to radiate the feelings of a place if it feels safe, comfortable, vibrant, quiet or threatening. In contrast to protection, comfort or enjoyment - which are the qualities that designers can allocate for a space (e.g. based on Gehl's Twelve Quality Criteria), meaningfulness is thus defined as a character that public places may acquire overtime, according to the kind of activities they afford to people, and the subsequent qualitative attachment they forge between those people and their immediate urban neighborhoods. Therefore, a space that is meaningful to a particular community of residents may not be so to tourists, for example (Hespanhol, 2018).

When it comes to the kind of activities that people can do in public spaces, Dines et al. (2006) proposed that "for most people, every day public spaces provide opportunities both as places of interaction and as places of retreat". Having this in mind, Hespanhol has suggested a classification of public spaces with regards to their "potential to become meaningful", based on two fundamental categories: (a) places of interaction and (b) places of retreat (Hespanhol, 2018). These characteristics help to contribute to the public place identity and uniqueness through outstanding, distinctive features, which hold in specific urban societies and are defined as the meaning affordances of a public urban to enable the communities to a set of interactions having the potential of leading to emotional attachment to that particular place by its regular users.

Hespanhol also adapts Montgomery's diagram (Montgomery, 1998) for meaningful spaces, to represent the aforementioned affordances as particular types of public space layout and activities they would accommodate which are able to initiate new memories among members of a community, shared memories and, consequently, collective meaning (see Fig. 3.3).

Conclusion

In this chapter, following chapter 2 and considering the gaps or the lack a pattern language to include *"Baukultur"* in designing renewable-energy power plants, led this chapter to review those literature which are relevant to the state of art in the intersection between the social and spatial studies and the essence of renewable-energy power plants which is transformation of natural flow to electricity, heat, or another form of energy.

Therefore, it is important to know more about the term "flow" that not only in the field of psychology and sociology matters as *"space of flows"*, but also in physics and spatial studies as *"transformation of flow"* got the attention of scientists and engineers.

Moreover, the studies focus on effects of atmosphere as the fundamental concept of a new aesthetics. It is crucial to find those atmospheres as the specific qualities of moods that the renewable-energy power plants have potential to radiate to the space.

We understood that the twelve quality criteria of Gehl for urban public space is essential but not enough. Instead, we aim to design an atmosphere with sense and meaning for social activities. (Hespanhol, 2018) And architecture is one of the main actors in this scene.

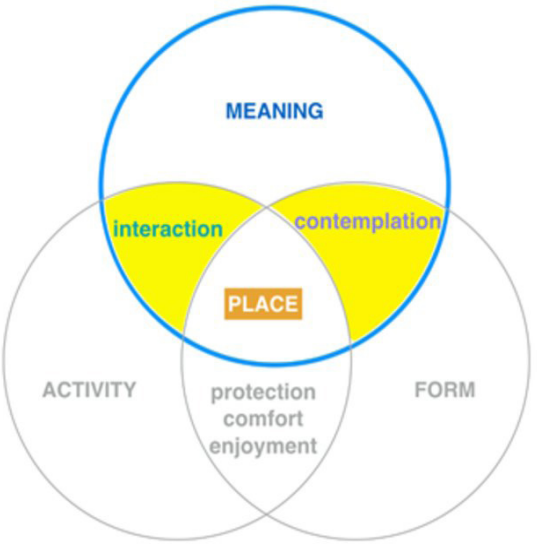


Fig. 3.3: Meaning affordances (in color) represented against the design dimensions for placemaking (Hespanhol, 2018).

Main references

Mihaly Csikszentmihalyi. Flow: The psychology of optimal experience, volume 1990. Harper & Row New York, 1990.

Mihaly Csikszentmihalyi. Flow and the psychology of discovery and invention. HarperPerennial, New York, Vol. 39, 1997.

Mihaly Csikszentmihalyi, and Isabella Selega Csikszentmihalyi. Optimal experience: Psychological studies of flow in consciousness. Cambridge university press, 1992.

Charles J. Walker. Experiencing flow: Is doing it together better than doing it alone? The Journal of Positive Psychology, Vol. 5, no.1, pages 3–11, 2010.

Kanyinke Sena. Renewable energy projects and the rights of marginalised/indigenous communities in kenya. International Working Group for Indigenous Affairs report, Vol. 21, 2015.

Manuel Castells. The rise of the network society, Vol. 12. John wiley & sons, 2011.

Felix Stalder. Manuel Castells: The theory of the network society. Polity, 2006.

Sven Stremke and Jusuck Koh. Ecological concepts and strategies with relevance to energy-conscious spatial planning and design. Environment and Planning B: Planning and Design, Vol. 37, no. 3, pages 518–532, 2010.

Bent Sørensen. Renewable energy conversion, transmission, and storage. Elsevier, 2007.

Ziyad Salameh. Renewable energy system design. Academic Press, 2014.

Peter Zumthor, and Iain Galbraith. Atmospheres: Architectural Environments, Surrounding Objects. Birkhäuser, 2006.

Friedlind Riedel. Atmospheric relations: Theorising music and sound as atmosphere. In: Music as Atmosphere: Collective Feelings and Affective Sounds. pages 1-42, Routledge, 2020.

Gernot Böhme. Atmosphäre: Essays zur neuen Ästhetik. Vol.1. Frankfurt am Main: Suhrkamp , 1995.

Gernot Böhme. The aesthetics of atmospheres. Taylor & Francis, 2016.

Gernot Böhme. Atmospheric architectures: The aesthetics of felt spaces. Bloomsbury Publishing, 2017.

Gehl Institute. Twelve quality criteria. Retrieved from https://gehlinstitute.org/wpcontent/ uploads/2017/08/QUALITY-CRITERIA-FINAL.pdf, 2017.

Gordon Cullen. Townscape, Reinhold pub. Corp.: New York, NY, USA, 1961.

John Montgomery. Making a city: Urbanity, vitality and urban design. Journal of urban design, Vol. 3, no. 1: pages 93–116, Taylor & Francis, 1998.

Luke Hespanhol. Making Meaningful Spaces: Strategies for Designing Enduring Digital Placemaking Initiatives. Conference: SAAN:, The First International Conference on Design, Innovation and Creativity. 2018.

Nicholas T. Dines, et al. Public spaces, social relations and well-being in East London. Policy Press, 2006.

4
Methodology and data selection

4.1 Methodology

4.1.1 Archetypal approach: an original model

In the existing renewable power plants e.g. solar parks, renewable-energy, generally there is a lack of creative approach to the design. The lack of renewable-energy power plants with social value is the problem that brings limitations for the research field to study them and to create a framework or typologies in architecture. Moreover, to connect the two concepts of energy and architecture, a common language is required. A common language can be defined by an archetype (Alexander, 1977) that conveys the meaning of both concepts with an easy and understandable term.

Therefore, there are two challenges in methodology. Firstly, finding a method to find a common language in architecture and energy. Secondly how that language can contribute to a new knowledge about the multfunctional and social potentials of renewable-energy power plants.

Speaking about the common language between two things It would be a good idea to come back to the original model or the first form of a concept. In Greek, the word archetype means *first form*, or *original model* as it exists as a basis for all later variations and combinations, according to Paolo Portoghesi (1968). Defined and clear archetypes exist which represent general solution to problems of form that remain the same regardless of time, place, or function. (Thiis-Evensen, 2011).

Fig. 4.1: An aerial view of the Kowloon Walled City in 1989, Hong Kong
Photo: Ian Lambot cc by-sa 4.0

Fig. 4.2: Original London bridge
Photo: Peter Jackson, FSA
https://www.ianvisits.co.uk

O'Shea refers on Immanuel Kant claims that knowledge has its origin in two basic components: intuition and thought. According to Kant all our thinking is related to imagination, which means it is connected to our senses, because the only way to describe an object is through imagination. The intellect is incapable of perceiving anything, and the senses cannot think. Only through a combination of both can knowledge arise (O'Shea, 2011).

Ungers collocated more than 100 various city maps in the course of history with images of flora and fauna and other images from science and nature, and concluded that in every person there is such a metaphysical desire to build a reality based on images, thereby, objects become meaningful through vision. First and foremost, artists and philosophers are occupied with the question of imagination and ideas as a tool of thinking and analyzing. However, in recent history this process of thinking has been not fully addressed because of the mainstream thoughts being influenced by quantitative and materialistic directions. In fact, what we generally call as thinking is nothing different from the application of imagination and ideas to a given set of facts. It is visual and sensuous event rather solely being an abstract process (Ungers, 2011).

Archetype is the basic metaphor that could feature a concept and atmosphere of a space. The *"bridge"* and *"door"* analogy by Georg Simmel is a proof for this statement (Simmel, 1994). Bridges are archetypes of connection, while walls being a central element in the discipline of architecture, have long been archetypes of separation. It is through separation that walls traditionally create domestic spaces, defending the privacy of our properties from the common space of outside. In another context, it is through separation that the walls also divide our cities and countries. Through their remarkable utility in the separation of *"them"* and *"us"*, *"inside"* and *"outside"*, the concept of the wall has become understood. Such terms settle in the place of very good metaphors, as they are also physical (Figs. 4.1 and 4.2).

According to Simmel (Simmel, 1994). Connection and separation bring us the architectural idea of permanent interaction in between people and space. It is clear how much an archetype can influence the shape of our life and create a meaningful link between feelings and spaces.

In the next section, the concept of "transformation of flows" will seek for an archetype that could well describe the concept.

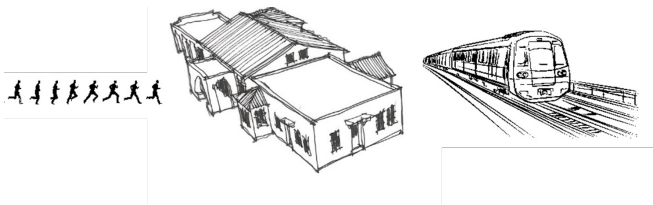
According to the discussion above, we realize that a clear archetype is a common language for connection of distinct themes, and has a potential to be immediately understood, regardless of the personal and cultural perceptions, and become an answer for the first challenge of the methodology. This is the first step to bring both fields of architecture and renewable-energy power plants together to the same page.

In the present thesis a "model" will be defined as lenses to look through the data and case studies for extracting the atmospheric, social and energetic information. A "model" usually is a person who appears as a prototype representing an ideal form. In a more general sense, a model is a structure or a pattern along the process of shaping something. In chemistry or physics, models are made to prove some scientific facts like biological models. Creating a model means finding a fundamental connection between certain compositions and fixed natures (Ungers, 2011).

Regarding the atmosphere of a space, Le Corbusier considers moods as the essence of architecture (Le Corbusier, 2013). Following his investigations, paying attention to the essence of architecture, i.e. moods and emotions (Böhme, 2016, see chapter 3), leads us to evaluate an architecture by the clear and meaningful mood that can radiate to the space. This radiation of atmosphere can be seen in a scheme by Le Corbusier, called "*The poetry of the skyscraper*" (Fig. 4.5).

Fig. 4.3: Station
Photo: JulianElliott, GettyImages

Fig. 4.4: Stations: spaces for *transformation of flow*



4.1.2 Abduction: Station as the potential archetype for transformation of flows

In the previous section, it was discussed that the archetypal approach can identify a conceptual subject by assigning it to a real-life object. In this section, the method is going through the challenge of identifying an archetype for renewable-energy power plants. From Chapter 3, we know that the renewable power plants are stations that transform flow of natural sources (e.g. wind) to another form of flow (e.g. electricity or heat). The term "*Station*" has been first employed by Manuel Castells to describe the "*space of flows*" in the field of sociology (Castells, 2011). Following the works of Castells, because of the

importance of flow in architecture, Carins et al. (2011) and Stadler (2006), elaborated the "*space of flows*" in the architecture discipline, as mentioned in the previous chapter (see Fig. 4.3). In the present study, we borrow *Station* to describe the "*transformation of flow*", which is further classified into "*energetic flow*" and "*social flow*".

By abductive reasoning and having the aforementioned discussions from physical science and sociology in mind, *Station* has the requirements of being the archetype, which can best describe the *transformation of flow* (see Fig 4.4). However, as the basic function of power plants is the transformation of natural flows of wind, solar and water to electricity (see Chapter 3), the main objective of this study for future renewable-energy power plants is to reinforce them to be able to transform the social flows.

Here, the etymology of the word *Station* will be explored to be examined in other aspects that might contribute to the relevancy of the term. *Station* origins from old French stacion or estacion (meaning site, location, stop or standstill), and from Latin stationem (meaning standing, standing firm, position, etc.). The early usage of the term is generally referred to position, in particular, position in life, status. In ecclesiastical use, the term is referred to a holy place of pilgrimage (visited as one of a succession). The verb dates from the late 16th century and the meaning place where people are stationed for some special purpose (as in polling station) is first recorded in 1823.

According to the Cambridge dictionary[1] *Station* means:

- A building and the surrounding area where buses or trains stop for people to get on or off
- A place or building where a specified activity or service is based.
- A company involved in broadcasting of a specified kind.
- The place where someone or something stands or is placed on military or other duty.
- A site at which a particular species, especially an interesting or rare one, grows or is found.

Pointing to the fifth definition, station refers to a status and position in life and a site which a particular and interesting species grows or is found. This definition sounds

[1] https://dictionary.cambridge.org

appropriate for a cultural renewable-energy power plant as a special space with a particular atmosphere to affect the state of human life that in this study is called entitled *"transformation of the social flow"*.

In the following we will take the main railway station of a city as an example, to further explore the meaning of Station in social life.

A main railway station of a city:

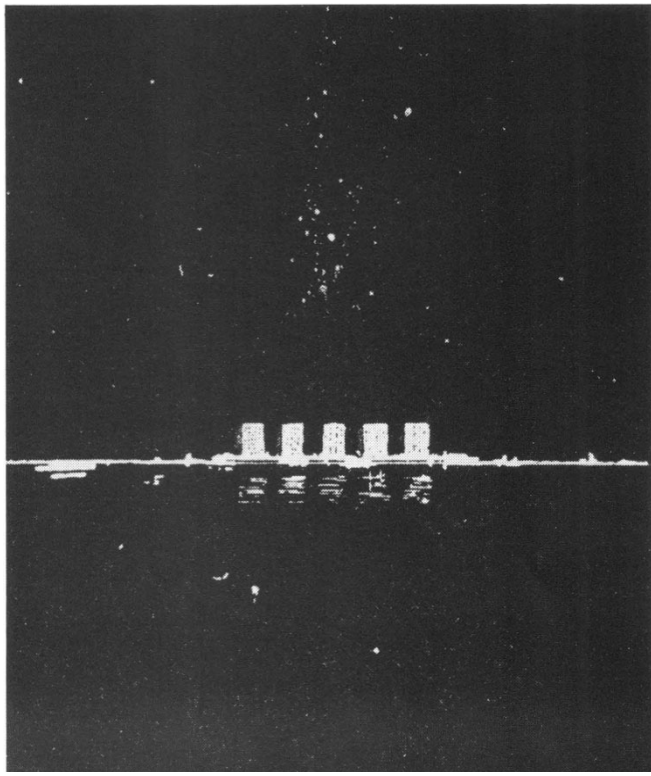
It is possible to find an analogy between the term Station, as an archetype, and the main railway station of a city.

A main station is dealing with the transformation of mobility flow, as well as social flow which includes the mental, emotional, and physiological changes. A main railway station of a city values the social flow and many emotional and physical movements in there. Stations are places with a unique atmospheric character. The unique quality and characteristics of the atmosphere of a Station is important to transform the social flow.

In the present study, we also elaborate our methodology via schematic illustrations, as will be seen in Chapter 5. For every aspect of the transformation, viz. atmospheric term, active architecture, and social activity the principals are depicted in a single sketch.

Following this methodology, through a broad experimental and verbal analysis over the associated vocabulary and phrases to Station (see Appendix for a summary) as well conducting brain storming, we realized that apart from the functionality of Station, its atmosphere comes with emotions, feelings, and moods. For example, it is a place for every class of society which makes the user feel welcomed. Here, the space (Station) radiates the emotions, e.g. safety, as emotions and the space are connected.

Fig. 4.5: The poetry of the skyscraper (sketch by Le Corbusier from Sestoft, Arkitektur, idé og sommenheng)
https://www.idunn.no



Station characteristics	Notes	Moods
big scale	needs plenty of space specially for trains	being lost/ found
vivid space with diversity of social classes	almost everyone in the city use the space of the main station	welcoming being safe/ unsafe clear/confusing clean/dirty
24 hours working	accessible all the time	time pressure/ time wasting cozy/ uncomfortable stay/ travel to be fast/ slow to run/ to sit
provides multiple services for people	has almost all services that a city offers; church, supermarket, hairdresser, ...	a city in city
iconic building	shining during the night	clear/confusing
critical space for events	such as environmental movements, strikes	for rich people/ for poor people strategical welcoming
a place for everyone	every class of society, public space	for rich people/ for poor people welcoming being safe/ unsafe
train shed, canopies	as roof/ shelter	under control/ freedom

Station characteristics	Notes	Moods
endless space	out of human scale	clear/confusing
spectacular in the night	bright and live in the evening/ night	clear/confusing to be safe/ unsafe to touch/ to miss
a place to meet people/ strangers	meet other cultures	connection/separation
a place to run, to be stressed/ to seat and wait	time matters	stressful/relaxing
a place to be careful not to be lost	signs are important	stressful/relaxing
a place of departure (to leave)	emotional space	in hurry/ waiting sadness/happiness
a place of arrival	emotional space	in hurry/ waiting
a place to reconnect/ to miss	emotional space	to touch/ to miss
a place to start or to end up a story	emotional space	to arrive/ to leave
a place of complexity and contradictions	diversity	for rich people/ for poor people security/insecurity
bright, transparent and open	light	light/dark
fast bar/ fast food	to be fast	to run/ to sit time pressure/time wasting

Station characteristics	Notes	Moods
endless space	out of human scale	clear/confusing
spectacular in the night	bright and live in the evening/ night	clear/confusing to be safe/ unsafe to touch/ to miss
a place to meet people/ strangers	meet other cultures	connection/separation
a place to run, to be stressed/ to seat and wait	time matters	stressful/relaxing
a place to be careful not to be lost	signs are important	stressful/relaxing
a place of departure (to leave)	emotional space	in hurry/ waiting sadness/happiness
a place of arrival	emotional space	in hurry/ waiting
a place to reconnect/ to miss	emotional space	to touch/ to miss
a place to start or to end up a story	emotional space	to arrive/ to leave
a place of complexity and contradictions	diversity	for rich people/ for poor people security/insecurity
bright, transparent and open fast bar/ fast food	light to be fast	light/dark to run/ to sit time pressure/time wasting in hurry/ waiting

Station characteristics	Notes	Moods
fast bar/ fast food	to be fast	to run/ to sit time pressure/time wasting in hurry/ waiting
tactile paving	disability friendly	to be safe/ unsafe cozy/ uncomfortable
stairs, escalators, lifts, moving walkways	different rooms (levels and halls)	to be fast/ slow
luggage lockers	to stay temporarily	stay/ travel safe/ unsafe
a place at ground level, underground, elevated or hanging	inside/outside of the soil	to be safe/ unsafe under control/ freedom
a place for pigeons and pigeon's feeders	urban birds	clean/dirty
a place for mouse/ rats	underground animals	clean/dirty
a place for flow of soul and culture	international people	connection/separation sadness/happiness clear/confusing
a place with platforms	point of transformation	to arrive/ to leave
a place for church/religious activities	spiritual corners	spiritual welcoming

Station characteristics	Notes	Moods
a place to waste the time and do nothing	waiting rooms/ lounges	time pressure/time wasting in hurry/ waiting
a place for unexpected circumstances	high chance of surprising behaviors	to be safe/ unsafe for rich people/ for poor people security/insecurity strategical
a place to strike, to be seen, to be heard (e.g. for workers' rights,)	under constant security control	security/insecurity for rich people/ for poor people welcoming strategical
a place to waste the time and do nothing	waiting rooms/ lounges	time pressure/time wasting in hurry/ waiting
a place for unexpected circumstances	high chance of surprising behaviors	to be safe/ unsafe for rich people/ for poor people security/insecurity strategical
a place to strike, to be seen, to be heard (e.g. for workers' rights,)	under constant security control	security/insecurity for rich people/ for poor people welcoming strategical

4.1.3 Hypothesis: Flow-station model for transformation of social flows

Since we found out that a *Station* is a place with atmospheric characteristics and also is transformer of people's mood, we can take it as the common language to bring atmospheric characteristics to the renewable-energy power plants and turn them to transform people ' mood. *Station* can also be a part of model that works as a structure or pattern to analyze and read the renewable-energy power plants with social and cultural integration.

This proposal defines a tool or an instrument to communicate between the renewable-energy power plants and the *Station* qualities. So, the model can be called *Flow-station*

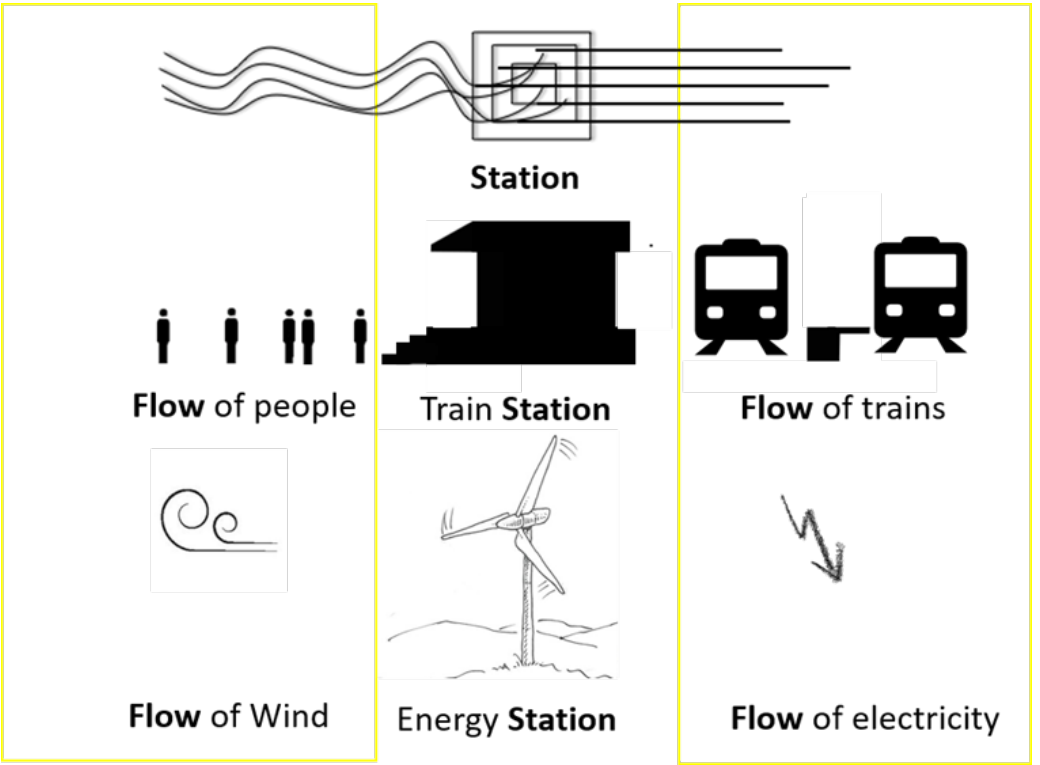


Fig. 4.6: Conception of *Station* as a transformer of flows.

model to include physical and atmospheric elements of both spaces.

The hypothesis is that the *Flow-station model* is the pattern which can describe the transformation of social flows, as well the transformation of energetic flows. The diagram below (Fig. 4.6) shows the conception of *Station* as a transformer of *flows*.

The *Flow-station model* is the lens or mental construction for abductive reasoning that interprets the 'pure' atmospheric qualities that can transform the social flows:

meaningful activity: Interaction

meaningful form: Contemplation (can be educative, meditative, memorable, memorial, beautiful, insightful)

This methodology is designed based on the general semiotic theory of Umberto Eco on the question of architecture and the built environment (Eco, 1986). As a semiotician, Eco adopts language as a middle ground, where he emphasizes on language as an infinite meaning which is not univocal. Eco who in his theory, architecture plays an important role, developed his theory based on codes and distinguishes between specific and general codes, where specific codes stand for the language codes of a particular language, while general codes refer to the structure of language as a whole. In our method, the atmospheric terms play the role of the specific codes, while the clusters are the general codes. Note that the cluster developed in the present study are the *pattern language* (Alexander, 1977) or the general semiotic codes (Eco, 1986) for the potential *Stations*.

4.2 Data selection: LAGI projects

4.2.1 Choice of data

LAGI (Fig 4.7) provides a platform to bring forward solutions for sustainable energy infrastructures that reflect culture and enhance the city as works of public art.

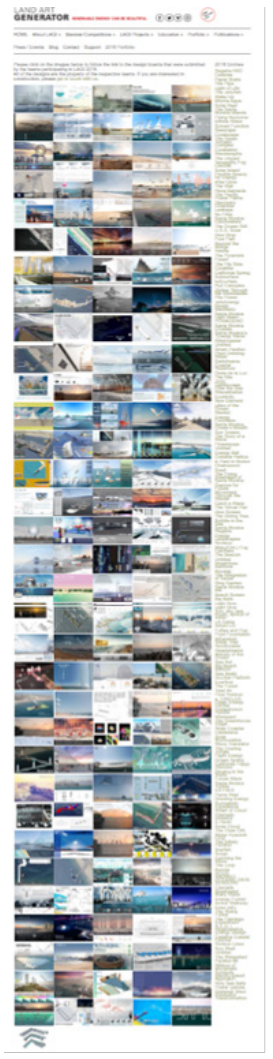
The goal of the Land Art Generator initiative is to accelerate the transition to post-carbon

Fig. 4.7: Land Art Generator: Renewable-energy can be beautiful. (screenshot: http://landartgenerator.org/)

economies by providing models of renewable-energy infrastructure that add value to public space, inspire, and educate, while providing equitable power to homes around the world. The motto of LAGI is *"renewable-energy can be beautiful"*.

According to the research and as mentioned before, there are few realized projects that fulfill the criteria of this thesis for a renewable-energy power plant that are considered in the thesis. But they are not enough to judge what kind of atmosphere a renewable-energy power plant can radiate. Thanks to the LAGI that initiated and founded this precious movement by holding biennale competitions since 2010. There are thousands of creative projects available by designers, planners, architects, and artists from all over the world. LAGI provides the opportunity to have a rich data to work on with the zoom of flow station as hypothesis of this thesis to transform the social flow via finding the purpose of designer for radiating a well-being and meaningful atmosphere to the space.



Previous page

Fig. 4.8: Bienniale competition enteries (left to right):

LAGI 2010
Dubai/Abu Dhabi

LAGI 2012
NYC Freshkills Park

LAGI 2014
Copenhagen

LAGI 2016
Santa Monica

LAGI 2018
Melbourne

LAGI 2019
Abu Dhabi

(screenshot: http://landartgenerator.org/)

4.2.2 LAGI projects

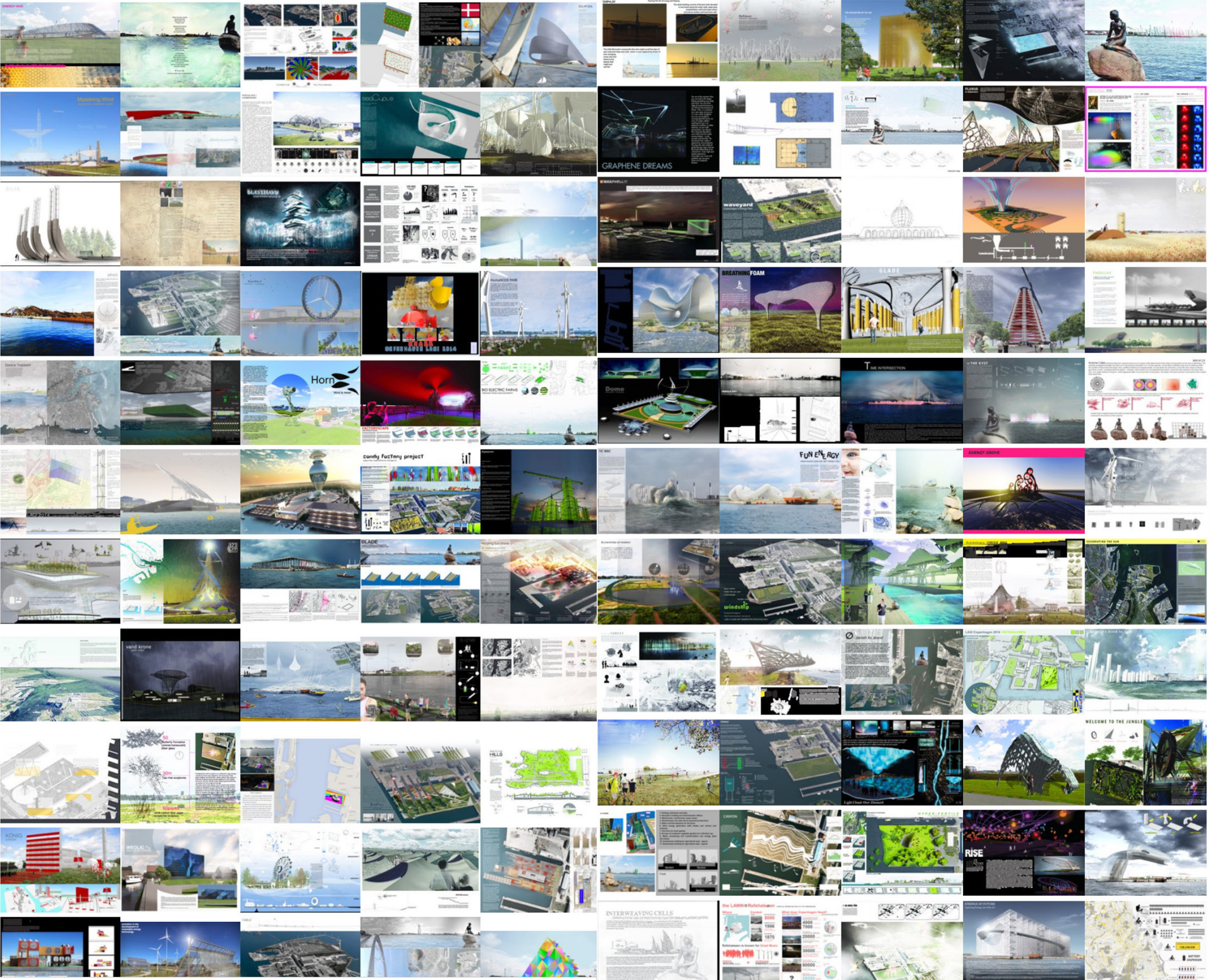
Since the data eventually is taken from the LAGI projects, It is important to know what are the *Land Art Generator Initiative* activities. The Land Art Generator Initiative, known as LAGI, every two years provides an opportunity for creative designers around the world to reflect their ideas on the future of renewable energy and what they can aspire to become real in a built form. The ideas that can integrate themselves into our cities in the ways that enhance public space, educate, and inspire. The thousands of participants from over 70 countries have made the project successful by presenting to the world their unique positive visions of our clean energy future.

For this research, from thousands of submitted projects within 5 competitions in 10 years (Fig 4.8), it is enough to select one competition and analyze all of the entries that met the criteria defined for a socially acceptable design. Thereby, the selection is the projects from the book (New Energies: Land Art Generator Initiative, Copenhagen) that belongs to the 2014 international competition.

The reason, why this research can rely on LAGI is that each year, LAGI tries to offer a unique, yet universally applicable typology that can be replicated within other similar conditions in other cities. The project has so far investigated (Fig 4.8) urban gateways (2010), landfills (2012), brownfields (2014), coastal sites (2016), overlays onto a masterplan (2018), city portals (2019), rural desert (2020).

There is baseline requirements that defines the design brief for the LAGI design competition—the artwork has to capture energy from nature, cleanly convert it into electricity. It should transform and transmit the electrical power to a grid connection point to be supplied by the city. Consideration could be made for the safety of the viewing public and for the educational activities that may occur on site. The design has to be constructible (rather than theoretical), and it must respect the natural ecosystem of the design sites.

LAGI works closely with the site owner and local stakeholders to develop a design brief that responds to the socioeconomic and cultural needs of the local site and that responds to the unique climate conditions.


ENERGY WAVE
Mastering Wind
GRAPHENE DREAMS
FLUKUS
BLASTHAVN
waveyard
BREATHING FOAM
GLADE
Horn
Dome
FUN ENERGY
ENERGY GROVE
candy factory project
vand krone
HILLS
RISE
WELCOME TO THE JUNGLE
INTERWEAVING CELLS

Previous page

Fig. 4.9: A part of 227 enteries of LAGI 2014 collected from. (screenshot: http://landartgenerator.org/)

It is also important that the jurors represent a mix between local community leaders and internationally recognized professionals across many disciplines who bring a global design, arts, and science perspective. Also, the partnerships are established with universities, utilities, municipalities, and nonprofits in the host city and the region who provide project support and assist with design brief development.

For every competition there is a publication, multiple exhibitions, and educational outreach events. The goal of LAGI is to feature the innovative work of the many talented interdisciplinary teams who participate. In each case LAGI creates unique educational materials, to harness the conceptual beauty and message of these artworks and the sustainable technologies.

According to the evidence mentioned above, such as the baseline requirements and the way LAGI takes the aesthetics and the social integration into its serious account, the projects selected by the jurors are reliable enough to be studied in the present thesis.

Conclusion

In this chapter, the methods were designed according to the challenges of the research questions. And the data was selected due to the lack of realized renewable-energy power plant projects that are multifunctional and social friendly designed.

Basically, there was two challenges in methodology. Firstly, finding a method to find a common language in architecture and energy. Secondly how that language can contribute to a new knowledge about mulitifunctional and social potentials of renewable-energy power plants.

For the first challenge, according to the litrature review through the psychological, social, and architectural studies related to social flow and space of flows (see in chapter 3), the archetypal approach with abductive reasoning, found *"Stations"* as the archetype for not only as the spaces of flow but also as the spaces of transformation of flow whether socialy or physically. For the second challenge, the *flow-station-model* is proposed as the hypothesis that works as new lenses that through them the two disciplines of architecture and renewable-energy can be connected. Through these lenses, the social

and the energetic flows can be seen as well as the transformations of flows through the designing atmospheres via meaningful forms and social activities.
Therefore, the selected data (LAGI 2014), the 64 creative proposals for renewable-energy power plants with the social and aesthetic values, can be analyzed and then clustered in the next chapter via the new lenses of the *flow-station-model*.

Main references

Paolo Portoghesi, ed. Dizionario enciclopedico di architettura e urbanistica. Vol. 2, Ist. editoriale romano, 1968.

Thomas Thiis Evensen. Archetural Archetype. Norwegian University Press, 1987.

James O'Shea. Kant's Critique of Pure Reason: An Introduction. Routledge, 2011.

Ungers Oswald Mathias. Morphologie: city metaphors. Cologne, Walter König, 2011.

Georg Simmel. Bridge and door. Theory, Culture & Society, Vol. 11, no. 1, pages 5–10, 1994.

Manuel Castells. The rise of the network society, Vol. 12. John wiley & sons, 2011.

Le Corbusier. Towards a new architecture. Courier Corporation, 2013.

Gernot Böhme. The aesthetics of atmospheres. Taylor & Francis, 2016.

Umberto Eco. Function and sign: Semiotics of architecture in Gottdiener, M. and Lagopoulos, A. Ph.(Eds.) The City and the Sign, 1986.

Christopher Alexander. A pattern language: towns, buildings, construction. Oxford

university press, 1977.

5
Analysis, clustering and framework for future design

5.1 Atmospheric analysis of the case studies

5.1.1 Introduction to LAGI 2014: Copenhagen

Chapter 4 was about the reason of choosing LAGI projects and describing LAGI organization with its broad activities on the focus on aesthetic aspect of renewable-energy.

In this chapter the focus is only on the entries from the LAGI 2014 competition.

The call is to think of a public art that generates clean energy for the City of Copenhagen. LAGI 2014 is an ideas competition to design a public artwork that, in addition to its conceptual beauty, can harness energy cleanly from nature and convert it into electricity for the utility grid of the City of Copenhagen in a specific site.

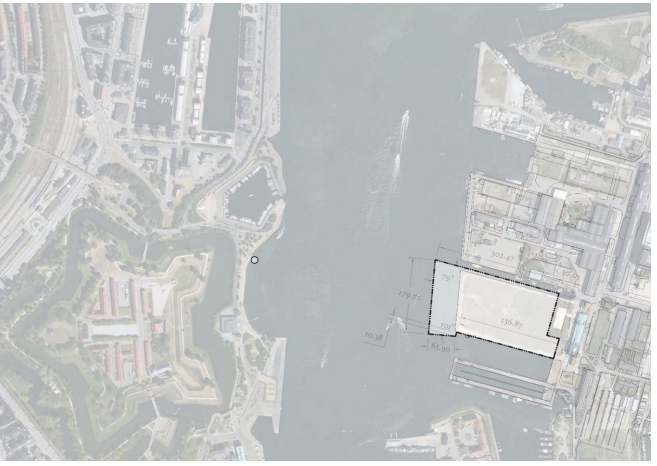
LAGI invited designers and artists from all over the world to give their ideas for an urban art infrastructure. However the whole entries to the competition are 227 projects that all are accessible on the LAGI website [1], in this thesis, the entire 64 projects selected and printed in the book *"New Energies: Land Art Generator Initiative, Copenhagen"* are the cases of studies. The project data, including project descriptions, figures and technologies has been collected from the book (New Energies: Land Art Generator Initiative, Copenhagen) and the website of LAGI.

The design site, Refshaleøen was a shipyard with thousands of individual employees.

[1] www.landartgenerator.org

Fig. 5.1: TLittle Mermaid in the foreground of the LAGI 2014 design site.
LAGI 2014 Design Guidelines
Photo: courtesy of Refshaleøen Holding Document

Fig. 5.2: LAGI 2014 Design site measures.
LAGI 2014 Design Guidelines
Photo: courtesy of Refshaleøen Holding Document



It is placed in a rich historical context and its view across the harbor is to the Langelinie and the cherished statue of the Little Mermaid (Fig. 5.1). This position and history of the site is an issue of inspiration.

Refshaleøen is a manmade artificial island in Copenhagen's harbor, which until 1996 was a shipyard Burmeister & Wain. As a shipyard employed 8,000 people and was an icon of Danish industrial history. A portion of the island was changed in the 1870s when the port's waterways were made deeper. Today the many shipyard workers have been replaced with a lot of creative entrepreneurships, small crafts facilities, flea markets, warehouses, and cultural and recreational venues.

The design site (Fig. 5.2) boundary encompasses the Sønder Hoved pier section of Refshaleøen and some of the surrounding waterways. The pier is an old landfill that is partially comprised of material from buildings that used to exist on the now empty site.

Fig. 5.3: LAGI 2014 Design site picture.
LAGI 2014 Design Guidelines
Photo: courtesy of Refshaleøen Holding
Document
(Signed red by author)

There are no LAGI 2014 design restrictions on foundation depth or type. The proposed artworks can exist anywhere within the site boundary but must not break the plane of the site boundary at any height. The design proposals must not exceed 125 meters in height at any point (height measurement is not an average but an absolute limit). There are some other design considerations to note. At the southwest corner of the site there is a water taxi terminal which is to remain. There are plans to develop the waterway to the

south of the site (Fig. 5.3) with houseboats, and boat access into the channel north of the site must also be maintained.

The criteria for LAGI 2014 design competition projects are as following:

- Consist of a three dimensional sculptural form that has the ability to stimulate and challenge the mind of visitors to the site. The work should aim to solicit contemplation from viewers on such broad ideas as ecological systems, human habitation and development, energy and resource generation and consumption, and/or other concepts at the discretion of the design team.
- Capture energy from nature, convert it into electricity, and can store, and/or transform and transmit the electrical power to a grid connection point to be designed by others. Consideration should be made for artfully housing the required transformer and electrical equipment within the project boundary and restricting access to those areas for the safety of visitors to the site.
- Not create greenhouse gas emissions and not pollute its surroundings. The work must not impact the natural surroundings negatively. impact assessment.
- Be pragmatic and constructible and employ technology that can be scalable and tested. There is no limit on the type of technology or the proprietary nature of the technology that is specified. It is recommended that the design team make an effort to engage the owners of proprietary technology in preliminary dialogue as a part of their own research and development of the design entry.
- The more pragmatic the proposals are, the greater the likelihood will be that one of them may get built.
- Be well informed by a thorough understanding of the history, geography, details of the design site, and the broader contexts of Refshaleøen,
- Copenhagen, and Denmark.
- Be safe to people who would view it. Consideration must be made for viewing platform areas and boundaries between public and restricted areas;
- Be designed specifically to the constraints of the design site at Refshaleøen as shown

in the Location Plan (available for download).

- Designs must not exceed 125 meters in height.

The LAGI 2014 competition was based on the following criteria:

- Adherence to the Design Brief.
- The integration of the work into the surrounding environment and landscape.
- The sensitivity of the work to the environment, and to local, and regional ecosystems.
- The estimated amount of clean energy that can be produced by the work.
- The way in which the work addresses the public.
- The embodied energy required to construct the work;.
- The perceived return on capital investment of the work, judged by the complexity of the design in relation to the energy it produces each year.
- And the originality and social relevance of the concept.

5.1.2 Atmospheric analysis by Flow-station model

We assume, that in the LAGI manifesto *"Renewable energy can be beautiful"*, *"beautiful"* is synonymic to an atmospheric and meaningful form, that not only stimulates individual appreciation and reflection, but also communication (message) and activities (use value) (to be seen in every LAGI project). As such, 'beautiful' does not aim on a subjective mood, but on a social quality (Schöbel 2012). From that perspective, the *"Land Art Generator Initiative"* is always both, an energetic and social transformer.

As described in the Methodology (chapter 4), the entire 64 selected projects published in the book *"New Energies: Land Art Generator Initiative, Copenhagen"* from the 227 entries to the LAGI 2014 competition, are the case studies to be read and analyzed via the lens of *flow-station model*.

on the left pages, there are 64 projects with a unique title, a statement from the designer or the author of the project, the employed renewable power technology, and visualizations.

The concept descriptions, technical data and other information related to the projects are adopted from the competition's book (LAGI 2014 Book, 2014) and the corresponding webpage[3].

Title: The title explains the most, the main dream behind designing the project

Statement: The statement in each project narrates the whole story from the designer's imagination for the form and activities and the main concept for creating a beautiful renewable power plant to the proposed technology and possible capacities.

Renewable power technology: The renewable power technology, is selected according to the available renewable environmental resources and the specific technology corresponding the dream of the designer whether in form or within interaction with the society and visitors.

Diagrams and visualizations: The statement in each project narrates the designer's dream and the main concept for creating a beautiful renewable power plant considering the existing technologies and possible capacities.

on the right hand pages in the clustering section (5.2.1 Clustering), there are 64 atmospheric analysis according to the hypothesis of the thesis.

Through *Flow-station model* we read the *flows* and the *transformations*. The atmospheric analysis consists of two parts: *flow* and *transformation*. *Flow* includes energetic flow and social flow. On the other hand, *transformation* contains atmospheric term, active architecture, and social activity.

The atmospheric analysis is aiming to identify each of 64 projects by appointing a relevant atmospheric term[2], that in the next step we could categorize them by clustering. After collecting the brainstorming for all the items flow and transformation (see Case studies), the best term from the author's point of view will be selected. The selected atmospheric term becomes as a specific semiotic code for each project that is written on top of the right-hand side pages of the case studies (see Case studies).

As discussed in Chapter 4, the hypothesis of this research, the *Flow-station model* is the lenses through which, designers and architects should be able to read and design a renewable-energy power plant that tends to be a meaningful space. A meaningful

[3] www.landartgenerator.org

[2] The interpretation of the atmospheric terms and the social activities is done by the contribution of two other persons out of the field of architecture imagining themselves in the spaces of the illustrations. And the transformation quality of the active architecture has been done by the author.

space supposes to be a place for people to experience meaningful form and meaningful activities (see chapter 3).

As conclusion, *Flow-station model* as a tool for atmospheric analysis, consists of *flow* and *transformation*:

Flow:

- Energetic flow
- Social flow

Transformation:

- Atmospheric term: The intention of the designer to provide a specific mood.
- Active architecture: The interacting with RES or the natural flow
- Social activity: The flow of people in the space for a meaningful activity.

The *Atmospheric term* is the intended atmospheric transformation that includes imagination, passion and humanity inside.

Since the clustering will be made according to the atmospheric terms, the structure of the phrases should be in a same grammatical order. Therefore, the phrase for every atmospheric term should contain minimum two words, the first part should be adjective and the second part of the phrase should be a noun. The adjective mainly describes the feeling and intangible sense of flow (the dynamic quality of the Architecture). And the noun for the second part, is an archetype for the physical feeling of the *Station* (the Static quality of the space).

The atmosphere is created by the designed form and activities that invites people to contemplate and interact. The atmospheric term encompasses both concepts of the *flow* and the *station*. The active architecture is the form (*Station*) to collect RES and transform to a form of clean energy. The space, by an intentional form (*Station*) provides a unique atmosphere transforming the mood of people (social flow) to contemplation and interactions.

5.2 Clustering and framework for future design

5.2.1 Clustering

By atmospheric analysis for every case study, the entire 64 projects have been identified or named by a unique atmospheric term. These terms are next clustered to be categorized according to their general spatial types.

For example, the cluster called *"Alienated natural phenomena"*, is named according to the atmospheric terms that intended to reflect an element or a phenomenon in nature but in artificial way. that could be out of scale, like *"Tulip Garden"* with huge Tulips that are bigger than humans or the forests with trees of textiles that cannot be found in the nature but in the imagination of the designer. Other atmospheric terms in this cluster are as follows:

Under Construction Forest, Floating Winter Forest, Prismatic cloud, Tornado Volcano, Forest Park, Tulip Garden, Recycle Forest, Paving Waves, Unfurled Animal Tree, Snake Garden, Snake Garden, Red Sail Forest, Artificial Reed Field, Golden Field, Blooming Flower Garden, Smoke Forest, Rolling Landscape, Lifted Algae Sea

Other clusters have been created with the same method:

Cluster 1: Alienated natural phenomena

Shaking waterfall

colorful fog

paving waves

unfurled-animal tree

ribbon waves

tornado volcano

golden field

blooming flower garden

mountain sunset

forest park
snake garden
smoke forest
shards forest
tulip garden
red sail-forest
rolling landscape
textile forest
recycle forest
artificial reed field
lifted algae sea
floating winter forest
under construction forest

Cluster 2: Cozy by vital nests
hive nest
soil nest
organic nest
warm rooms
nesting boxes

Cluster 3: Mysterious naves[4] (navis)
sunk ship
sacred dome

incense smoky church

flying phantom

open-air church

ship illusion

playful sail boats

Cluster 4: Sonorous halls

urban wind harp

embedded horn

rusty horns

Cluster 5: Lightweight construction

giant cage

landed sailing-chain

sailing shades

mesh sail tower

feathery scaffold

pixeling scaffold

unfinished structure

timing sun ring

Cluster 6: Illuminated architecture

crystal curtain

wind screen

glowing catwalk
volumetric screen

Cluster 7: Endless maze
massive sheet pile
mysterious maze
green ziggurat
soft tile-floating platform

Cluster 8: Futuristic exhibition
futuristic gallery
futuristic museum
algae art-factory
balancing-sculpture park
floating duck sculpture
digital robots

Cluster 9: Culture storages
glorious fortress
framing cloister
steam locomotive

Next page

Fig. 5.4: Example of clustering with the master students in the course Research by Design, TUM, Faculty of Architecture (Photo by author, Dec 2019)


Verhalten bei Unfällen
1. OBERGESCHOSS FIRST FLOOR
CLUSTER

Case studies

This Section contains the entire 64 case studies with their original name and the artist's description in the left hand pages and the right hand pages are dedicated to the atmospheric analysis by *Flow-station model*. Therefore, each project has been identified or named by the chosen atmospheric term.

The case studies are already placed in their own cluster. At the beginning of each of the 9 categories (clusters), the reader can also find a collective page summarizing all the projects which belong to that cluster.

Clustering is the last part of the process to reach to a new knowledge that could be use as a framework for future designs that will be discussed after the case studies. An example of clustering process was done with the master students in the course Research by Design at TUM, Faculty of Architecture. (Fig. 5.4 and Fig. 5.5)

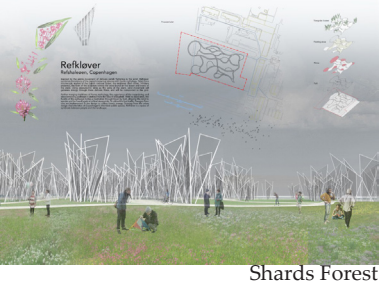
Previous page

Fig. 5.5: Example of clustering with the master students in the course Research by Design, TUM, Faculty of Architecture (Photo by author, Dec 2019)

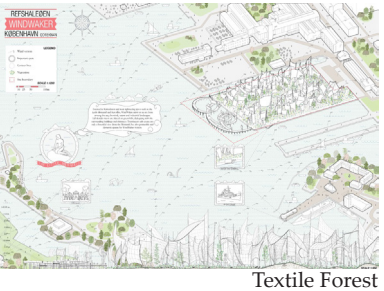
Shaking Waterfall

Ribbon Waves

Mountain Sunset



Shards Forest



Textile Forest

Cluster 1

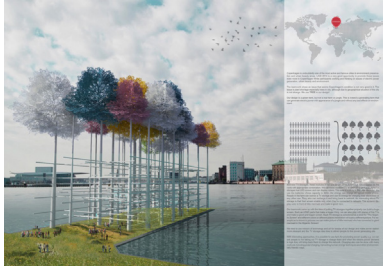
Alienated natural phenomena

In this cluster those atmospheric terms with a strong element of natural phenomena, gather in one category. Namely they are:

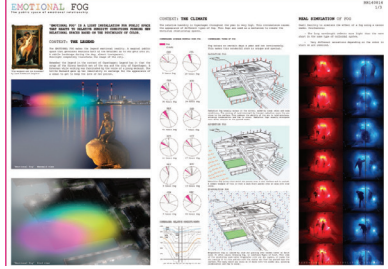
shaking waterfall, colorful fog, paving waves, unfurled-animal tree, ribbon waves, tornado volcano, golden field, blooming flower garden, mountain sunset, forest park, snake garden, smoke forest, shards forest, tulip garden, red sail-forest, rolling landscape, textile forest, recycle forest, artificial reed field, lifted algae-sea, floating winter forest, under construction forest.

In short, the cluster contains the natural elements of landscape such as forest, garden, field, mountain, flower, fog etc.

However, the spaces remind natural phenomena, they are completely artificial with creative ideas to harvest the RES and radiate special feeling to the visitors that turns the atmosphere to a weird space.



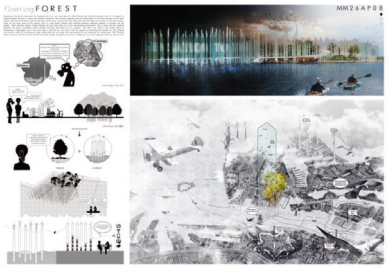
Under Construction Forest



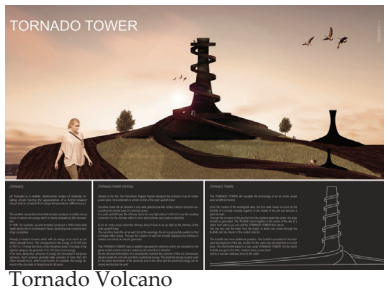
Prismatic cloud

Paving Waves

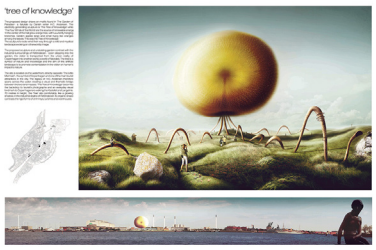
Golden Field



Floating Winter Forest



Tornado Volcano

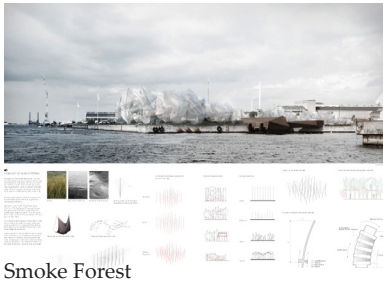


Unfurled Animal Tree

Blooming Flower Garden

Forest Park

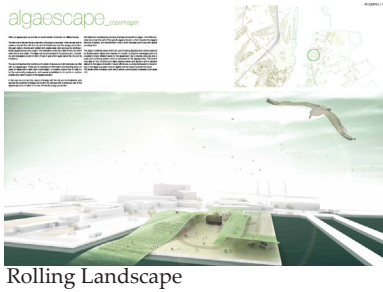
Snake Garden



Smoke Forest

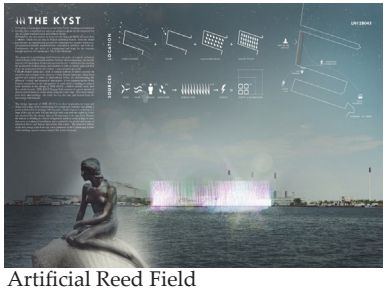
Tulip Garden

Red Sail Forest

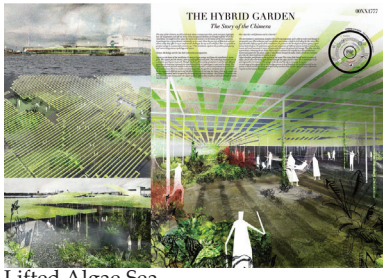


Rolling Landscape

Recycle Forest

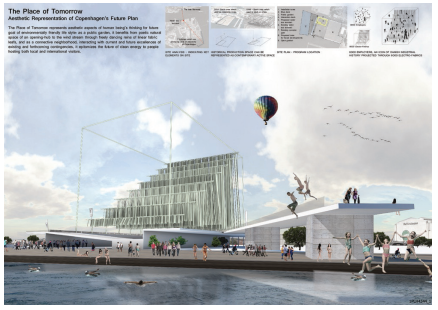


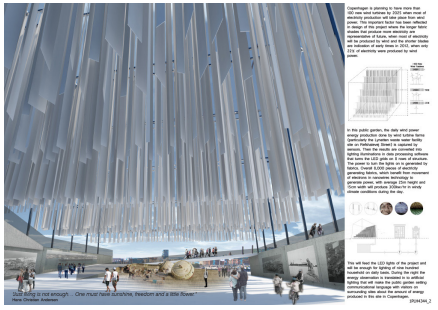
Artificial Reed Field



Lifted Algae Sea

Project 1.1: The Place of Tomorrow: Aesthetic Representation of Copenhagen's Future Plan





Team: Amir Shouri, Fereshteh Tabe

Energy Technologies: piezoelectric fabric, piezoelectric discs

Design inspiration: poetic natural space

Design goal: allowing the experience of joy, freedom with technical ameliorative methodologies

Author's concept description:

Aesthetic translation of key aspects in strategic planning for clean energy production for future of human being using natural energy sources provides the opportunity to draw better, healthier and beneficial perspective for future generations, allowing the experience of joy, freedom and assurance along with technical ameliorative methodologies.

The Place of Tomorrow represents aesthetic aspects of human being's thinking for future goal of environmentally friendly life style: as a public garden, it benefits from poetic natural space of an opening-hub to the wind stream through freely dancing rains of linear fabric leaves, and as a connective neighborhood, interacting with current and future excellences of existing and forthcoming contingencies, it epitomizes the future of clean energy to people hosting both local and international visitors.

Shaking waterfall

Flow

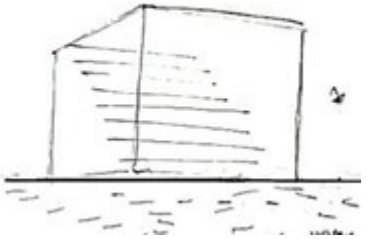
Energetic flow: wind to electricity

Social flow: water activities

Transformation

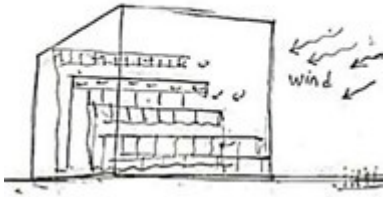
Atmospheric term: *shaking waterfall*

rain, crystal palace, giant stairs, dangerous needles, acupuncture, huge show, big audience, travelling, bright stairs/needles, lighthouse, hanging vertical louver waterfall from the sky



Active architecture: *shaking by the wind*

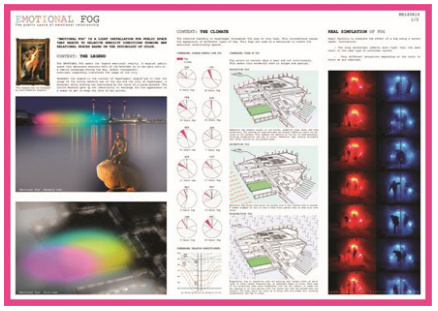
Reflection effect, moving landmark, repetition of a form, transparency of material, suspended structure, cubic abstract of the complete shape

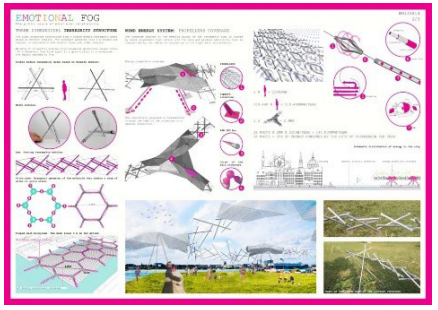


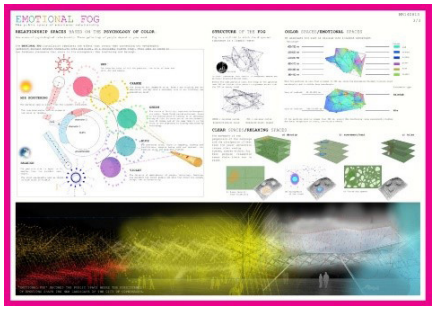
Social activity: *entertaining under waterfall*

jumping, climbing, light, travelling, theater, music, flying fox

Project 1.2: Emotional Fog







Team: Ricardo Morcillo

Energy Technologies: micro wind turbines

Design inspiration: fairytales and Copenhagen's natural weather conditions

Design goal: generate a mystical experience that touches people's feelings

Author's concept description:

The "EMOTIONAL FOG" makes the legend becomes a reality. A magical public space that generates emotions both of the beholder as to who gets into it. A subtle landscape during the day, almost transparent… overnight completely transforms the image of the city into a space of wishes and feelings crossing.

Remember the legend in the context of Copenhagen: Legend has it that the songs of the Sirens bewitch men of the sea and the city of Copenhagen. A fisherman while working was fascinated by the voice of a young mermaid. The Little Mermaid gave up her immortality in exchange for the appearance of a woman to get to keep the love of her prince. If you look at the physical context and specifically in the climate, we can see that the relative humidity in Copenhagen throughout the year is very high. This circumstance causes the appearance of different types of fog.

Prismatic cloud

Flow

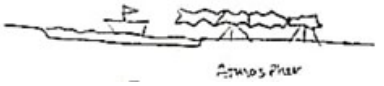
Energetic flow: wind to electricity

Social flow: different feelings

Transformation

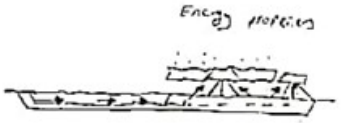
Atmospheric term: *prismatic cloud*

Celebrating of colors, performance stage, blurry, steam waft, camouflage, melting colors, arena colors, war of colors



Active architecture: rotating with the wind

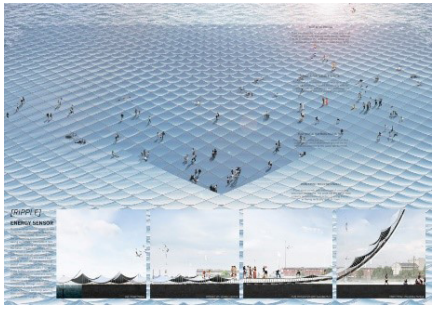
shapeless hug, mysterious swirling and living creatures, colorful pioneer of the city, confused construction, the beginning-phase of a nest, folded paper

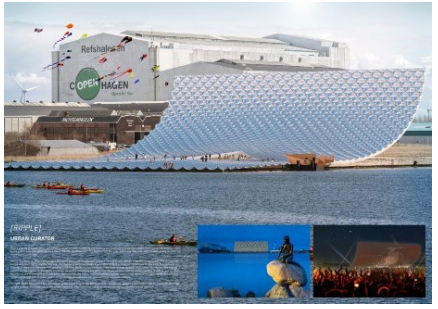


Social activity: *provoking different feelings*

Festival, game, culture, dance, music, community, finding compromise

Project 1.3: Ripple





Team: Junfeng Wang and Qiyao Li

Energy Technologies: piezoelectric generators

Design inspiration: the form of water

Design goal: create an object that merges sky, water and social interaction

Author's concept description:

Places designed to reinvigorate the body and the mind are not an indulgence in our fast-paced society – they are a necessity. They are event spaces that engage people's exploration, meditation and conversation. Within the frame of various sustainable technologies, we try to seek a balance between natural, industrial and social entities, the in-between form which addresses ecological issues and human interactions in beneficial ways.

We imagine a space which naturally integrates into the site. In lieu of a simple harvest of natural power, it is an embracement of nature. Bridging from water to sky, Ripple settles on a curved surface creating a harmonious conversation between the two parallel worlds. It embodies a rhythmic unitized shape inspired by the form of water, which generates electrical energy by harvesting kinetic energy. As the more parabolic units capture the wind power effectively, the flatter units engage various ways of human occupancy and activities. It transforms the common ground into a flexible event holder. The light aluminum panels which reflect the surrounding colors of the sky and water blends into the environment, flickering in the wind or resting in peace. The process of energy production is put into display as a pleasant experience to the visitors, by which it blurs the line between the artificial and the natural. The subtle movements in the surrounding environment are perceived by visitors through multiple senses at the same time.

Paving waves

Flow

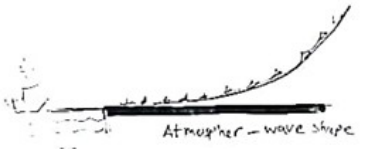
Energetic flow: wind and movement to electricity

Social flow: events and communication

Transformation

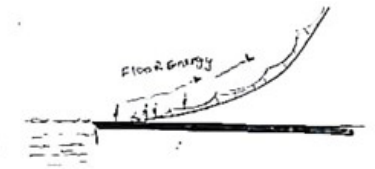
Atmospheric term: *paving waves*

sailing, travelling, cube waves, rectangle waves, curved waves, huge kicker, slide into waves, ship christening, surprise of elegance, curved entrance,



Active architecture: *embodying a rhythmic shape*

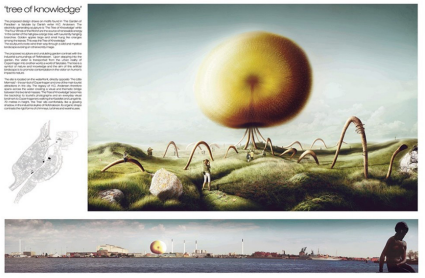
simple but dominant structure, an empty canvas, crumpled paper, empty coloring, small spikes, threatening elevation, water out of solid material



Social activity: *engaging the human kinetic power*

sailing, travelling, cube waves, rectangle waves, curved waves, huge kicker, slide into waves, ship christening, race, swimming, sports, sunbathing

Project 1.4: Tree of Knowledge



Team: Boguslaw Barnas, Rafal Barnas, Omar Gharaibeh, Natalia Jejer

Energy Technologies: piezoelectric toroids, micro wind turbine

Design inspiration: fairytale 'The Garden of Paradise'

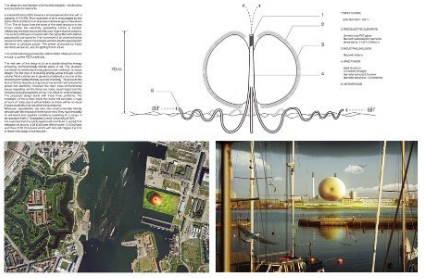
Design goal: create an otherworldly and mystical landscape

Author's concept description

The proposed design draws on motifs found in 'The Garden of Paradise'- a fairytale by Danish writer H.C. Andersen. The electricity generating sculpture is 'The Tree of Knowledge' while 'The Four Winds of the World' are the source of renewable-energy.

'In the center of the hall grew a large tree, with luxuriantly hanging branches. Golden apples large and small hung like oranges among the leaves. This was the Tree of Knowledge.'

The scultpure's roots wind their way through a wild and mystical landscape evoking an otherworldly image.



The proposed sculpture and undulating garden contrast with the industrial surroundings of Refshaleoen. Upon stepping into the garden, the visitor is transported from the urban reality of Copenhagen into another world, a world of fairytales. The tree is a symbol of nature and knowledge and the aim of this artificial landscape is to promote contemplation in the visitor on human's impact to nature.

Unfurled animal tree

Flow

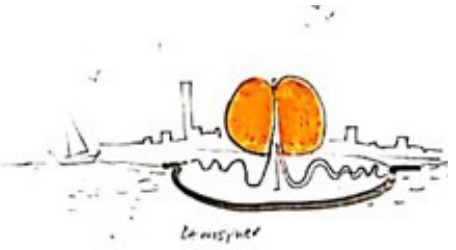
Energetic flow: wind and piezoeffect to electricity

Social flow: reflection on surroundings

Transformation

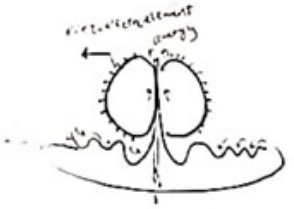
Atmospheric term: *unfurled animal tree*

mind blowing, unrealistic reality, unconfirmed physics, floating golden apple, energy apple, energetic worms, glowing ball, mystic brain



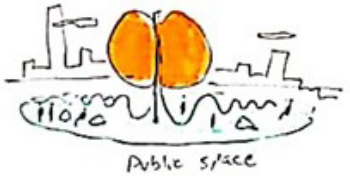
Active architecture: *spreading over the land*

Fluffy appearance, a glowing ball, tree as central point, tendrils move away from the center, up and down movement, creeping appearance



Social activity: *running into the wild*

conference, spiritual meetings (church), chillout, medical support, mental healing station, teaching/learning, sound experiments/ conerts, singing, spiritual hiking



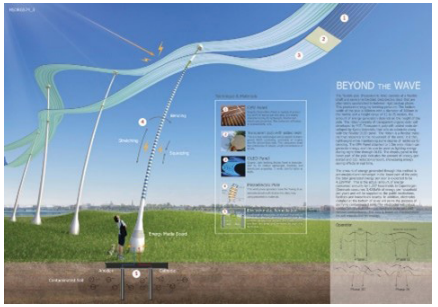
Project 1.5: BEYOND THE WAVE

Team: Jaesik Lim, Ahyoung Lee, Sunpil Choi, Dohyoung Kim, Hoeyoung Jung, Jaeyeol Kim, Hansaem Kim (Heerim Architects & Planners)

Energy Technologies: organic photovoltaic (OPV), kinetic harvesting (piezoelectric)

Design inspiration: the encounter between wind and water

Design goal: creating a peaceful and healing place for people to enjoy



Author's concept description

Refshaleøen has an old historical trail of being a major shipyard and is dominated by westerly winds nearby the sea. Since it served its long term role as the manufacturing plant, surrounding soil contamination is severe thus extensive purification and treatments are required for the city urban planning in order to develop the site into a farmland. Through the idea of Len Lye's diverse and dynamic kinetic art, the wavy expression of ribbons and flexible poles create the tangible and the intangible movements through a healing environment. The allocation of the poles and ribbons are based on Copenhagen's wind rose and soil survey map. Therefore, the frequency, density and spacing between the poles are dependent on the wind strength and intensity. The placement of the poles creates a variety of spaces; especially around bus station and water taxi docks, the layout of the poles naturally defines an entry towards the open space at North inducing people towards the site.

Ribbon Waves

Flow

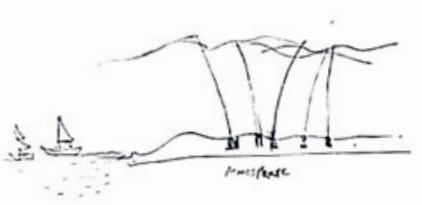
Energetic flow: wind to electricity

Social flow: various leisure activities and events

Transformation

Atmospheric term: *Ribbon Waves*

Waves celebration, windy park, flags of flow, friendly flow ribbons, light souls, breezy openes, summer wind/air, wind of change, windy trees



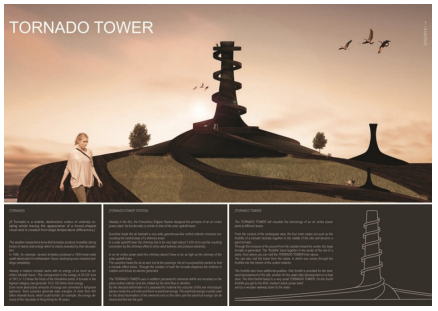
Active architecture: *waving trees' ribbons*

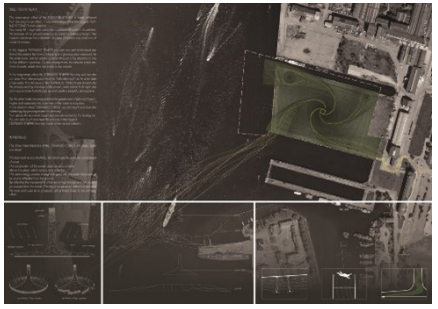
summerly coloring, light and unweighted, transparent components, playing with light and shadow, raised above the heads, lively movement in the wind

Social activity: *walking the forest*

recreation, park, games, skate park, sports, workout, celebration (wedding), exhibition, concert

Project 1.6: Tornado volcano





Team: David Rieke, Stefanie Prümer

Energy Technologies: atmospheric vortex engine

Design inspiration: the form and force of a tornado

Design goal: making the power of surrounding elements visible

Author's concept description

The TORNADO TOWER will visualize the technology of an air vortex power plant at different levels: From the corners of the rectangular area, the four main routes run such as the foothills of a tornado helically together in the middle of the site and become a giant tornado. Through the increase of the ground from the outside toward the center, the large tornado is generated. The "foothills" band together in the center of the site to a stairs, from where you can visit the TORNADO TOWER from above. You can also visit the tower from the inside, in which one comes through the foothills into the interior of the roofed collector.

The foothills also have additional qualities. One foothill is provided for the landward development of the site, another for the water-side development on a boat dock. The third foothill leads to a very small TORNADO TOWER. On the fourth foothills you get to the third, medium-sized, power plant and by a wooden walkway down to the water.

Tornado tower

Flow

Energetic flow: wind to electricity

Social flow: educational experiences

Transformation

Atmospheric term: *Tornado Tower/chimney*

shifting , standing the breakers/surge, point of navigation/overview/oriantation, upper light, strong hold, stormy support

Active architecture: *collecting the sunlight heat*

dominant and strong form, industrial character, cold materiality, well-known structure in unusual surroundings, great vertical effect, entwining paths

Social activity: *ramp up the tower*

View point, downhill race, hike, meditation, schooling, dance, play / game

Project 1.7: Golden Roots

Team: Ronny Zschörper, Franziska Adler

Energy Technologies: biomass, piezoelectric paving

Design inspiration: danish nature and landscapes

Design goal: strengthen the connection of urban inhabitants and their cultural origin

Author's concept description

Like a walk through golden fields as a remembrance to longing for relaxation and childhood memories, the design contrasts the urban environment of Copenhagen with the experience of unspoiled nature. It takes up the often encountered image of Denmark as a sparsely populated country, which is closely related to agriculture and whose inhabitants keep a tight relationship with nature. Especially the process of planting and harvesting is usually hidden from us, but these circles of urban gardening become a major factor in the design, as a visible sign of sustainability. Through a system of paths and bridges, the visitor is guided through the field and the possibility of relaxing on the countryside is brought to life for the residents, at any time. To avoid unnatural monocultures, poppies are plant in and consequencently they provide a year-round staging of the areal by the different phases of growth.

Golden field

Flow

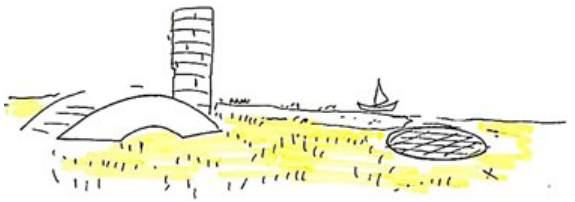
Energetic flow: biomass and movement to electricity

Social flow: relaxation and appreciation of the landscape

Transformation

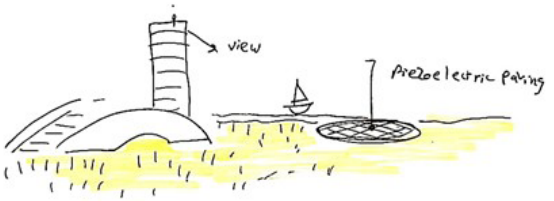
Atmospheric term: *golden field*

pop up bridges, corny bridges, hiding ways, unexpected position, future bread exhibition, growing ways, corn tower,



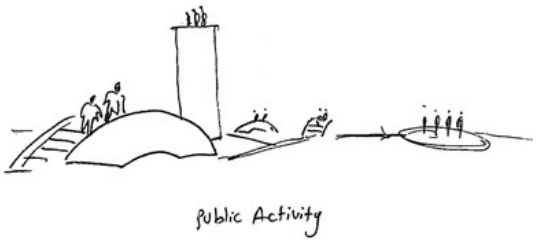
Active architecture: *shaking by the wind*

up and down paths, vertical structures, merging with the landscape, industrial and natural materials,

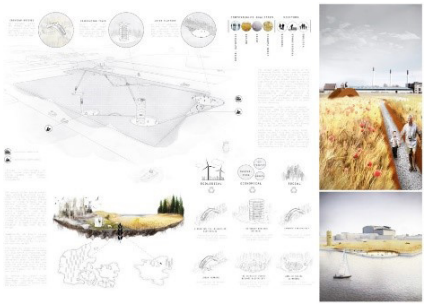


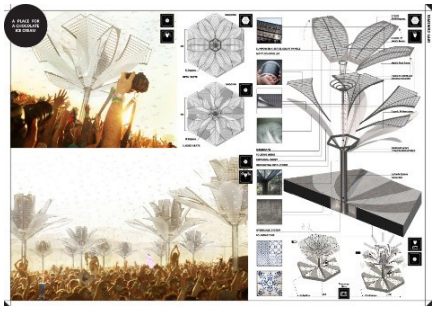
Social activity: *meeting the nature*

games, hike, hide and seek



Project 1.8: Place For A Chocolate Ice Cream





Team: Juan David Ramirez, Diana Marcela Manrique, Bao Bao Huan, Rasmus Johansen

Energy Technologies: photovoltaic panels

Design inspiration: natural elements such as honeycombs and flowers

Design goal: creating a place that adapts to the needs of people

Author's concept description

Copenhagen is a vibrant city where tons of different cultural and festive activities invade the public space all along the year. Christmas markets, different kind of music festivals from distortion to small local ones, and various spring and summer festivals, take the streets and parks of the city in a never ending cycle, winter or summer, sunny or rainy, day or night.

The place for a Chocolate Ice-cream is mean to become one of those places where the public actions take place. Taking advantage of the location close to the canals and just in front the little mermaid, one of the most popular spots in Copenhagen, the opportunity of intervention in the site with a pavilion call to create a new icon for the city.The project part of a modular grid of retractable energy-generating pavilions inspired in Danish Rococo style mosaics. Creating a 3Dimensional sculpture inspire on the 2D Drawings. Which can change between day and night revealing a new appearance depending of the occasion, and that combined with a mesh of light inside the flowers that replace the panels daylight reflections and remember the generated energy on the night, is going to become a spectacle in the Copenhagen skyline attracting the attention of the Copenhageners and the foreign visitors, exhibitions and events.

Blooming flower garden

Flow

Energetic flow: sunlight to electricity

Social flow: public actions

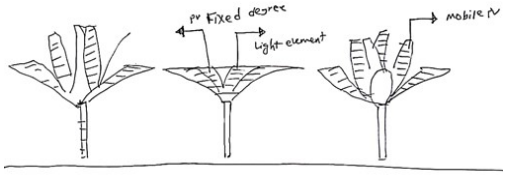
Transformation

Atmospheric term: *blooming flower garden*

sun collecting flowers, giving and receiving plants, protecting heads, huge plants park, make flowers big again, sun wings, blooming collective

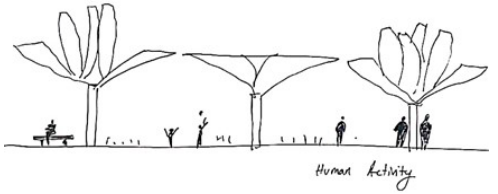
Active architecture: *reacting petals to the sunlight*

imitating a flower, protecting like a parasol, repeating patterns, little alternation, movable according to

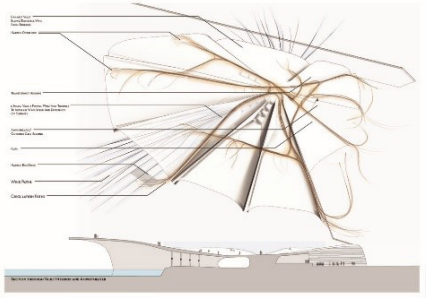


Social activity: *walking through the garden*

festival, christmas market, cars exhibition, gathering, flea market, concerts, celebration



Project 1.9: Zephyrus Park



Artist: Mike Sollenberger

Energy Technologies: wind turbines within acceleration vaults

Design inspiration: the small streets and large public spaces of Copenhagen

Design goal: creating a park for cultural events

Author's concept description

Zephyrus Park harnesses the power of available wind that blows across the harbor of Copenhagen. Wind vector and sun angles form vaults that funnel wind into an array of wind turbines, amplifying wind speed and increasing the efficiency by which each turbine produces energy to give back to the city of Copenhagen. On the surface, a park provides community space along with semi-private areas created through topography which frame views of the sunset throughout the year to allow for constantly changing experiences of the site at different times of day and year.

The vaults are set up to collect wind as much as possible throughout the year. The 5 intake vaults are positioned to take advantage of the abundant west wind. The funnels significantly increase the wind speed so that each turbine produces much more energy allowing for a lower number of turbines.

The form of the vaults to funnel wind create a dynamic topography for the park above and lend to creating different types of spaces from the middle, communal area of the site to smaller, semi-private fingers that branch out on the top of the vaults. The vault system created a perfect setup for an amphitheater space on the east side of the site and to form spaces for other programmatic elements such as the café.

Mountain sunset

Flow

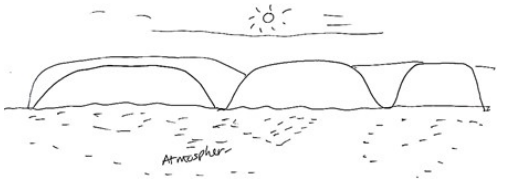
Energetic flow: wind to electricity

Social flow: leisure and cultural activities

Transformation

Atmospheric term: *mountain sunset*

home of ships, mother of sailor, wind home, bringing wind on land, fishing for wind, up lift the wind, feeding the wind, uplifted visitors, wind hill, coast wind hill, shore wind collector, windy push up,

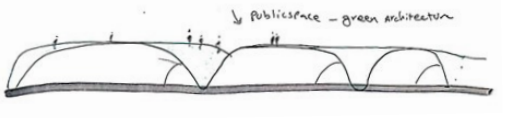


Active architecture: framing the sunset

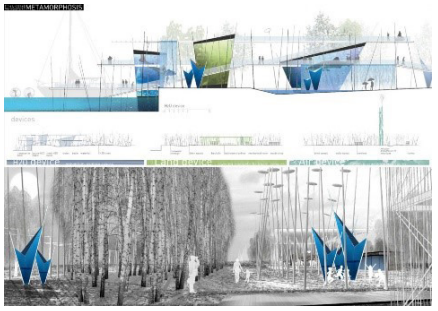
bulbous ground, knobbly shape, overgrown roof, green but hollow, protected areas, like the skin of a

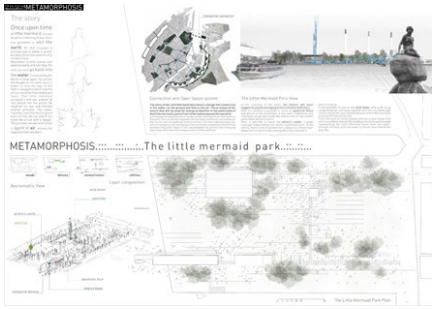
Social activity: *Watching the sunset*

downhill racing, bike park, ski/snowboard (winter in sweden), celebration, spiritual ritual, ship boarding, playing kites



Project 1.10: Metamorphosis. The Little Mermaid Park





Team: Michele Galella (Ph.D., Architect), Pepe Barbieri (Professor, Architect), Michele D'Amico (Architect), Filomena Ricciardella (Architect), Francesco Ziccardi (Architect), Consuelo Nava (Professor Architect, Energy Consultant), Raffaele Astorino (Ph.D. Architect, Energy Consultant)

Design inspiration: the metamorphosis of the little mermaid and her fairytale

Design goal: let visitors explore the fairytale

Author's concept description

The story of the Little Mermaid tells about a change that comes true in the water, on the ground and then in the air. Three states of the nature that will be used for energy production in the park/wood of the little mermaid, just in front of her statue beyond the sea strip.

A renewable-energy boat will carry the visitors who want from the statue to the park. This connection between the two sides reinforces and enhances the tourist and recreational function of the Little Mermaid providing her with an own park, and rebuilding at the same time, a seamless connectivity between the public space of the consolidated city and the new emerging places born from the urban regeneration of the east front.

In the clearings of the wood, the visitors will meet suggestive places belonging to the Little Mermaid story.

After the landing is possible to cross an aquarium theca and attend to the movement of the sea's inhabitants and mermaids projected inside the basins and on the screen walls made of dust of water.

Forest park

Flow

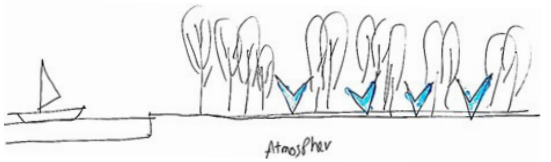
Energetic flow: water, sunlight and wind to electricity

Social flow: cultural experience

Transformation

Atmospheric term: *forest park*

park of levels, level up nature, forrest to sea, flexible trees, city rain forrest, harbor tree collection, long sticks area, rain forest water collector



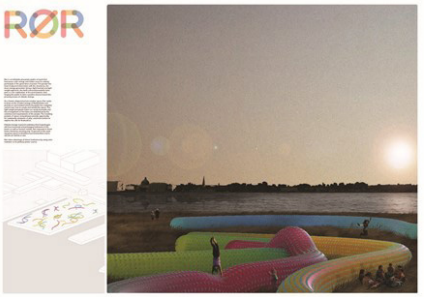
Active architecture: *collecting rainwater*

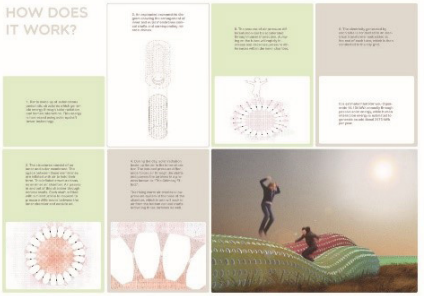
flower-shaped funnels, many interacting components, a lot of variation, interplay of vegetation and technology, stony ground, vertical and flat structures,collecting rainwater flower-shaped funnels, many interacting components, a lot of variation, interplay of vegetation and technology

Social activity: *identify the way with the collecting water elements*

hiking, climbing (trees), meditation, forrest dance, recreation area, sound installation, sports, celebrate

Project 1.11: Rør





Team: Evan Wakelin, Christopher Tron, Sylvia Zhou

Energy Technologies: micro wind turbines driven by the solar thermal expansion of air

Design inspiration: the creative energy of the space

Design goal: engaging visitors to be creative and have fun

Author's concept description

Rør is an inflatable pneumatic public art park that harnesses solar energy and invites users to actively participate in the generation of power. The greater the level of physical interaction with the structures, the more energy generated. Using a light hearted and light weight approach, the multi-coloured pneumatic tube park is a fun celebration of the environment, challenging the public to take a positive stance toward the pressing issues of climate change.

As a former shipyard turned creative space, Rør seeks to draw on the creative energy of Refshaleøen and provide an environment where the public has complete control over how to create and inhabit the space. The light weight pneumatic tubes are easily moveable and the arrangement of the tubes are determined by the activities and requirements of the people. The resulting pockets of space and pathways provide opportunity for community, moments of play, and invite visitors to explore the site for themselves.

Snake garden

Flow

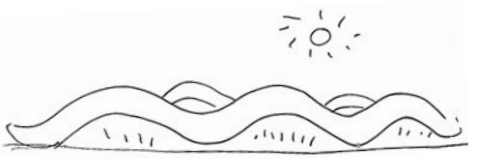
Energetic flow: sunlight and movement to electricity

Social flow: fun activities

Transformation

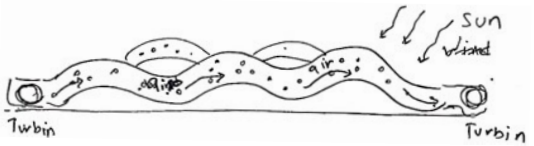
Atmospheric term: *snake garden*

next level worms, worms above ground, color tubes, convoluted play, static snakes, snake play park, infinite tubes, flexible worms



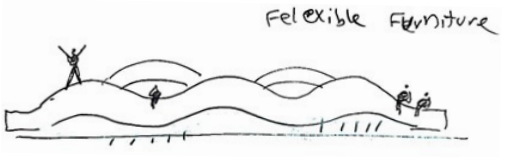
Active architecture: - taking the wind flow in

flexible structures, transparent and colorful materials, vertical alignment, never the same, jumpy

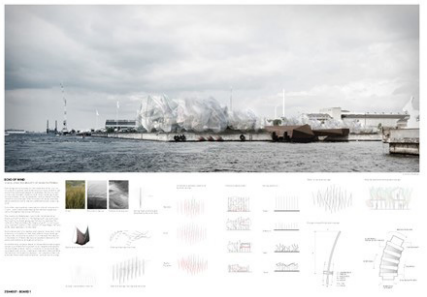


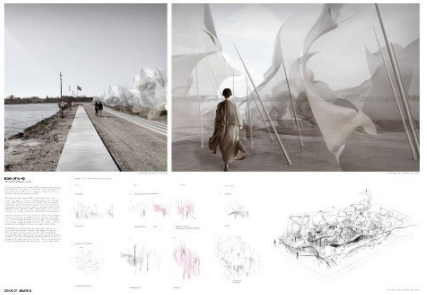
Social activity: *customizing their own space*

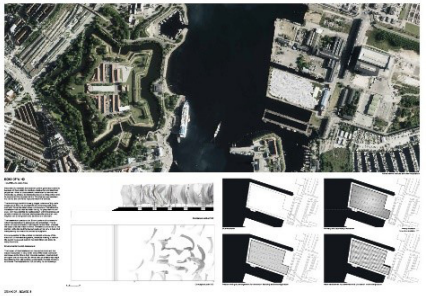
play hike and seek, parkour, picknick, skate park, hike



Project 1.12: Echo of Wind







Team: Mathias Bank Stigsen, Olga Krukovskaya

Energy Technologies: elastomeric piezoelectric toroids

Design inspiration: the patterns that wind creates

Design goal: making the beauty of wind visible to the visitors

Author's concept description

Textile has an ability to capture and visualize movement. It has a memory in its behavior, that both reflects its surroundings but also the constraints by which it is composed. This duality in the behavior of fabric has been an aesthetic fascination for artists and architects throughout centuries. An architectural proposal based on this aesthetics has a supple sensibility and therefore a possibility to integrate and capture literal and phenomenal motion in relation to its surroundings, its program and visitors. Creating an installation that embodies the transition from static to dynamic – an installation that visualizes the forces within and around us – and utilizes its energy.

Smoke forest

Flow

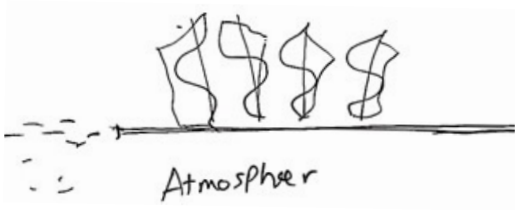
Energetic flow: wind and piezo effect to electricity

Social flow: dialog between humans and nature

Transformation

Atmospheric term: *smoke forest*

cloud and wind forest, flixible trees, chaotic and turbulent, gray and sad, hide and seek



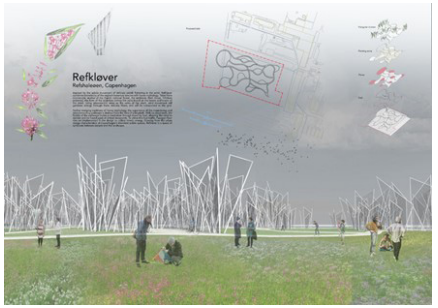
Active architecture: *blowing smoke*

light materials playing with the wind, repetitive pattern, transparent and soft appearance, cold coloring, vertical main structure

Social activity: *walking through smoke*

contemplation, lose and find self, sense of the natural energy, seeing, feeling the wind, sensing the energy

Project 1.13: Refkløver



Team: Allison Palenske, Christina Gråberg Røsholt, Akshaya Narsimhan, Javier Vidal Aguilera, Zhao Xie, Diandra Saginatari, Yanli Shen

Energy Technologies: piezoelectric wires, Pavegen™ pavers

Design inspiration: the leaf veins of the danish national flower Trifolium pratense

Design goal:

Author's concept description

The design for Refkløver is a dynamic combination of biomimicry of the region's botanical species with Norse mythology. Taken from microscopic studies of the Danish national flower, the rødkløver (red clover, Trifolium pratense), the form of the energy-generating structures mimics the veins found on the leaves and bracts of the plant. These veins act as highways for photosynethetic processes, transporting energy and sugars to the rest of the plant. The design of Refkløver acts in a similar way. Using piezoelectric wires to represent the veins of the plant, wind movement will generate energy through these delicate fibers, and will be transported to the city grid.

Further merging traditions of Norse mythology, the experience of the meandering and interconnecting pathways is derived from the idea of a labyrinth. With no dead ends, the fluidity of the pathways incites a meditation through travel by foot, allowing the mind to wander and be found again at critical viewpoints.

Shards forest

Flow

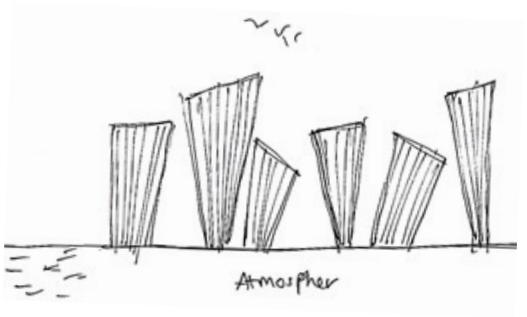
Energetic flow: wind, movement and piezo effect to electricity

Social flow: leisure activities

Transformation

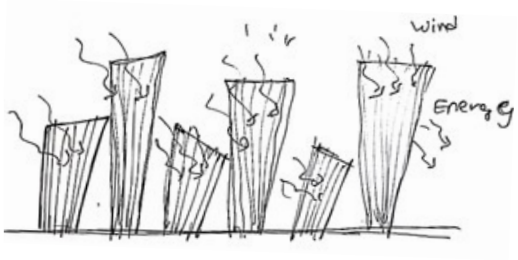
Atmospheric term: *shards forest*

tree panels, panels park, border tree areas, new art park, fallen shards, impaled fragments, airy fragments



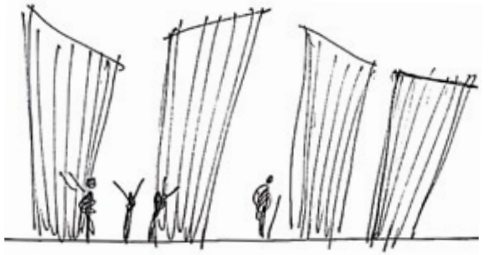
Active architecture: *adapting geometric form (with the organic)*

repeating basic shape always rearranged, transparent material, dangerous appearance, sterile surface, vertical and sharp-edged

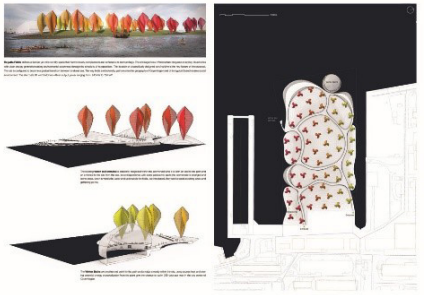


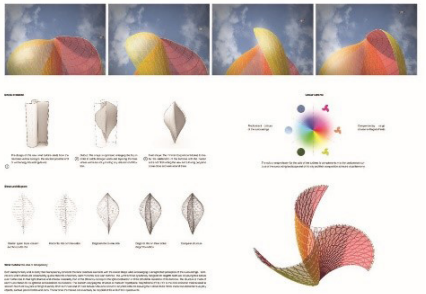
Social activity: *participating through kinetic interactions*

art installation, running games, walk, team competition, displays for live shows / sports, picknick



Project 1.14: Regatta Fields





Team: Riccardo Mariano, Salvatore Maraniello

Energy Technologies: vertical axis wind turbines, Pavegen™ pavers

Design inspiration: simple but interesting shapes

Design goal: strengthen the transition between water and land

Author's concept description

Regatta Fields defines a familiar yet otherworldly space that harmoniously complements and enhances its surroundings. The envisaged new infrastructure integrates everyday life activities with clean energy generation raising environmental awareness through the simplicity of its operation. The iteration of a specifically designed wind turbine is the key feature of the proposal. The site is configured to become a gradual transition between land and sea. The way fields are broken by paths evokes the geography of Copenhagen and of the typical Scandinavian coastal environment. The existing water taxi terminal is smoothly integrated within the promenade and it is both an end to the path and an entrance to the site from the sea. In correspondence with some panoramic spots the promenade is enlarged and some steps, down towards the water and up towards the fields, are introduced, they can be used as sitting areas and gathering points. The Winter Baths are another end point for the path and a major amenity within the site, using excess heat and storing potential energy overproduction from the plant give the chance to swim 365 days per year in the city center of Copenhagen.

Tulip garden

Flow

Energetic flow: wind to electricity

Social flow: water activities

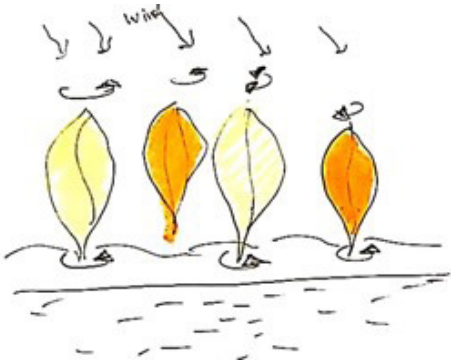
Transformation

Atmospheric term: *tulip garden*

tulps park, fire out of ground, leaves garden, ground of hearts, huge blooming flower, great seeds, air ships, windy leaves, fire fountains

Active architecture: *catching stronger wind by the larger top*

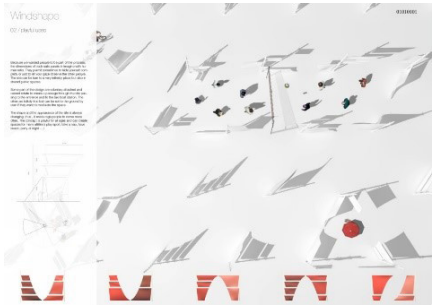
Repeated pattern, dominant warm color, complementary color between nature and structure, oversized, moving structure



Social activity: *walking along the promenade*

racing games, climbing / bouldering, sounds installation, walking / hiking, sports

Project 1.15: Windshape



Team: Manon Robert, Martin Le Carboulec, Marc Antoine Galup

Energy Technologies: piezoelect3ric fabric, rotating electromagnetic generators

Design inspiration: History of the site

Design goal: playful public space, hide and appear

Author's concept description:

WINDSHAPE is situated in Refshaleoen, a small peninsula attached to the city of Copenhagen previously used for yardship and industry. The site benefits to an unobstructed panoramic view which permit to be easily seen inter alia other shore of the city. We used this advantage to make people come to this place and to transform this unused site to an attractive landmark of Copenhagen. Due to marine stream and the absence of obstacles, the site benefits naturally to a very good input of wind, this all year. Thus, WINDSHAPE is using its asset to produce power. The project produce energy in three different ways: Human action, Piezoelectric textile system and Dynamo System. Each poles have a dynamo system to produce energy when the wind make them rotate

Red sail forest

Flow

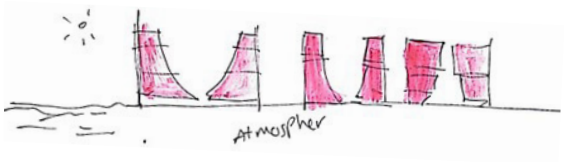
Energetic flow: wind to electricity

Social flow: fun and leisure activities

Transformation

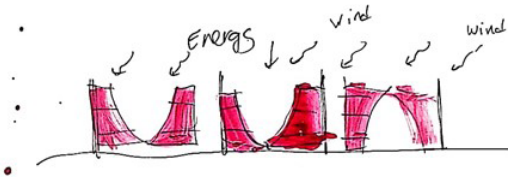
Atmospheric term: *red sail forest*

land sails, landing ships, ships under ground, moving the wind, flags landing, pirates on land, orientation wings



Active architecture: *shaking in a regular structure*

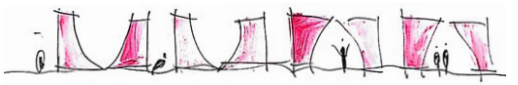
repeated pattern, dominant warm color, soft materials, components that play with the wind, room forming fabric walls



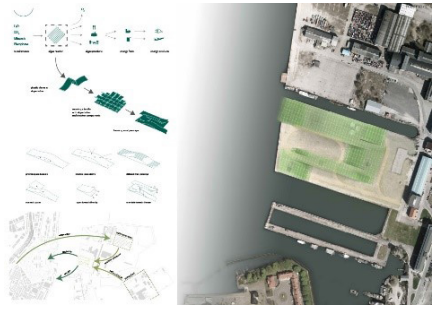
Social activity: *playing hide and seek*

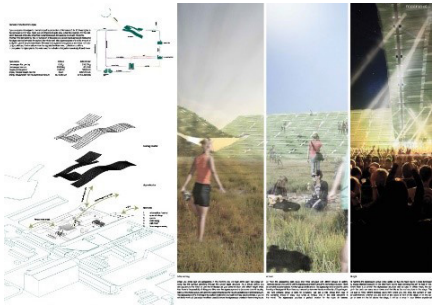
team games, art installation/exhebition,

running, obstacle course, sound experiments



Project 1.16: Algaescape





Team: Tobias Anderson, Adam Pajonk

Energy Technologies: microalgae bio-reactors (algae biogas production)

Design inspiration: an environmental connection on different levels

Design goal: a filter for the city which clean the air and water.

Author's concept description:

The first one is the technical production of energy by biomass. Here we are able to create a circular flow with the city and its infrastructure and the energy production. We gain carbon dioxide and nutrient-rich waste water and produce by photosynthesis algaebiomass and oxygen. The installation works like a filter for the city which clean the air and water. The algae can be processed for food production, cosmetics and energy production in form of fuel or gas which again serve the city and its inhabitants.

The second level are the functions and variety of spaces and atmospheres we offer with our

algaescape. These are for example an information and teaching point, an open air stage with a view over Copenhagen, a covered outdoor bar or café run by the surrounding restaurants, and several possibilities to do sports or outdoor activities all in direct impact of the algaeproduction.

Rolling landscape

Flow

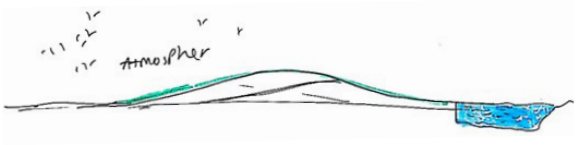
Energetic flow: to demonstrate that it can be playful

Social flow: walking on, and gathering under the shade of the Algae shelter

Transformation

Atmospheric term: *rolling landscape*

solid wave, soil to wave, leveled field, protective grassland, subterranean terrane, soft field, peacefull lawn, leveled nature

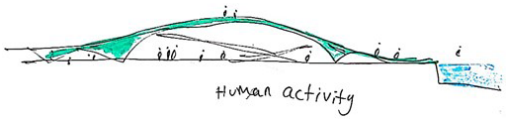


Active architecture: *providing a resource loop*

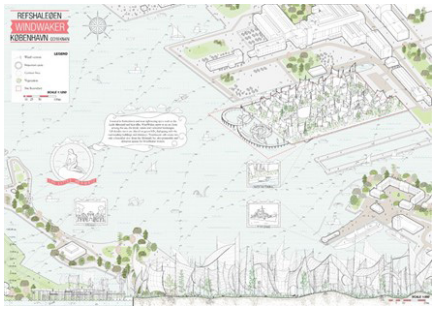
transparent roof, flat organically shaped bodies, green light effect, technical reference to grass hills, building without side walls, form without reference points

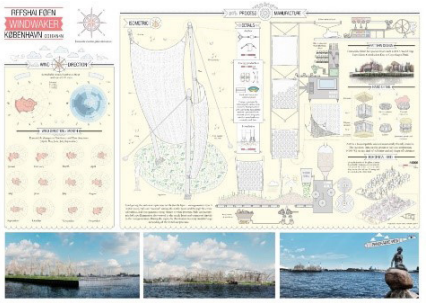
Social activity: *inhabiting the Algae surface*

festival, concert, team games (soccer, etc), market, exhibition, big celebrations, ski, mountain boarding, playing



Project 1.17: WindWaker





Team: Julio Alejandro Romero Alonso, Miguel Ángel López Carro

Energy Technologies: nanogenerator (NG) fabric

Design inspiration: fishing port history

Design goal: creating a dynamic space for people to discover

Author's concept description

Emerging from water, WindWaker appears among the industrial landscape of Copenhagen's seaport as a new reference point for tourism, citizens and renewable energies. Its masts like a pillar structure and its high sails exposed to wind, creates a new dynamic horizon for The Little Mermaid and a welcoming, green, open and high tech park ideal for any kind of events. Through an undulating landscape bathed in scattered light, open but at the same time protected from the rain under the sails when necessary, people will be able to explore a new sculptural way of harvesting energy from the wind. Copenhagen has always been a crucial point in the map of north Europe since its beginnings as a fishing port, because of its proximity to Sweden and its connection with numerous commercial routes. Being such a junction point has forced Copenhagen to be kept up-to-date culturally, socially, industrially and, in the last decades, also in green technologies. WindWaker is inspired by Copenhagen's history. As a port city, sea is a main element from the ancient Nordic people to contemporary ships. Wind is another key factor in WindWaker design, including former windmills and current wind turbines. The idea is to regenerate the view of the industrial platforms by the strategic setting of sails.

Textile forest

Flow

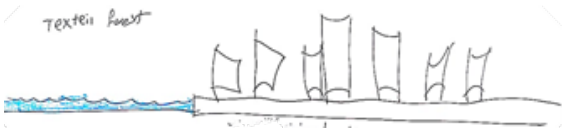
Energetic flow: wind to electricity

Social flow: living in the wilderness

Transformation

Atmospheric term: *textile forest*

mystic forrest, foggy park, bumpy tree land, naturalized micro hills, wild water park, cursed swamp, enchanted trees

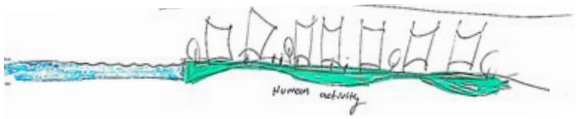


Active architecture: *dancing hanging sheets*

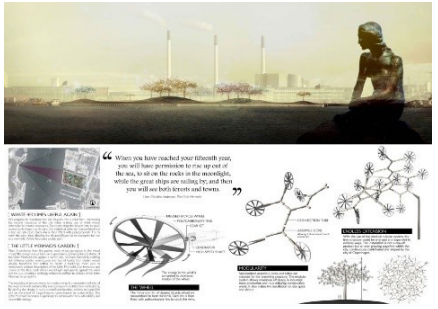
highly raised, transparent soft materials, fishing nets in the sky, colorless design, repetitive pattern, no highlight

Social activity: *living in the wilderness*

recreation, community wild gardering, open zoo, orientation run, forrest/nature dance, swinging, rainbow gathering



Project 1.18: The by Cycle



Team: Kenneth Ip, Joey Yim

Energy Technologies: micro wind turbines from repurposed bicycle rims

Design inspiration: Copenhagen as a world leader in sustainable living

Design goal: solving an environmental issue of old bicycle

Author's concept description:

What if old and abandoned bicycles were reintroduced back into the sustainable ecosystem of Copenhagen? Although they may no longer be suitable to be used on the road again, their basic framework and structure allows them to be recycled for another purpose. Instead of disposing them as waste, these bicycles could be transformed into a meaningful part of Copenhagen's ambitious plan to be carbon neutral by 2025.

We propose to transform the old bicycles into a wind farm, harnessing the natural resources of the city while making use of what would otherwise be wasted resources. Deconstructing the bicycle into its basic elements; its frame and its rims, the individual parts are reassembled into a tree like structure. Each rim is then fitted with polycarbonate fins to catch the wind, thus allowing the disused bicycle to be readapted for use as a windmill. Waste becomes useful again.

Recycle forest

Flow

Energetic flow: wind to electricity

Social flow: play and meet up in recycling forest

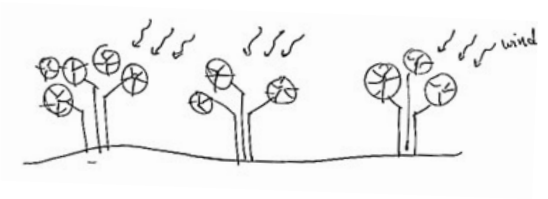
Transformation

Atmospheric term: *recycle forest*

magic trees, bike magic, circles of love, renaturized sorcery, wizard tree park, bikes heaven, magic rings

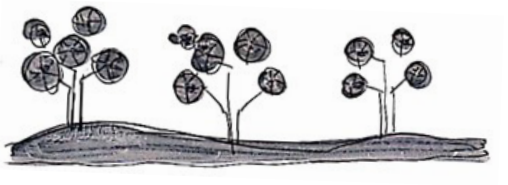
Active architecture: *Repurposing bicycle rims*

repetitive pattern, everyday objects within structures, imitation of a tree, structures have a protective effect, grouping of individual structures, delicate construction

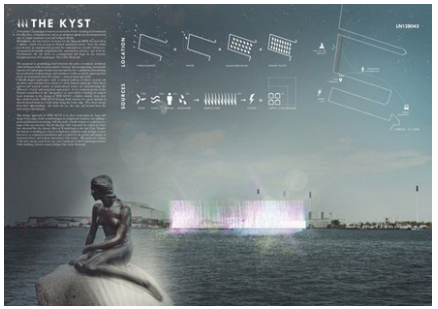


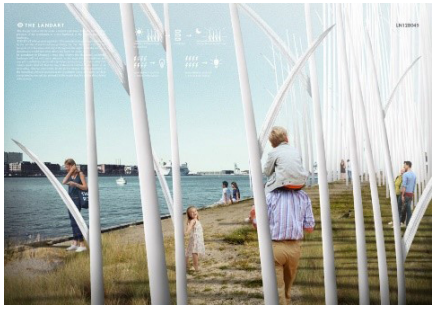
Social activity: *visiting recycle forest*

bike park, hiking, sound installation, community gatherings, poetry, BBQ



Project 1.19: THE KYST





Team: Janka Paulovics, Annika Janthur

Energy Technologies: piezoelectric discs and fibers

Design inspiration: combination of natural and high-tech structures

Design goal: adding a poetical dimension

Author's concept description

The proposal is positioning itself between the poles of natural, technical, cultural history of the location and the visionary all-encompassing, sustainable impetus of Copenhagen. It takes into account the city´s ambitions of promoting the production of clean energy and combines it with an artistic approach that draws its inspiration from the country´s natural landscape itself.

Climate shaped landscapes, such as natural habitats of dunes, coastal salt meadows and wetlands cover about 10% of the Danish landscape. Their floral pattern and natural texture as inspirational source are characterizing the proposal´s visual (and acoustical) appearance. A very common species of the Danish coastal flora is the "phragmites" or reed which is lending its natural basic structure to the design of THE KYST: a hollow slender stem. Just like a field of reeds, THE KYST Energy Park consists of a great amount of densely placed stems in a wide stripe along the water edge. They draw energy from their surroundings: the wind, the sea, the rain, and beyond from the interaction with humans.

Artificial reed field

Flow

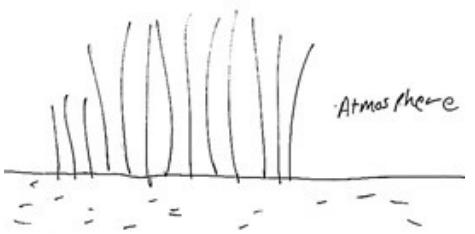
Energetic flow: wind and people to electricity

Social flow: move through the reed field

Transformation

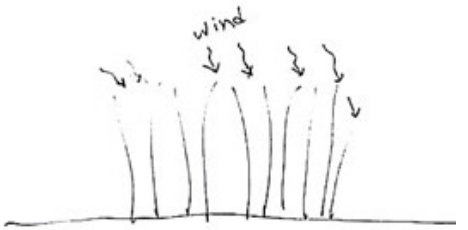
Atmospheric term: *artificial reed field*

wild sticks, huge white gras, small ants, light harbor, sea bambus, dense shore, giant white bank, hair on the edge



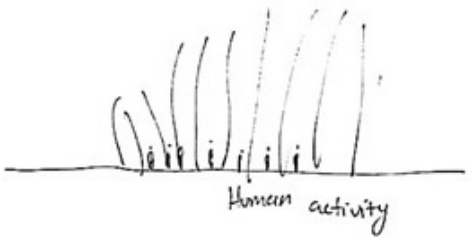
Active architecture: *moving with, wind, water or rain*

high reaching slim structures, repeating patterns, movement by wind, glowing poles, artificial materials, oversizing

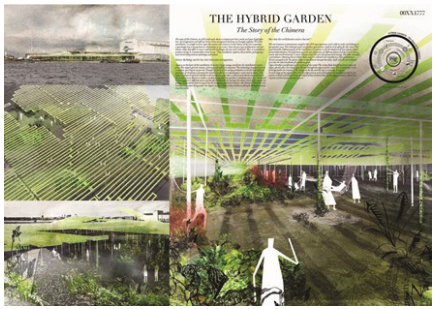


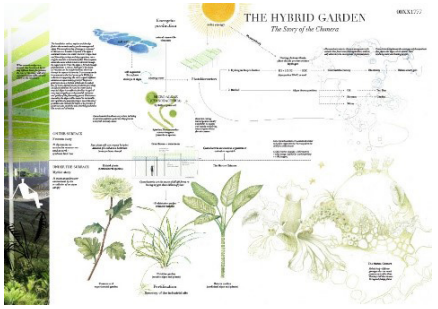
Social activity: *moving through the field of reeds*

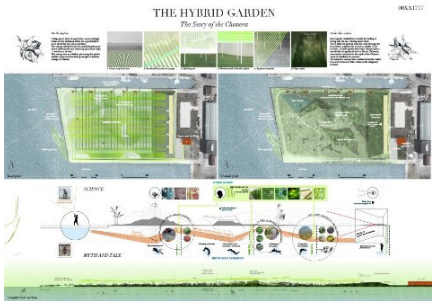
playing hide and seek, climbing/bouldering, obstacle course, iron man



Project 1.20: The Hybrid Garden, the Story of the Chimera







Team: Alexandra Arènes, Axelle Grégoire, Sophie Fernandez, Paul Riley

Energy Technologies: photosynthetic hydrogen production, algae (Cyanobacteria) biofuel

Design inspiration: the story of the chimera and the relation to the sea

Design goal: a garden that celebrates the entropy of a healthy ecosystem with a mystical touch

Author's concept description:

Algae is at the heart of the installation. It covers a large canopy and forms the installation's centrepiece. The algae's growth creates a thriving, self-sufficient ecosystem. The technology employed acts as a catalyst, spurring on its growth. Though this form of bio-energy production is not the most efficient generator of electricity, it grounds the installation firmly in Copenhagen's water and its history. The algae's ecological universe unfolds in the installation's garden, a closed and ordered entity similar to the Greek cosmos. However, unlike a traditional garden, this garden is inhabited, alive. It is constituted by the ecosystem's different parts and therefore embraces the entropy, the chaos which such a space can possess. It represents and is occupied by the imaginary, mythical creature : the Chimera. There are also transient organisms living under the algae's surface. Science thus recalls an old myth through constructing this world.

Lifted algae sea

Flow

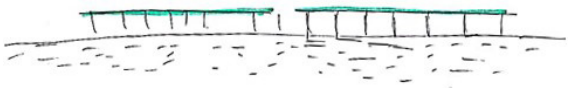
Energetic flow: algae to electricity

Social flow: walk under a green sea

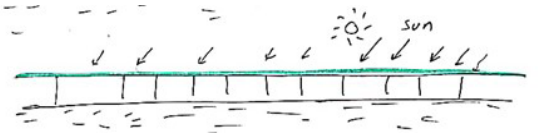
Transformation

Atmospheric term: *lifted algae sea*

relax garden, chaotic you, free yourself, connecting garden, green moorings, community place, building up us, green roofs, green above and below

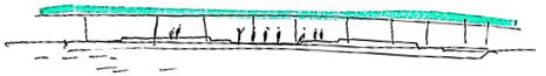


Active architecture: *covering a large canopy, filtering the light (through the algae and its water)*



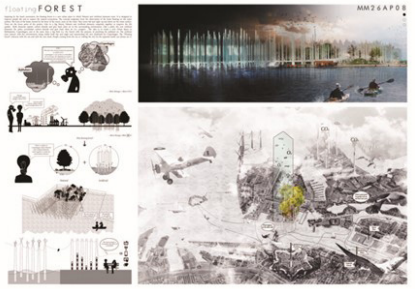
green roof, transparent material, network of long tubes, straight surface, living material, wide dimension

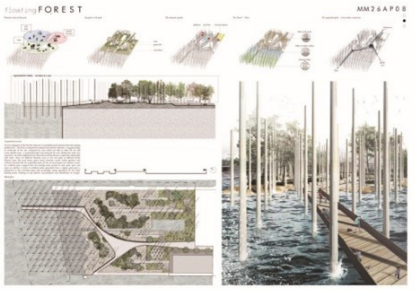
Social activity: *submerging in an unrecognizable environment*



teaching/learning, conference, small community meetings, games, community gardening, workshops, concerts, art exhibition

Project 1.21: Floating Forest (between the trees!)





Team: Massimiliano Matera, Annalisa Pilati

Energy Technologies: kinetic harvesting, compressed air turbines

Design inspiration: The movement of a boat on the waves of the sea

Design goal: improving life quality for the urban inhabitants

Author's concept description

Inspiring by the boat's movement, the floating forest is a new urban place in which Natural and Artificial elements meet. It is designed to improve people life and to respect the natural ecosystems. The concept originates from the observation of the boats floating on the water surface. The trees of the boats, moved by the force of the waves. sway on the water. They move left and right, up and down on the water surface. Trees are the focus point of the project. Like in a big Forest, Natural and Artificial elements cooperate together to improve the life quality. Both elements capture carbon dioxide and give back clean air to the surrounding environment. Like a plant, the new artificial elements, the poles, accumulate carbon dioxide and give back clean air (i.e. oxygen).

The idea is to create a new Urban Space in RefshaleØen, Copenhagen, and at the same time a big Park (i.e. the forest) with the purpose of purifying the polluted air. The artificial trees interact with the environment, being visible both day and night and representing the new landmark for Copenhagen. The "Floating Forest" interacts with the sea and with the new dock. People coming from the sea or visiting the city (in the opposite bank) can always see it.

Floating winter forest

Flow

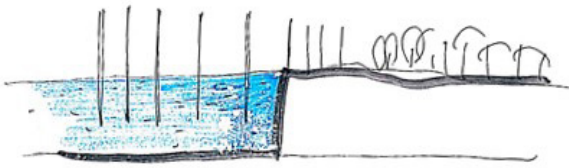
Energetic flow: wave and wind and human to electricity

Social flow: walk through an artificial forest

Transformation

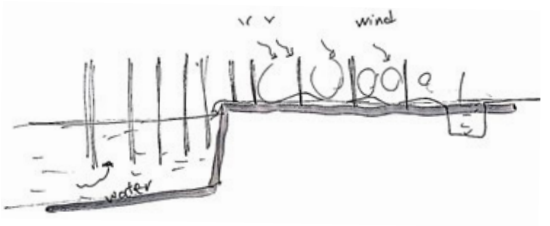
Atmospheric term: *floating winter forest*

pre forrest, waves breaking forrest, water trees, storm swallowing woodland, waves jungle, continuation plantation, ice berg woods



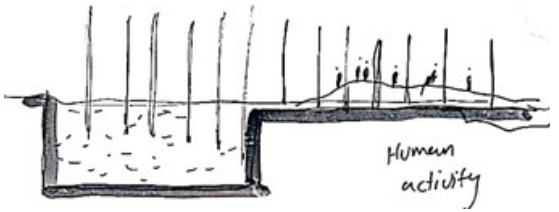
Active architecture: *moving with the force of wind and water*

vertical poles, connection to water and land, repeating pattern, shining in the night, forest without trees made of cold materials, poles and accommodation center separated from each other, water and wind



Social activity: *flowing in the forest*

kayaking, wild waves swimming, water rescue training, hiking, meditation, bike tours



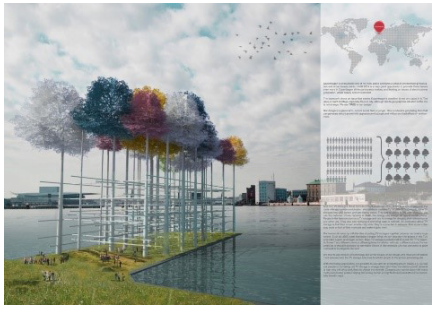
Project 1.22: Raised Farm

Team: Iman Amini, Alireza Hoobakht, Amin Amini, Mahdi Ghotbi, Mohsen Khanmohamadi, Mahdi Musavi

Energy Technologies: piezoelectric generators

Design inspiration: lack of trees in the city

Design goal: creating a green and art-like farm for people to benefit from

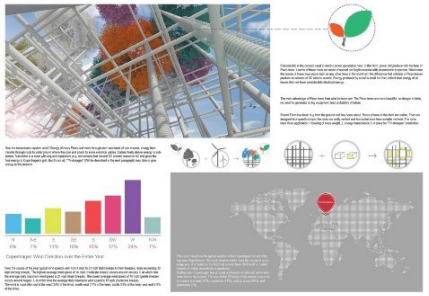


Author's concept description:

Copenhagen is undoubtedly one of the most active and famous cities in environment preservation and urban beauty areas. LAGI 2014 is a very good opportunity to promote those issues even more in Copenhagen While participants working and thinking on issues of electric power generation, urban beauty and environment.

The teamwork chose an issue that seems Copenhagen's condition is not very good in it. The issue is plant shortage especially trees in city, although due to geographical situation of the city is not strange. We use TREE in our design!

Our design is a green farm, but not a real farm or jungle. This is indeed a generating farm that can generate electric power with appearance of a jungle and without any bad effects on environment.



Under construction forest

Flow

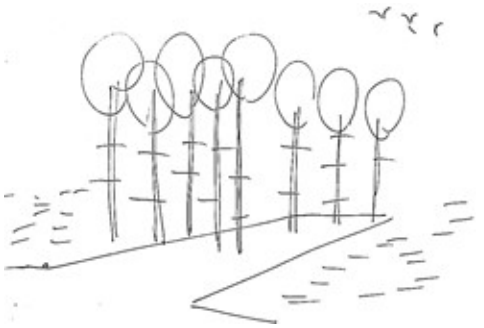
Energetic flow: wind to electricity

Social flow: walk through a colorful forest

Transformation

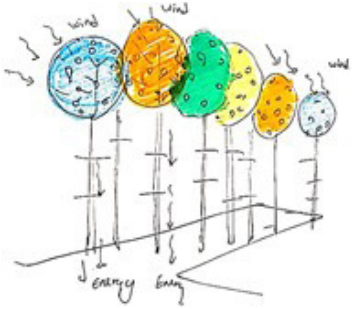
Atmospheric term: *under Construction Forest*

huge color trees, colored harbor hat, water grid, colored airy roof, empty structure, higher meaning, mermaid in forrest, clown grid, circus trees



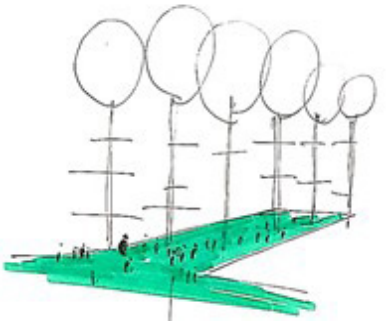
Active architecture: *presenting an artificial forest*

artificial trees, artificial materials, unnatural coloring, high elevation, vertical bristly structure, climbing grid, little interaction



Social activity: *gather and celebrate the colors of art*

climbing, bouldering, exhibition, team sports, divisible space, water playground, slides, swings, parade



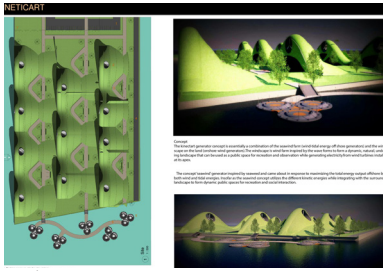
Cluster 2

Cozy by vital nests

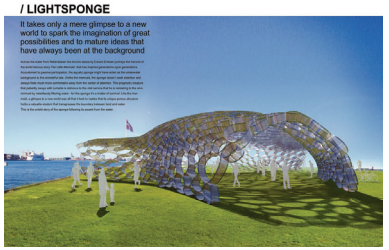
In this cluster there are the atmospheric terms, in which they radiate the feeling of comfort and coyiness to the space. They look like crowded, safe and warm. Vitalizing is another character of these spaces.

Those atmospheric terms with the sense of vitalitzing and embraced by architectural element are: hive nest, soil nest, organic nest, warm rooms, nesting boxes.

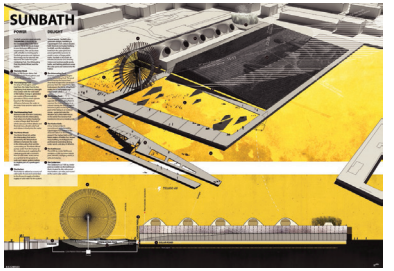
The spaces in this cluster are cozy by presence and safety of other people around and the architecture of embracement.



Soil Nest

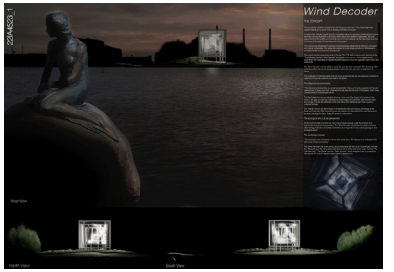


Organic Nest



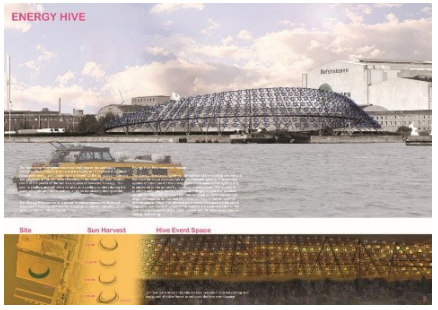
Warm Room

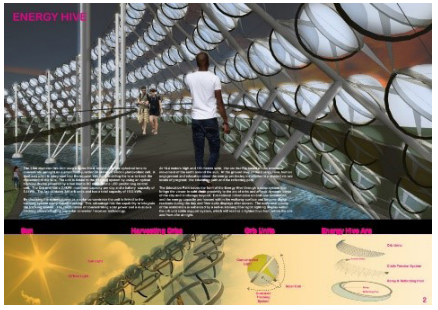
Hive Nest



Nesting Boxes

Project 2.1: Energy Hive





Team: Glenn LaRue Smith, Vinson J. Camacho

Energy Technologies: concentrated photovoltaic (CPV)

Design inspiration: beehive structure

Design goal: creating a simple yet beautiful place for human interaction and play

Author's concept description:

The natural system of bees working in choreographed synchronization to harvest and produce for the benefit of the collective has provided meaning for the Energy Hive. Our installation metaphorically extracts the beehive structure, expressed as a sculptural arc of orbs, to construct a new interactive renewable-energy hive.

The energy hive system is a harvester of sunlight, tracking the radiant energy of the sun's rays as the sun moves across the sky during the day. The harvesting of this sun energy is exponentially multiplied by the collective orbs and stored within the two anchor pylons at each end of the hive arc. These anchor pylons are also points of distribution for the collected energy. Thus, the two anchors serve two pivotal purposes: first, the primary structural tension support for the system of cables supporting the orb units along the arc, and second, the anchors house the system of converters, transformers and mechanical devices that feed an expansive underground distribution network.

Hive nest

Flow

Energetic flow: solar to electricity

Social flow: ramp up in a cozy nest

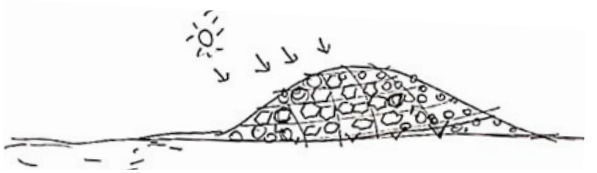
Transformation

Atmospheric term: *hive nest*

dome of pearls, diamond arena, eyes of sun and sea, community lenses, focus area, half disc, open arena, open dome, headless dome, no roof – no problem, ellipse of pings

Active architecture: *reflecting the collected light shine*

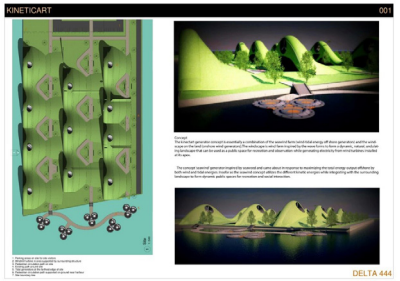
light construction, rigid construction, perforated facade, smooth curves, industrial cold materials, reflective



Social activity: *gather and meet inside the nest*

sports competition/events, concerts, reflection/ medtitaion, concerts, art exhibition

Project 2.2: Kinectart Generator

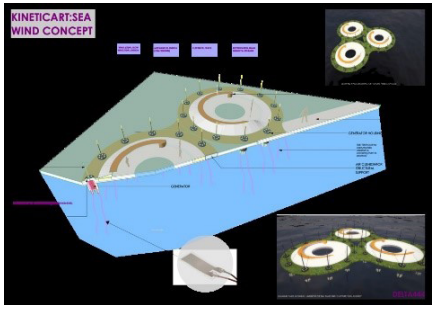


Team: Mbaabu Stephen, Victor Basweti

Energy Technologies: piezoelectric generators

Design inspiration: the form of waves

Design goal: creating a dynamic space that harmonizes with the land- and waterscape aesthetics



Author's concept description:

The kinectart generator concept is essentially a combination of the seawind farm (wind-tidal energy off shore generators) and the windscape on the land (onshore wind generators).The windscape is wind farm inspired by the wave forms to form a dynamic, natural, undulating landscape that can be used as a public space for recreation and observation while generating electricity from wind turbines installed at its apex. The concept 'seawind' generator inspired by seaweed and came about in response to maximizing the total energy output offshore by both wind and tidal energies. Insofar as the seawind concept utilizes the different kinetic energies while integrating with the surrounding landscape to form dynamic public spaces for recreation and social interaction.

Soil nest

Flow

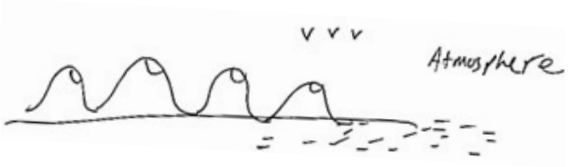
Energetic flow: wind to electricity

Social flow: ramp up in a cozy nest

Transformation

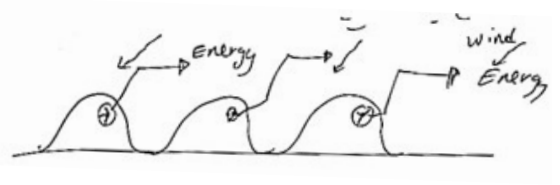
Atmospheric term: *Soil Nest*

open hills, airy holes, high breathing, flower hole, green hills, blooming mountains, rub soil, rub hillock, circled mounds



Active architecture: *inflating pierced soil*

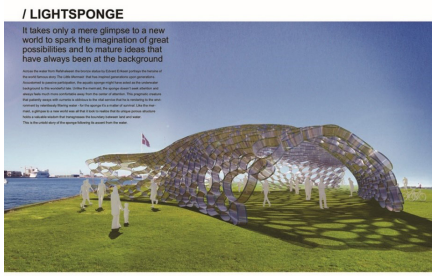
surreal and artificial ground movement, oversizing, repetitive curved shape, natural grass surface, offset structures



Social activity: *explore artificial rolling landscape*

mountain boarding, ski/snowboard, workout, team games, capture the flag, king of the hill, celebration, community gathering, workshops, learning/teaching

Project 2.3: LightSponge

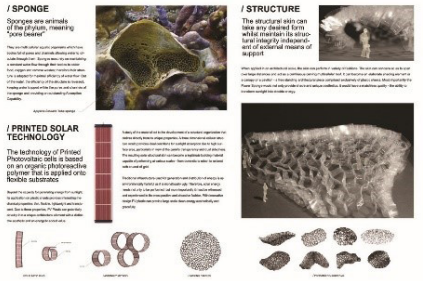


Team: Asaf Mayer, Diego Prilusky, Michal Lerman, Adi Glaser

Energy Technologies: organic thin film photovoltaic

Design inspiration: aquatic sponge

Design goal: encouraging wisdom that transgresses the boundary between land and water



Author's concept description:

Across the water from Refshaleøen the bronze statue by Edvard Eriksen portrays the heroine of the world famous story The Little Mermaid that has inspired generations upon generations. Accustomed to passive participation, the aquatic sponge might have acted as the underwater background to this wonderful tale. Unlike the mermaid, the sponge doesn't seek attention and always feels much more comfortable away from the center of attention. This pragmatic creature that patiently sways with currents is oblivious to the vital service that he is rendering to the environment by relentlessly filtering water - for the sponge it's a matter of survival. Like the mermaid, a glimpse to a new world was all that it took to realize that its unique porous structure holds a valuable wisdom that transgresses the boundary between land and water. This is the untold story of the sponge following its ascent from the water.

Organic nest

Flow

Energetic flow: solar to electricity

Social flow: experience an open cozy nest

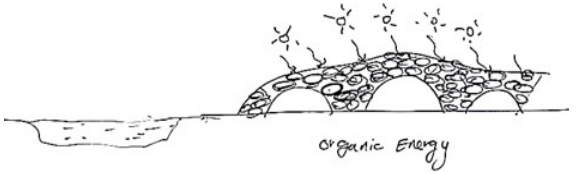
Transformation

Atmospheric term: *organic nest*

friendly skeleton, framed sponge, holding crab, light airy dome, crawling shore, crab park, left behind skin, parched dome, crystal frames, framework of pearls, shell hall

Active architecture: *opening sun windows*

organically formed sculpture, transparent material, small size, perforated facade, cell structure, light construction, natural form, rigid, shelter

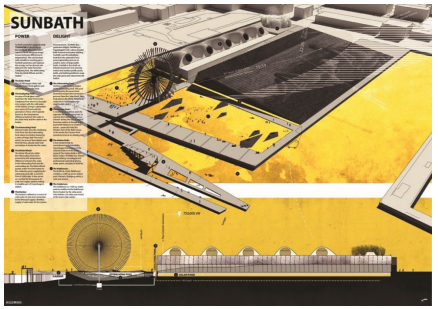


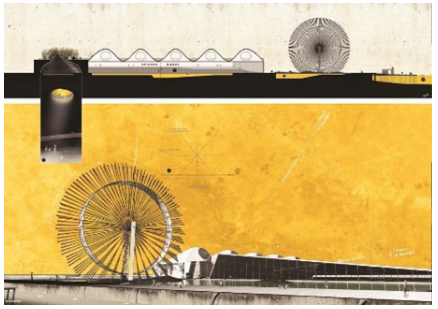
Social activity: *standing in a human nest*

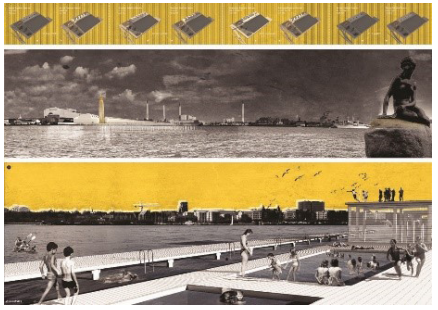
celebration, workshop, concert,

community meeting, art installation, drying food, small team games, sports / yoga, dancing, small festival

Project 2.4: SunBath







Team: Jacob Boswell, David Shimmel, Ian Mackay

Energy Technologies: solar pond, thermoelectric generators

Design inspiration: bathing culture of Copenhagen's citizens

Design goal: a usable place as a symbol for culture and futuristic energy production

Author's concept description:

As a city and port Copenhagen exists at the threshold between land and water. It is startlingly appropriate that the city's symbol, the Little Mermaid, also exists at that threshold: a creature between worlds, half man half fish, caught between land and sea. Copenhagen's rich bathing culture partakes of this liminality as well, inviting visitors to shed their daily skins and partake in the delights of a warm public bath, or a bracing swim in the harbor. SunBath is a project that attempts to harness the innate capacity of the Refshaleøen site in order to generate electricity, provide a civic amenity, and to give Copenhagen an enduring symbol of its liminal position, culture and leadership in forging a path toward carbon neutrality.(Jacob Boswell, David Shimmel, Ian Mackay)

Warm room

Flow

Energetic flow: wind to electricity

Social flow: move through series of cozy nests

Transformation

Atmospheric term: *shaking waterfall*

rain, crystal palace, giant stairs, dangerousneedles, acupuncture, huge show, big audience, travelling, bright stairs/needles, lighthouse, hanging vertical louver, waterfall from the sky

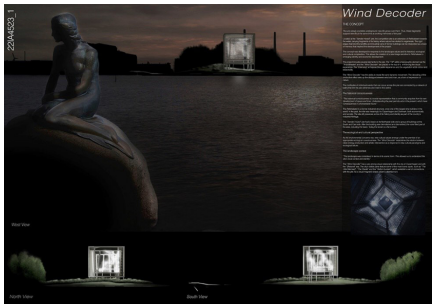
Active architecture: *sun-exposing variable pools*

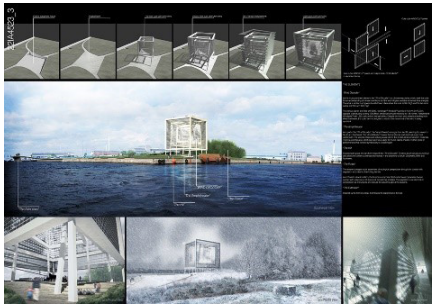
clear lines, many components, connection to water, round and angular components in contrast, focus point wind turbine, large wide areas

Social activity: *swimming the warm water*

ferris wheel, diving, jumping, sunbath, performance, skating, jogging, art installation

Project 2.5: Wind Decoder





Team: António Pliz, Cláudia Branco

Energy Technologies: aeroelastic flutter (WindbeltTM)

Design inspiration: fragments of its history

Design goal: new cultural paradigms and ecological values

Author's concept description:

"As ruins slowly crumbles underground, new life grows over them. Thus, these fragments support new life at the same time as evoking memories of the past". Located at the "Sønder Hoved" pier, the competition site is an extension of Refshaleøen towards the water, carrying fragments of its history where nature has started to regenerate. The rigid edges that bind the landfills and industrial ruins of former buildings can be interpreted as a trace of memory that inspired the development of the project.

The concept was developed in response to the landscape values and its historical, ecological and cultural complexities. This allows the creation of a new image sensitive to Refshaleøen's emerging identity and economic development.

Nesting boxes

Flow

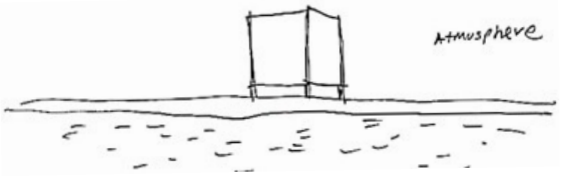
Energetic flow: wind to electricity

Social flow: meet under a cozy cage

Transformation

Atmospheric term: *nesting boxes*

transparent surprise box, light 3D square, fance cuboid, just landed, ready to escape, enter the void, beautiful ashlar, wizards place, time machine



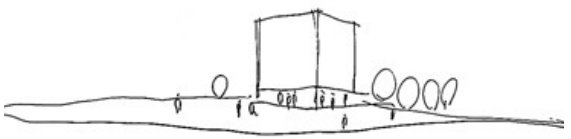
Active architecture: *covering an open room*

cubic form, glowing at night, monumental character, stand-alone effect, rigid frame and lively interior, play with light, transparency

Social activity: *meeting under the box cages*

dance performance, workshop, celebratrion of love, wedding, concert, movie premiere,

concert, art exhibition,

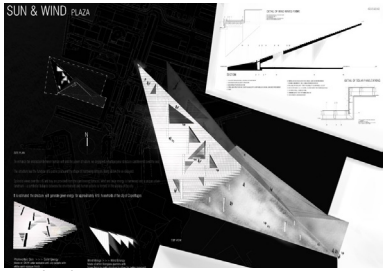


Cluster 3

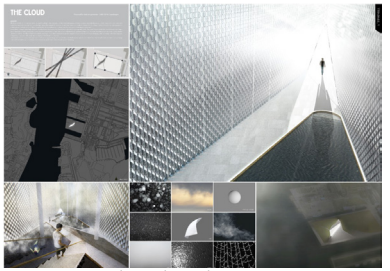
Mysterious Naves (navis)

This cluster has the atmospheric terms that the main charachteristic of them are something like naves with a mystery. They namely they are: sunk ship, sacred dome, incense smoky church, flying phantom, open-air church, ship illusion, playful sail boats.

Boats, ships and churches sometimes feel like a mysterious naves, and the word *"nave"* comes from latin that means ship.



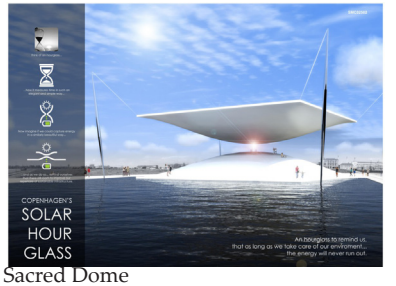
Sunk Ship



Incense Smoky Church

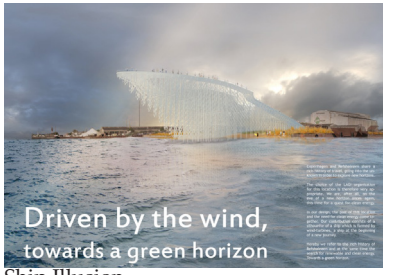
Flying Phantom

Playful Sail Boats



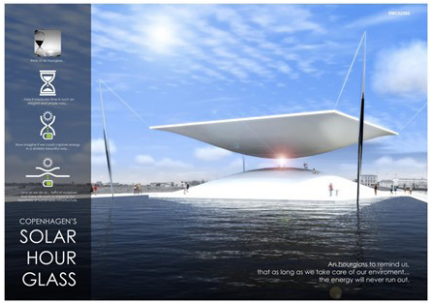
Sacred Dome

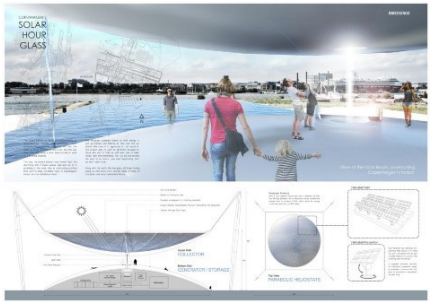
Open-air Church



Ship Illusion

Project 3.1: The Solar Hourglass





LAGI 2014 1st Place Winner

Artist: Santiago Muros Cortés

Energy Technologies: concentrated solar power (thermal beam-down tower with heliostats)

Design inspiration: the passing of time and energy

Design goal: creating a place that leaves an optimistic impact on the visitors

Author's concept description:

The Hourglass somehow remind us that energy is just as precious and fleeting as time, and thus we should take care of it, appreciate it… not waste it. The project aims to send an optimistic message to those who visit it; that we still have time to make things right environmentally; that we are not beyond the point of no return… and most importantly, that we don't need to be. The Hourglass represents one more step in our search for sustainable, feasible, and beautiful ways of producing clean, renewable and environmentally friendly energy. Along with the earth, the hourglass will keep turning, giving us with every turn, another beam of hope for a brighter and more sustainable future.

Sacred dome

Flow

Energetic flow: sun to electricity via Light beam

Social flow: to gather in mysterious space

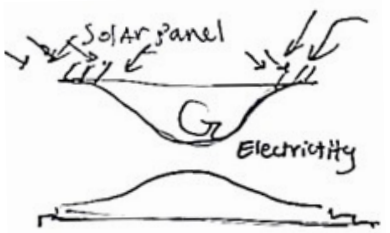
Transformation

Atmospheric term: *sacred dome*

shine funnel, suspended dome, protruding island, hot hill, convergent planes, warm support, a piece of art

Active architecture: *harvesting liquid shine*

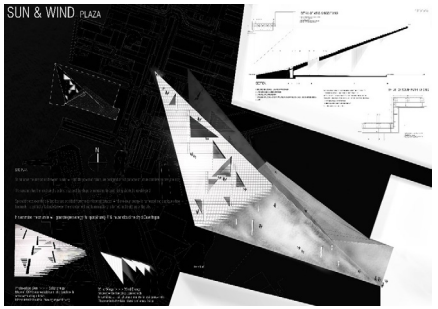
floating in the air, opening figure, sun collector, circular shelter, abstract form, Framing city, harvesting the fruit of sun, drawing the focus to a point of light and transformation, hiding technical equipment under the hill



Social activity: *praying the source*

sense of praying, see the light and sun in a certain way, contemplating the sun value, gathering point, get to a warm space in cold weather- go curious, educate, sit in a warm shadow, feel safe and cozy

Project 3.2: Sun & Wind Plaza



Team: Michał Kowalski, Aleksandra Kaszubska; Babaka Architekci

Energy Technologies: Onyx™ solar panels

Design inspiration: on the verge of city and nature

Design goal: balance between the environment and human activity

Author's concept description

Refshaleøen in the docklands of Copenhagen is a place where the urban and natural landscapes meet. To enhance the interaction between human will and the power of nature, we designed a multipurpose structure cantilevered over the sea.

The structure has the function of a public plaza and the shape of narrowing terraces rising above the ex-shipyard. Splendid views over the city and bay are provided from the cantilevered terraces; wind and solar energy is harnessed and a unique urban landmark – a symbol of balance between the environment and human activity is formed in the skyline of Copenhagen.

Sunk ship

Flow

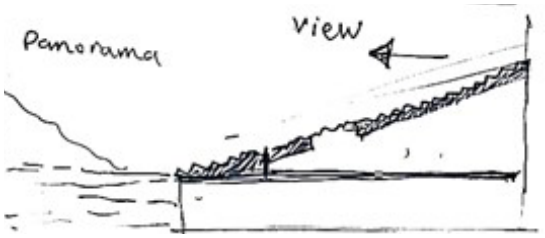
Energetic flow: Sun to electricity via Light beam

Social flow: socializing via Gathering in mysterious space

Transformation

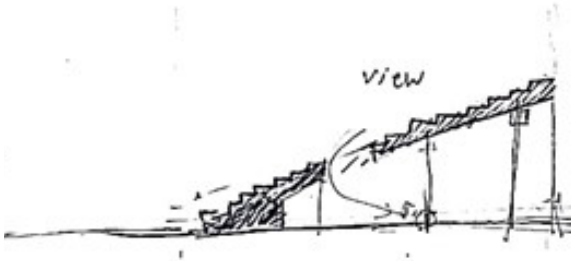
Atmospheric term: *sunk ship*

Ramp to view the land, meet air and sky, water, the high, dive, deep, jump, triangulation of the ground, up to the top nature sound, stairways into the wild



Active architecture: *exposing to the wind*

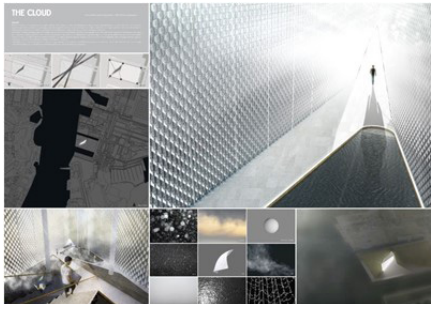
forcing shape, pointed and dangerous, viewpoint, easy to walk on, seat steps, components break through the floor, sticking out high

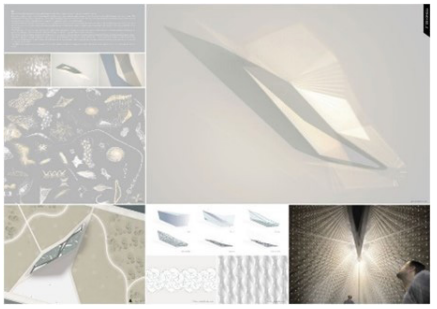


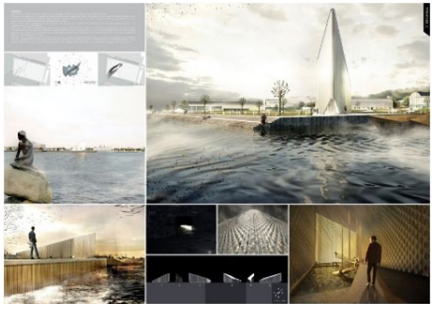
Social activity: *climbing up to the ship prow*

Social meeting base for walking and kind of terrasse, meeting point to being exposed to nature, fresh air and light, wide view, maybe to be used as a stage for performances and concerts plain air

Project 3.3: The Cloud







Artist Name: Tim Thikaj

Energy Technologies: micro wind turbines

Design inspiration: dynamics of the cloud phenomena

Design goal: to encourage a healthy and active lifestyle for its citizens

Author's concept description:

A cloud is most commonly known as a visible mass of condensed water vapor floating in the atmosphere, typically high above the ground. It describes an indistinct mass, especially of smoke or dust, a large number of insects or birds moving together within a certain dynamic. With regard to fractals, in mathematics a cloud can refer to a set of multidimensional points.

In an effort to comprehend large amounts of information, the human mind will often scale tasks to manageable levels. The mind focuses on details critical to understanding a given situation, avoiding complexities outside of the primary focus. Similarly, in Fractal Mathematics, geometric figures such as the Mandelbrot Set are continuously divided into finer sections. The Mandelbrot Set exhibits structures, that when examined at greater magnification seems to be forever changing, while retaining a structure uniquely defined by its equation. We would like to think of "The Cloud" as a fractal.

"The Cloud" exists as a visual metaphor for itself in it being part image of a fractal, that is both illustrative and abstract. Therefore, "The Cloud" can be described best as being both solid and hollow, yet it continues mathematically predictable, while also being ever changing. (Tim Thikaj)

Incense smoky church

Flow

Energetic flow: wind to electricity

Social flow: experience a mysterious atmosphere

Transformation

Atmospheric term: *incense smoky church*

One point all, fractal openings, energetic spaceshp, merkabah, matter as vibes, energyfield, ätheric restoration, cloudy collector, welcoming the wind, building honouring the wind, open to space, still stable, artistic architecture, energy

collector

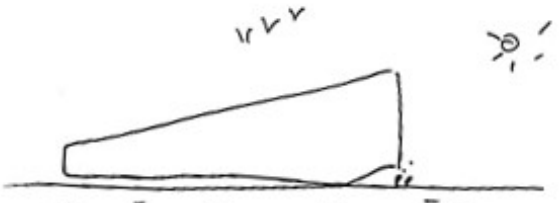
Active architecture: *collecting the maximum wind*

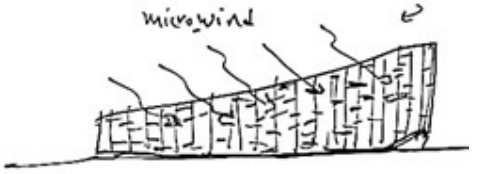
Align to the wind, dynamic facade, landmark, altering the skyline, taking natural light, fade into the light, moving through a corridor of light, opening to the sky

Social activity: *seeing a mysterious atmosphere*

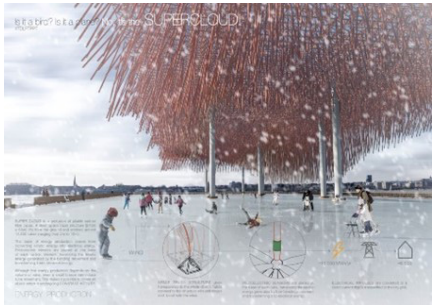
Museum for renewable energies, representative space for lectures about climate change,

political meeting point





Project 3.4: Super Cloud



Artist Name: Lucas Jarry, Rita Serra e Silva, Lucas Guyon, Marianne Ullmann

Energy Technologies: piezoelectric discs

Design inspiration: the gestural flux of wind patterns

Design goal: to embrace a NEW CONCEPT OF PUBLIC LIVING SPACE.

Author's concept description

SUPER CLOUD presents itself in a truly authentic manner, it aims to personify the gestural flux of wind patterns. It floats between ground and sea, vibrating in the rhythmic harmony of the wind and becomes a living element within the city. Located in proximity to the acclaimed Littler Mermaid, the Cloud is so much more than a piece of art and asserts its unique character via its presence. Refshaleøen Island is presented with the opportunity to become a special place in the city once again. Its identity will define a large part of Copenhagen's urban life.

Landscape, Art, and Energy act cohesively in a system of symbiosis. As these parts work hollistically, the issues and problems of the 21st century begin to fade in attempt to grant people a sustainable lifestyle. (Lucas Jarry, Rita Serra e Silva, Lucas Guyon, Marianne Ullmann)

Flying phantom

Flow

Energetic flow: wind to electricity

Social flow: fun and shared activities

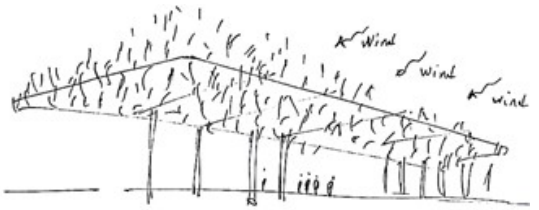
Transformation

Atmospheric term: *flying phantom*

Bali or Brazil, South America or Hawaii, bast skirts, thatched roof, organic effect, summer feelings, lightness, eroticism, caipirinha

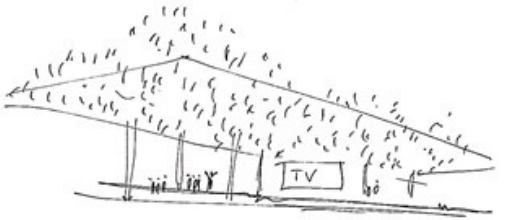
Active architecture: *capturing the ever-changing direction of the wind*

lively and inviting, warm color scheme, breathes like a living animal, floats above the heads, offers shelter and a roof, dynamic form, many parts form a whole



Social activity: *visiting under the phantom*

celebration, beach bar, dancing activities, chillout, festival, performance, movie premiere



Project 3.5: The Mermaid's Forest

Artist Name: Javier Fernandez Ponce

Energy Technologies: photovoltaic panels, piezoelectric generators, titanium dioxide air purification

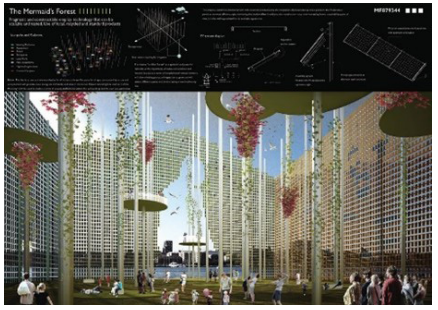
Design inspiration: public green open space for locals and visitors

Design goal: human environmental interactions

Author's concept description

"We envision public art three dimensional intervention for Copenhagen, a tribute to Refshaleøen shipyard industrial heritage that now will be used as a public green open space for locals and visitors which at the same time generates utility-scale clean energy".....

The Site's views across the harbor to the Langelinie and the cherished statue of the Little Mermaid are inspiration sources of the project. " Renewable-energy CAN BE BEAUTIFUL". We propose a new "Void" or opening on the West facade by extracting the silhouette of the Little Mermaid statue so that viewers can enjoy the site's views and automatically create a imaginary link between this national symbol and the site's new use. The waterfront experimental garden will be a new floating and floodable area which will allow citizens to experience by themselves new types of aquaponic systems (aquaculture + hydroponics), which can contribute to the city future food supply demands. (Javier Fernandez Ponce)



Open-air church

Flow

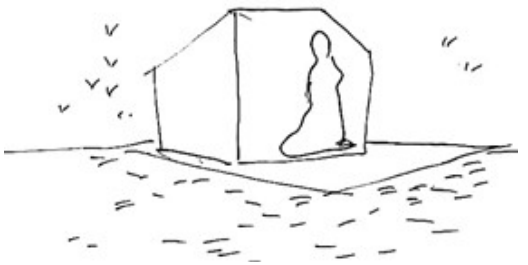
Energetic flow: sunlight and wind to electricity

Social flow: education an appreciation of the environment

Transformation

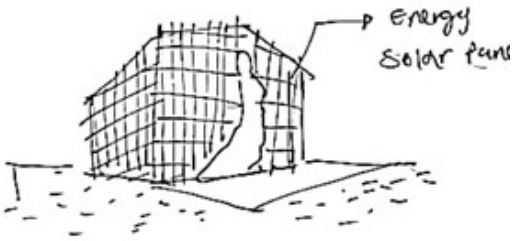
Atmospheric term: *Open Air Church*

holy sacred space, old church, protected space massive sculpture, windy box, floating discs, hanging garden



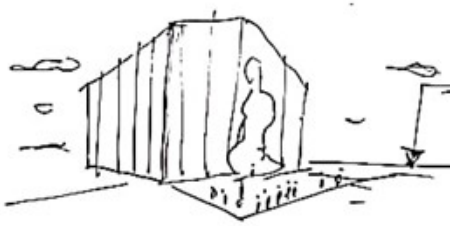
Active architecture: *opening ecological church*

familiar form in a new context, oversized scale, playful approach to the little mermaid, sacred center, open roof, protected space, living walls

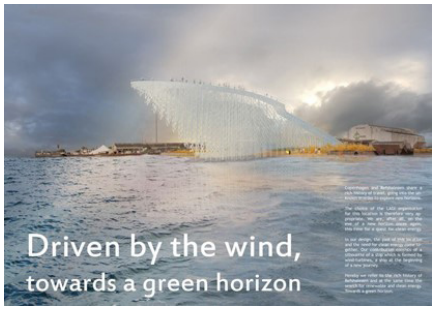


Social activity: *meet people and nature*

park on the lake, event area , concerts, theatre, celebration, spiritual services, exhibition



Project 3.6: Driven by the Wind



Artist Name: Guido Zeck, Ingrid Ackermans, Peter Twisk

Energy Technologies: UGE VisionAIR3™ vertical axis wind turbines

Design inspiration: a rich history of travel in Copenhagen and Refshaleøen

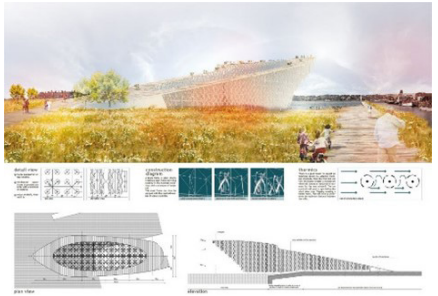
Design goal: the ongoing transformation of Refshaleøen

Author's concept description

Seen from the city the ship is a logo and catalyst for the ongoing transformation of Refshaleøen. A transformation into a residential area 'driven' by the wind.

The front of the ship offers a spectacular view over the Sond and the historic city-centre of Copenhagen. The ship is also a poetic backdrop for the little mermaid, where her prince on the ship is always near.

The installation unites its functional significance for harvesting wind energy with the spatial and strategic importance as a catalyst and attractor. (Guido Zeck, Ingrid Ackermans, Peter Twisk)



Ship illusion

Flow

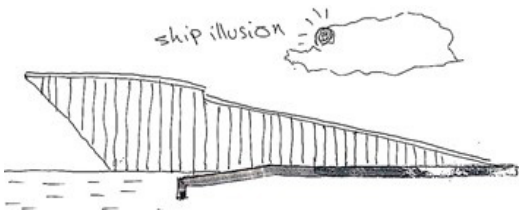
Energetic flow: wind to electricity

Social flow: nostalgic viewpoint

Transformation

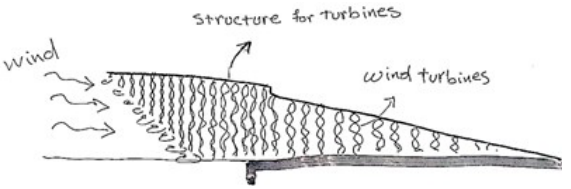
Atmospheric term: *ship illusion*

Magical effect, ghost ship, legend, reminiscent of an odyssey, Mythical, fine, filigree



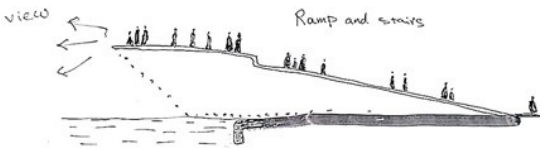
Active architecture: *simulating a ship*

ship-like form, light materials, the striving towards the ocean, rising high like falling water, creating a view into the future, monumental character

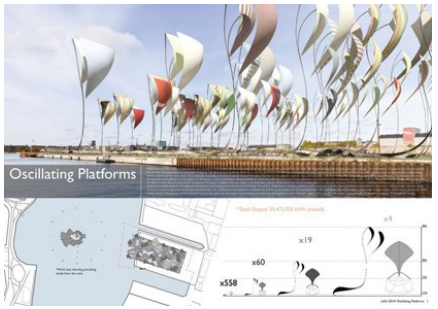


Social activity: *ramp up to the sea*

viewing platform, market, café, street artists, performance, shipping, summer festival, racing, hiking



Project 3.7: Oscillating Platforms

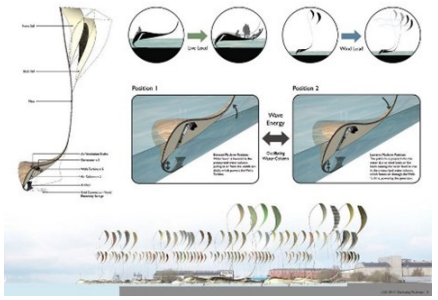


Artist Name: Felix Cheong

Energy Technologies: wind sails, oscillating water column, Wells turbine

Design inspiration: history of the site

Design goal: to be playful



Author's concept description:

When looking at the island of Refshaleøen one can see its relationship with the water defined by the many piers that protrude into the strait, like fingers reaching out to grasp at its surroundings. This intertwining of land and sea is emphasized by the fact that Refshaleøen was at one point a shipyard. The idea behind Oscillating Platforms is to bring back the connection that the island had with its surrounding environment and history as well as allow visitors to recognize their relationship with the island and the water itself.

Playful sail boats

Flow

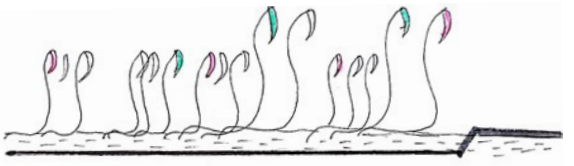
Energetic flow: wind to electricity

Social flow: playful bouncing platforms

Transformation

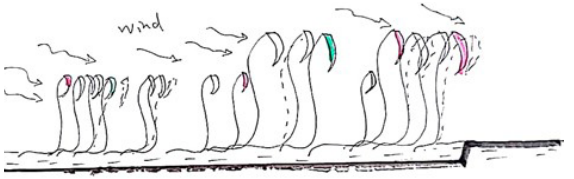
Atmospheric term: *playful Sail boats*

refreshing, airy, summer breeze, colourful flags in the wind, interesting sails, diverse winds, good mood, holiday feeling, enyojable view



Active architecture: *inflating the sails with wind*

repetitive pattern, colorful and playful design, light construction, vertical effect above the visitors' heads, curved form, playing with the wind



Social activity: *playing on the curvy platforms*

promenade, walk, spa town, open air swimming, impress visitors, sound installation, games, art exhibition

Cluster 4

Sonorous Halls

In this cluster the atmospheric terms present sounds in space like stations with sound of the trains and crowed.

The atmospheric terms namely are: urban wind harp, embedded horn, rusty horns.

This cluster has kinds of sonorous and laod atmospheres and they can fill the space like a hall at a station.

Embedded Horn

Rusty Horns


Urban Wind Harp

Project 4.1: Wind Harp: Wind Energy as Music

Team: Brian Chi Fung Lee, Ken Ka Chun Lee, Terry Chun Yin Chan

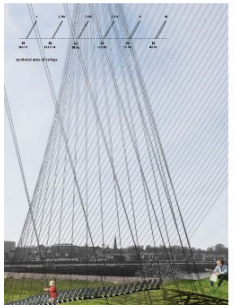
Energy Technologies: aeroelastic flutter (WindbeltTM)

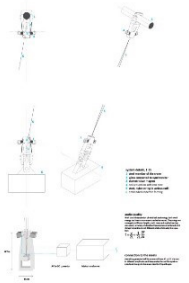
Design inspiration: gantry cranes

Design goal: becoming an icon and entertainment for the city

Author's concept description:

A stationary crane structure of 30m by 100m is then to be erected at the proposed area near the coast line, next to the water bus station. The structure, a minimal frame of light-weight steel, is a reference to the gantry cranes that used to operate in the B&W shipyard in the past life of the site.





On both sides of this crane, a total of 224 'wind strings' are attached to the structure at one end and to the ground at another. As these 'strings' become tensioned, they generate both electricity and sound through oscillation by wind or by direct human interaction, the subsequent energy is then harvested by small devices attached to the opposite ends of the string. The turbine noises usually associated with conventional wind turbines is transformed into music.

Urban wind harp

Flow

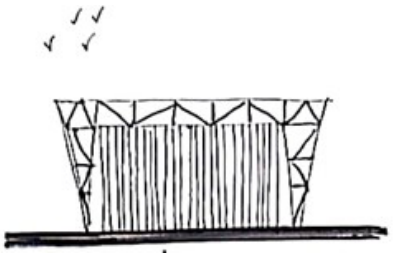
Energetic flow: wind to electricity

Social flow: playful musical urban activity

Transformation

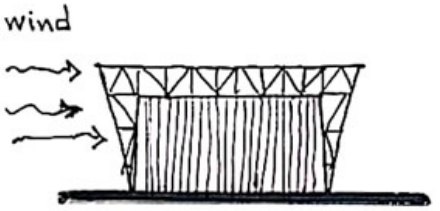
Atmospheric term: *urban wind harp*

permeable distance, technical wires, huge ropes, Eiffel Tower, sky strings, hanging gardens



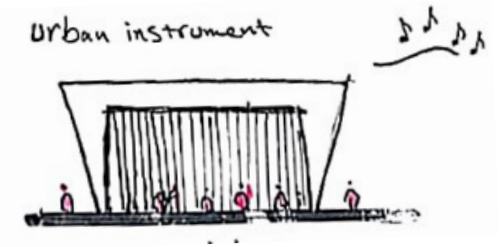
Active architecture: *resonating to the wind*

light construction, monumental character, winds in the air and plays with the wind, rigid frame, cold and industrial materials, thin threads create a woven pattern, a construction that creates music

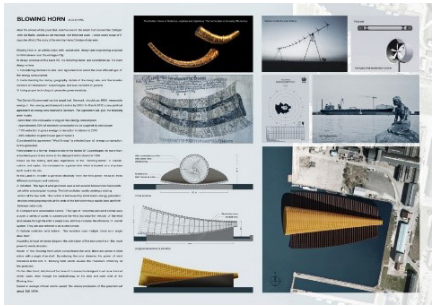


Social activity: *listening to the wind music*

walking, sound object, teach/learn, games, team sports, recreation, festival, market, fair, exhibition



Project 4.2: Blowing Horn



Artist: Hooman Tahvildar Akbary

Energy Technologies: Windbelt™, compact wind acceleration turbine, multi-rotor wind turbine

Design inspiration: historical horns

Design goal: efficient land-art that values historical artefacts

Author's concept description:

Near the shores of the great Belt, which is one of the straits that connect the Cattegat with the Baltic, stands an old mansion with thick red walls. I know every stone of it, says the Wind. (The story of the wind by Hans Christian Andersen). "Blowing Horn" is an artistic vision with sustainable design and engineering proposal in Refshaleøen near Copenhagen City. In design process of this Land Art the following items are considered as the main design criteria. 1- Considering Denmark's rules and agreements to select the most efficient type of the energy consumption. 2- Understanding the history, geography, details of the design site, and the broader contexts of Refshaleøen, Copenhagen, and also Denmark in general. 3- Using proper technology to generate green electricity.

Embedded horn

Flow

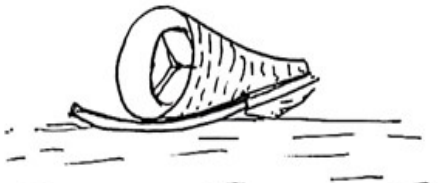
Energetic flow: wind to electricity

Social flow: listen to the transformation of nature sound

Transformation

Atmospheric term: *embedded Horn*

Fallus-form, organic, nestled up landscape, spot of colour massive, huge, formal structure, mega instrument, wind collector

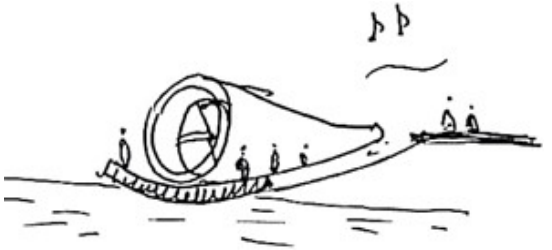


Active architecture: *raising the nature sound*

iconic form, a small object upscaled, golden glow, reflecting surface, the wind becomes music, floating above the water as entrance signal for Copenhagen

Social activity: *listen to the sound of nature*

rafting, skate park, concerts, audio experience artwork, chillout, celebration, spiritual gatherings



Project 4.3: The Sound of Denmark

Team: Laura Mesa Arango, Rafael Sanchez Herrera

Energy Technologies: compact wind acceleration turbines

Design inspiration: Vikings horns

Design goal: cherishes the danish culture

Author's concept description:

The force of the wind has pushed the development of Denmark since immemorial times. In the past, wind strength boost the Vikings to colonize new lands, now in the present wind power provides renewable-energy to Denmark. The wind is the sound of Denmark since this natural force has always state rooted to the development of the country. Then, how do Denmark sounds? This is a space for reflection and to feel the sound of the natural force that drives Denmark. It is a space for remembering the past and envisioning the future of this nation. This is a sound-landscape. In order to rescue the history and Danish culture the project is designed based on Vikings horns and ships as well as based on the Danish runic alphabet. The project consists of 4 Viking horns trios. Each one consists of 3 different sized horns allowing the project to be built in different stages according to the economic availability of the time.

Rusty horns

Flow

Energetic flow: wind to electricity

Social flow: experience standing inside a musical instrument

Transformation

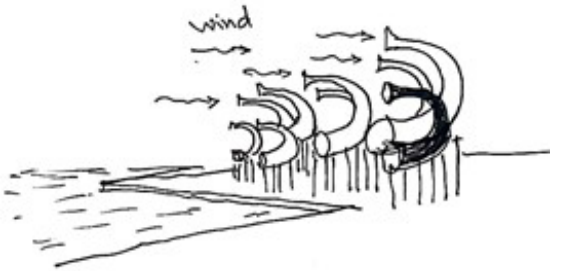
Atmospheric term: *rusty horns*

fairytale, mystical poetic, symbolic horns, the listening and receiving, industrial blow out, open ears

Active architecture: *hearing the voice of nature*

repetitive pattern, well-known object

upscaled, old industrial material, dirty character, rough design matching the rough sea, scaffolding as supporting structure



Social activity: *standing inside the horns*

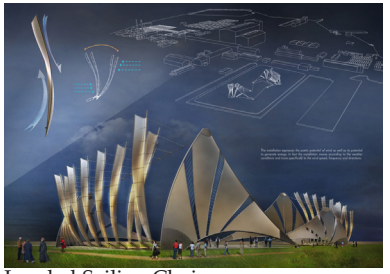
theatre, summer ateliers, festivals, slides, swings, embark on ships

Cluster 5

Lightweight Construction

The cluster lightweight construction, contains lightweight structure as the main character of the space. The atmospheric terms are: giant cage, landed sailing-chain, sailing shades, mesh sail-tower, feathery scaffold, pixeling scaffold, unfinished structure, timing sun ring.

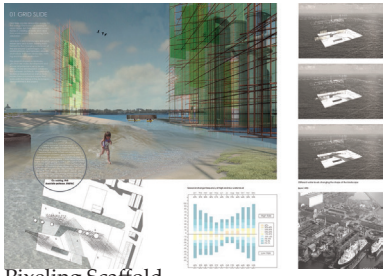
Hence, the cluster contains those atmospheres that feel like unfinished like scafolds or light or flying like a porus cage, chain or a ring.



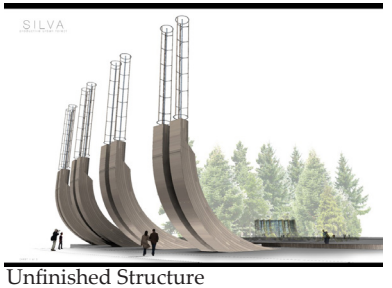
Landed Sailing Chain

Sailing Shades

Mesh Sail Tower



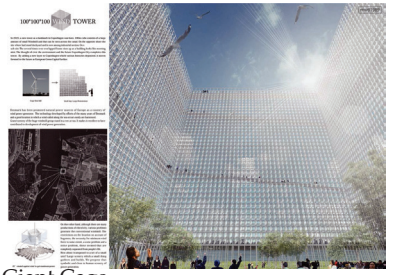
Pixeling Scaffold



Unfinished Structure

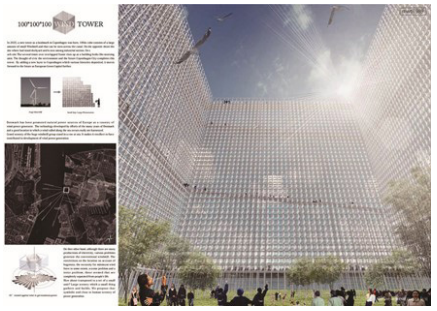
Timing Sun ring

Feathery Scaffold



Giant Cage

*Project 5.1: 100*100*100 Wind Tower*

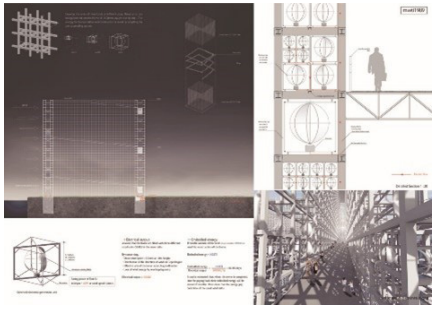


Team: Mitsuhiro Wada and Takanori Ishii

Energy Technologies: vertical axis wind turbines

Design inspiration: Denmark as Europe's wind-power-generator

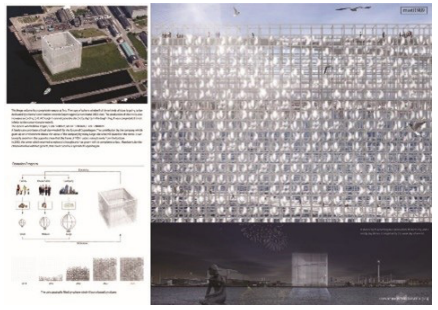
Design goal: changing the view visitors have of the city of Copenhagen



Author's concept description:

Denmark has been promoted natural power sources of Europe as a country of wind-power-generator. The technology developed by efforts of the many years of Denmark and a good location in which a wind called along the sea occurs easily are harnessed. Grand scenery of the huge windmill group stand in a row at sea. It makes it recollect to have contributed to development of wind power generation.

On thee other hand, although there are many productions of electricity, various problems generate the conventional windmill. The restrictions on the location on account of hugeness, the necessity for minimum wind force to some extent, a scene problem and a noise problem, these seemed that are completely separated from people's life. How about transposed to a set of a small unit? Large scenery which a small thing gathers and builds. We propose that symbolic and close to human scenery of power generation.



Giant cage

Flow

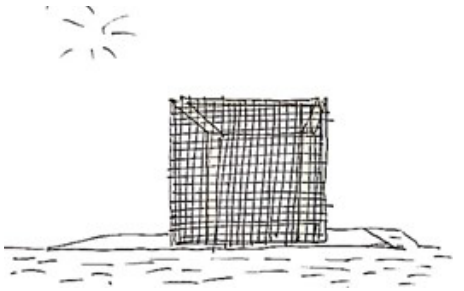
Energetic flow: wind to electricity

Social flow: ramp up through a cage wall

Transformation

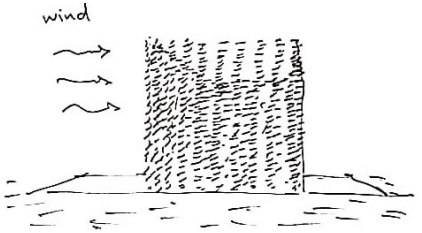
Atmospheric term: *Giant cage*

High appearance, reflective squares, protected space, angular wall, huge mosaic, roofless cubes



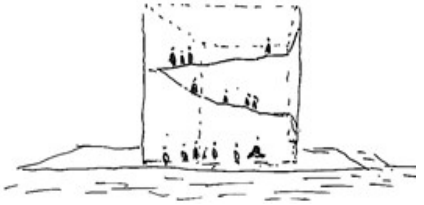
Active architecture: *rotating tiny windmills of façade*

high rising, open roof, transparent walls, focus on the sky, like a picture frame upwards, rigid and geometric form, view to the sea and the city, creating new perspectives, glitters in the light of the sun

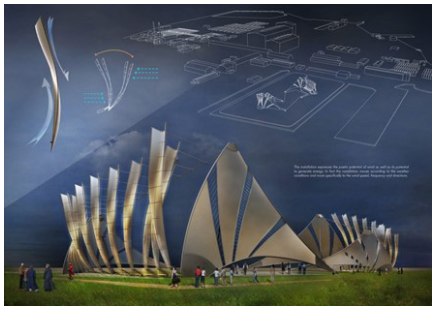


Social activity: *climbing up the spiral ramp*

sports, festival, demonstration, rallies, chillout area, concerts, movie premiere



Project 5.2: Aetherius



Artist: Marilu Valente

Energy Technologies: wind-driven hydraulic cylinder generators

Design inspiration: beauty of natural resources

Design goal: express the powerful elegance of wind and creating a multifunctional space

Author's concept description:

Aetherius expresses the poetic potential of the natural resource as well as its potential to generate energy. Indeed the intervention aims at transmitting the beauty of the natural resource through its material manifestation.

The installation moves according to the weather conditions and more specifically to the wind speed, frequency and directions. The wind direction is not always constant. Indeed, even though the prevailing wind is westerly wind, there is always a microclimate created within an urban context. The installation responds to the unpredictability of the wind. Its location was carefully studied in order to take advantage of the most frequent wind directions. Two structures are included each covering a volume of 40 meters (length) by 45 meters (width) by 30 meters (height). Their orientation is carefully chosen in order to maximise the view of the undulating façade. In fact, it takes into consideration the fact that most visitors would enter the site from its east or south side.

Landed Sailing-chain

Flow

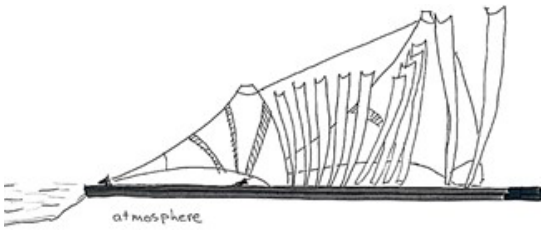
Energetic flow: wind to electricity

Social flow: walk to sailing

Transformation

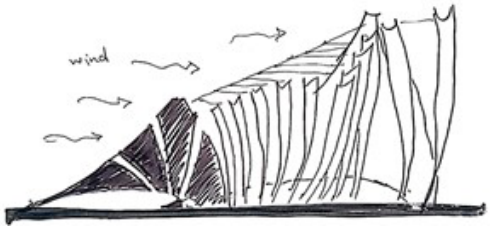
Atmospheric term: *Landed Sailing-chain*

Modern skeleton, organic space, dynamic motion, nature harmony, pleasant extraordinary, fanciful future, lightness flying, soil fin, empty whale



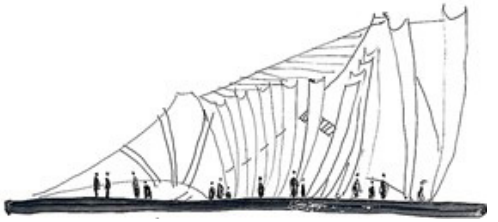
Active architecture: *flowing sailing animals*

disintegrating sails, curved shapes reaching into the sky, light construction, structures form a space, warm colors, a soft barrier

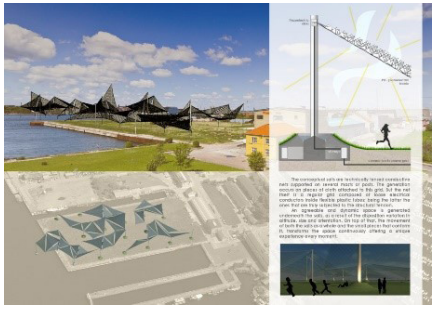


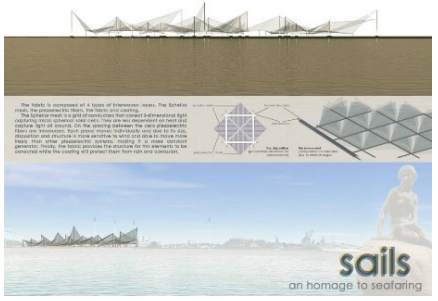
Social activity: *gathering for occasions*

Sun bath, rest in shade, separating space, workshops, community gathering, exhibition



Project 5.3: An homage to seafaring





Artist: Laura Ruiz

Energy Technologies: Sphelar® photovoltaic, piezoelectric

Design inspiration: the culture of seafaring

Design goal: creating a space for unique experiences and the celebration of Danish culture

Author's concept description:

Sun, wind and sea. These are the constant companions of the seafarer. Whether it was centuries ago o right now at this moment the sailor always knows he will encounter them on his voyage; he counts on them. And in Copenhagen, so should we. It was the importance of seafaring for Denmark and Copenhagen throughout history what inspired the shared remembrance of sails playing on the wind. Understanding the full significance of the vision; the transformation of natural power into energy without harming his environment. A basic idea, but often forgotten. The conceptual sails are technically tensed conductive nets supported on several masts or posts. The generation occurs on pieces of cloth attached to this grid. But the net itself is a regular grid composed of loose electrical conductors inside flexible plastic tubes; being the latter the ones that are truly subjected to the structural tension. The generation occurs on square pieces of fabric (size of 1x1m.) that are attached to the net on its diagonal. This disposition is chosen in order to optimize the recollection through the conductive net while allowing maximum movement.

Sailing shades

Flow

Energetic flow: wind to electricity

Social flow: water activities

Transformation

Atmospheric term: *sailing shades*

Spider net, filigree permeable, tent canopy, funny tips, zigzag awaking, invigorating shades, land water connection, lines of life

Active architecture: *connecting the sea to sun and wind*

Fishing nets above the heads, reaching out to sea, transparent and light construction, irregular angular shapes, covering large areas

Social activity: *passing through the sailing shades*

sun roof party, festivals, slides, rest in shade, walk out

Project 5.4: Sail

Team: Andrew Jepson-Sullivan, Grayson Morris

Energy Technologies: aeroelastic flutter (Windbelt™)

Design inspiration: ship sail

Design goal: iconic contrast to the energy consuming history of the site

Author's concept description"

Refshaleøen historically provided a space for industrial processes forced to the urban periphery, specifically the energy-intensive process of shipbuilding. SAIL is juxtaposed against this industrial past, a graceful and iconic art installation that generates utility-scale power rather than consuming it. SAIL projects prominently from the west corner of the former shipyard into the prevailing wind, providing an elegant symbol of clean energy for the city of Copenhagen. The form recalls the shipbuilding past of the harbor, transforming fluidly from the rigid cup of a ship hull to the gracefully unfurled surface of an open sail. A curled base results in limited ground-level impact, while the open face at the crest maximizes surface area. This results in maximized energy collection from the wind through the use of Windbelt technology.

Mesh sail tower

Flow

Energetic flow: wind to electricity

Social flow: shifting to gathering at a landmark

Transformation

Atmospheric term: *mesh sail-tower*

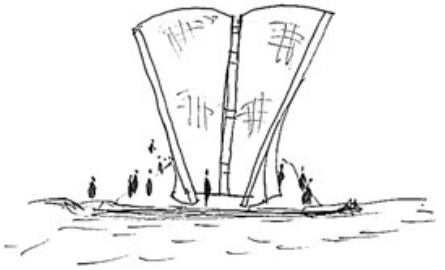
football goal, beautiful night, two wings, night. fairytale net, windy night sails, light harbor

Active architecture: *transmitting the source of wind*

towering high, monumental and sculptural character, transparent materials, strong expressiveness, glowing in the night, sterile form that does not allow interaction

Social activity: *entering the wind at the apex of the tower*

sculpture art exhibition, performance stage (theatre, opera), landmark at the lake, sailing



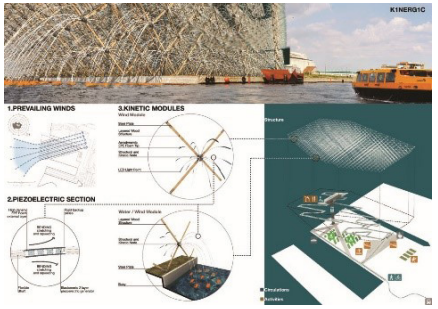
Project 5.5: KINERGIC

Team: Hector Paredes Gutierrez, Jorge Arias Olaiz

Energy Technologies: piezoelectric toroids

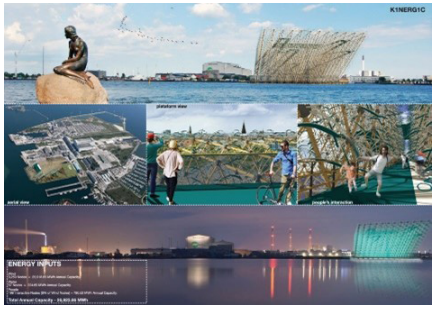
Design inspiration: natural forces of the site

Design goal: enhancing the interaction between people and the environment



Author's concept description:

The KINERGIC proposal is conceived after an effort to understand the main natural forces that are present in the site; wind, water and people. It has everything to be with motion, an energy that is found everywhere in nature, even in our own bodies. Inspiration came from the wind with its great strength and unpredictable temperament, water with its constant and tireless motion, and us humans, always prone to changing our surroundings and ourselves in other to achieve greater goals.



Inviting people to interact with the KINERGIC structure, "playing" with the filaments, walking up and down, transforming motion into electricity the same way that wind and water do, is one of the most important missions of the project. People mutates from mere consumers to the producers of the energy they will use latter. This action invites the user create a conscience that there is a better way to inhabit our environment and use the available resources in a more responsible way.

feathery scaffold

Flow

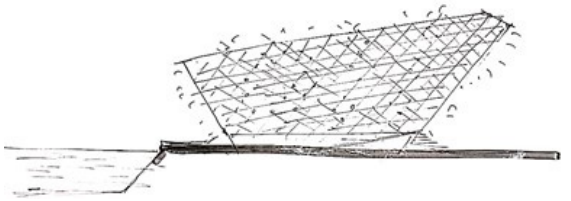
Energetic flow: wind to electricity

Social flow: water activities

Transformation

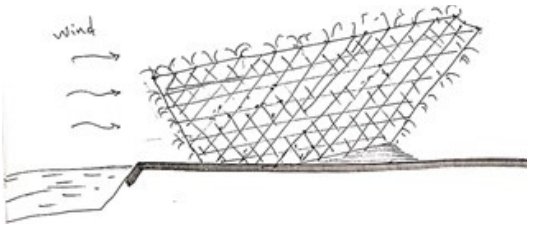
Atmospheric term: *feathery scaffold*

dynamic grid, moving knots, physical interaction, cryptic spirituality, mysterious connections, filigree system, versatility view, steep organism, airy way



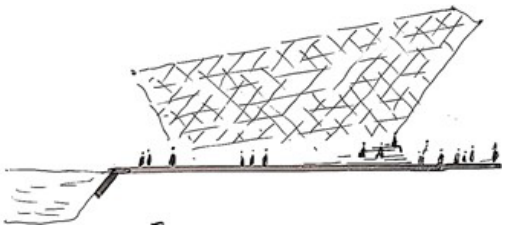
Active architecture: *exposing a massive volume*

complex but light construction, natural materials, compacted rods that make the structure almost opaque, vibrating optics, lets you wander high up and create new perspectives, many small parts form a large body

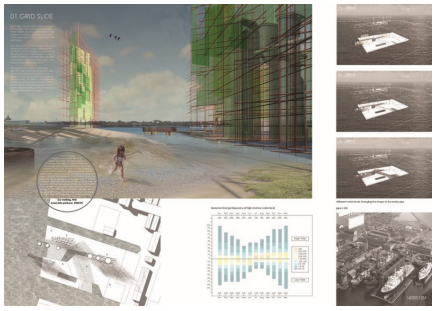


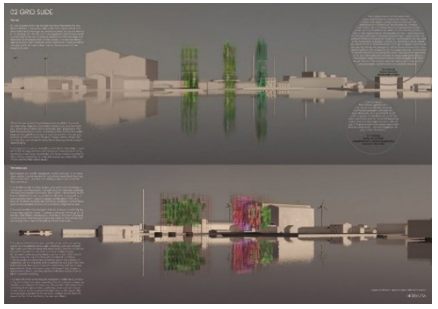
Social activity: *interacting with the scaffold*

excursion destination, physical experiments, playground, jump into water, art exhibition



Poject 5.6: GRID Slide





Team: Morten Rask Madsen, Julie Trier Brøgger, Julie Rindung, Natalia Guerrero Gutiérrez, Artis Kurps, Kevin Bailey, Søren Laurentius Nielsen, Per Møller, Jesper Ahrenfeldt, Tobias Thomsen

Energy Technologies: algae biofuel

Design inspiration: the tides

Design goal: a recreational area which balances production and consumption

Author's concept description:

GRID Slide creates renewable-energy for the energy Grid based on farming of micro algae. But Grid Slides real potential lies in creating diversity and value from waste products by returning it into cirkulation. But Grid Slide is also a landscape sliding between land and ocean, beeing transformed by the changing waterlevels of the sea around Copenhagen. A recreational landscape between urbanity and nature, between landscape, farming and industrial production. This project is based on technologies that are under development and whose full potential is yet to be explored. It was developed in collaboration between architects, designers and technical researchers as well as technicians from a municipal supply that works with the testing of actual algae and gasification plants.

Pixeling scaffold

Flow

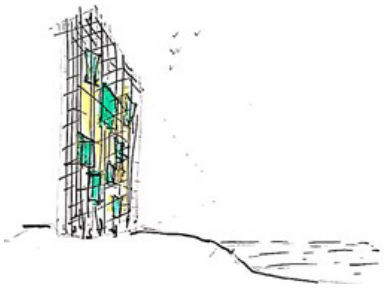
Energetic flow: algae biofuel

Social flow: climbing and water activities

Transformation

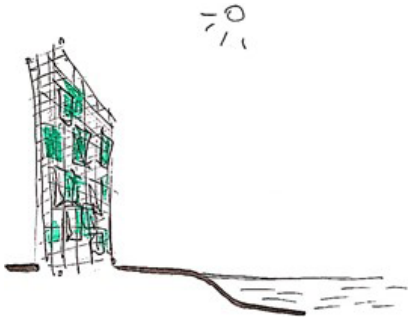
Atmospheric term: *Pixeling scaffold*

pretty grid, colorful color wall, positive mind, led future, huge show, light boxes



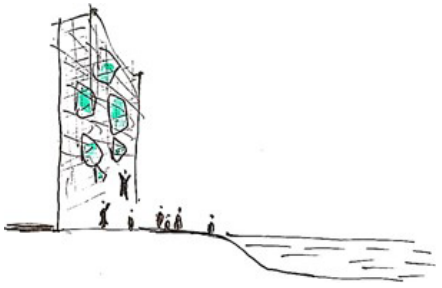
Active architecture: *holding the pixelated panels*

vertical dominant structures, industrial framework is filled with living material, transparent and translucent, play with complementary colors, thin walls, play with light

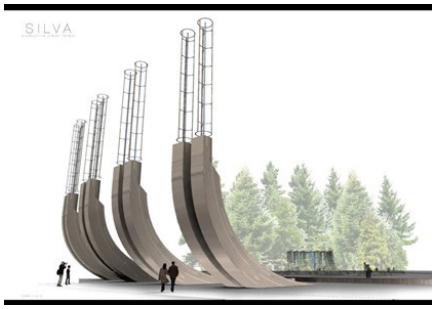


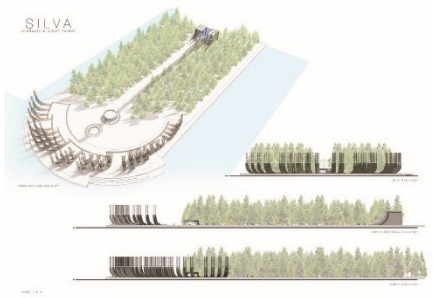
Social activity: *going to the water and climbing the green towers*

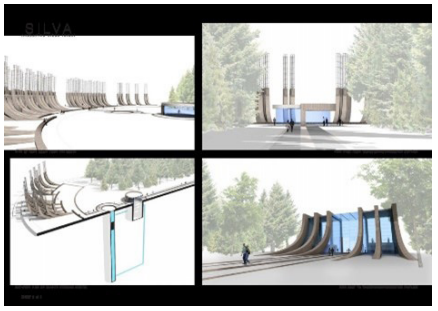
ship navigation, light wall., theatre, events, beach, sun buth, climbing / bouldering, movie premiere



Project 5.7: 62-SILVA







Artist: Clynt Ringrose

Energy Technologies: vertical axis wind turbines, Gravity Power™ storage

Design inspiration: the industrial and nautical history of the site

Design goal: illustrate the sustainable use of resources

Author's concept description:

SILVA is a sustainable art/energy project that is as much about the unbuilt as it is of the built. Its defining features communicate a narrative of environmentally sensitive development centred on the sustainable management and use of forest resources.

As a biodegradable and renewable resource, high performance structural timber laminates, act as the predominant material employed throughout the site. With a bold aesthetic that references the site's industrial and nautical history, timber provides both a structural and sculptural presence.

As a counterpoint to the constructed timber elements, a large portion of the project site is to be transformed into a productive urban forest. This creates a dialogue between the resource in its virgin state and its use as a sustainable building resource. While enhancing urban ecological values the forest would also be open for recreation and educational use challenging visitors notions of sustainable resource use.

Unfinished structure

Flow

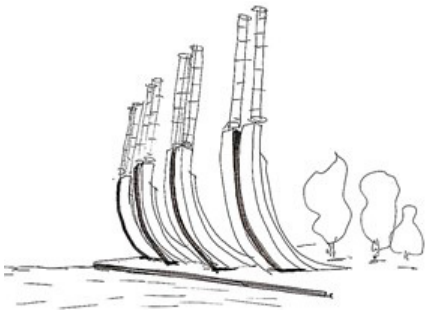
Energetic flow: wind to electricity

Social flow: walking through the ruins

Transformation

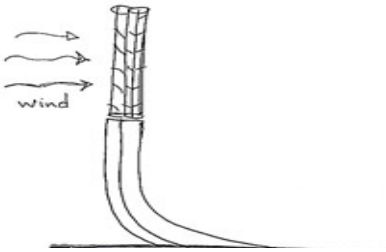
Atmospheric term: *Unfinished Structure*

architectural haven, peaceful looks, stone circles, nature security, cool horns, trees transition, steep parts



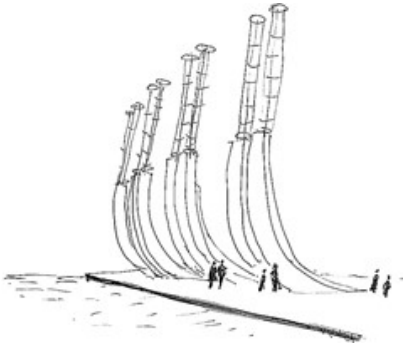
Active architecture: *growing columns*

high towering structures, repetitive patterns, natural and industrial materials in combination, unfinished design, sculptural effect, like an open barrier between sea and land, protective character



Social activity: *see and educate the urban forest ecology*

spiritual gatherings, shamanic rituals, transition from nature, opening up to nature, play, oriental run, slide, jump into water, music experiments, concert



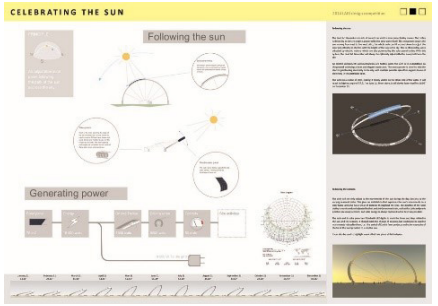
Project 5.8: Celebrating the Sun

Team: Sturla Sandsdalen, Knut Helge Teppan

Energy Technologies: heliostatic photovoltaic panels

Design inspiration: the sun

Design goal: strengthen the appreciation of the sun



Author's concept description:

We want to build an object that connects us to the sun.

The sun is the origin of all life and energy on our planet. It has spawned myths, awe and wonder throughout history, and defines every day and every year of every person on our planet. We need to celebrate the sun, and its importance for our daily lives, by bringing and following its movements down to earth whilst harvesting the energy it provides.

The Land Art Generator follows the sun, and adjusts to every movement to capture energy as efficiently as possible. It adjusts to nature rather than taming it, humbly and with respect. The concept celebrates the sun, and expresses and reflects the suns movements during the day and throughout the year.

Visitors can experience the slow movements and changing geometry of the Land Art Generator, with slow changes during the day and subtle adjustments during the year. An almost meditative notion is achieved, where the installation slowly adjusts to the way the sun moves across the sky. Nearly all renewable-energy comes directly or indirectly from the sun.

Timing sun ring

Flow

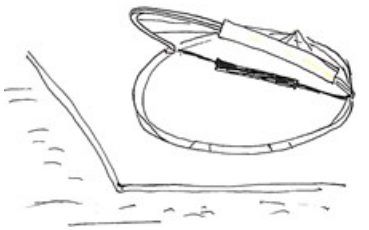
Energetic flow: solar to electricity

Social flow: scientific experience of sun movement

Transformation

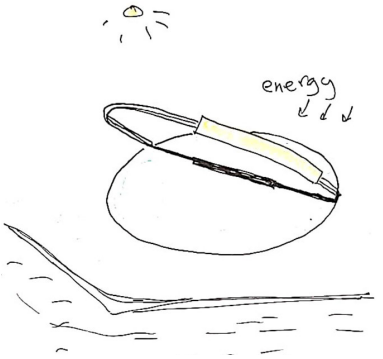
Atmospheric term: *timing sun-ring*

ferris wheel, spring festival, unobtrusive future, effecitive elegance, funny eclipse, open soil, sun celebration,



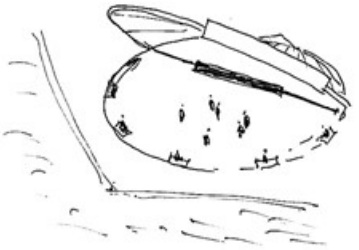
Active architecture: *adjusting to the sun light*

the round shape that reflects perfection, slim construction, elegant effect, little interaction with the land, much interaction with the sun, moving sculpture



Social activity: *visit the constant change of the nature*

community gardening, sunbathing, team sports, concerts, ball games, skate park, art exhibition



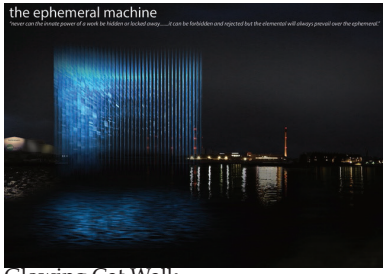
Cluster 6

Illuminated Architecture

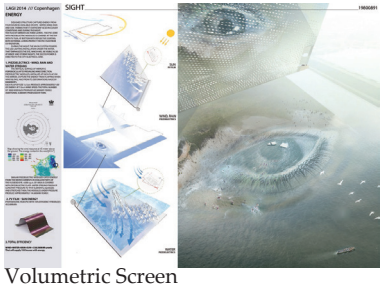
The terms of atmospheres in illuminated architecture have characteristics of glowing as their main character.

Namely they are: crystal curtain, wind screen, glowing cat walk volumetric screen.

The cluster contains screens, catwalk stage and crystal curtain that are charachteristics belong to the illuminated architecture.



Glowing Cat Walk



Volumetric Screen

Wind Screen

Crystal Curtain

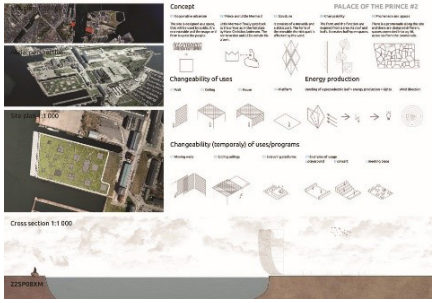
Project 6.1: Palace of the Prince

Artist: Jakub Med

Energy Technologies: elastomeric piezoelectric toroids, wind-catching sails (leaves)

Design inspiration: fairytale 'The Little Mermaid'

Design goal: creating a place that adapts to the needs of the citizens



Author's concept description:

Well known statue of Little Mermaid finally gets an opposite - a palace of the prince - on the other bank of the gulf. Her fate will be no more so sad, she will be once for more close to her prince as in the Hans Christian Andersens fairytale. There are already some signs of participation and public interventions on the place – garden beds, volleyball playground. Goal of the design is to create a transient public space for people. Content will be changeable and dependent on the public needs and ideas.

This designed system is scalable and free-changeable. It can be used safely anywhere in the public space and create an amount of clean energy to provide funcionability of the space (lights...). Electricity must no more be out of the city, it can be right in the public space and it can produce energy for the public space activities.

Crystal curtain

Flow

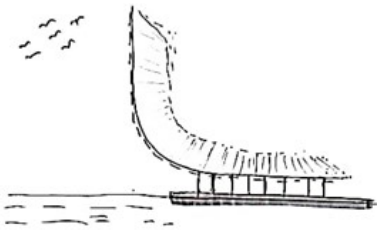
Energetic flow: wind to electricity

Social flow: gathering under the shelter

Transformation

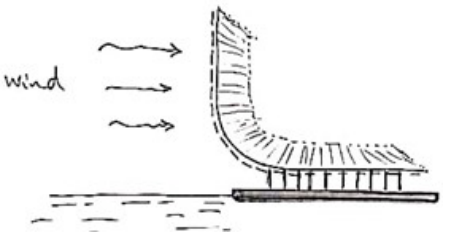
Atmospheric term: *Crystal Curtain*

curved flag, aristocratic wall, princely strings, unfinished sculpture, sky water wall, steep entrance



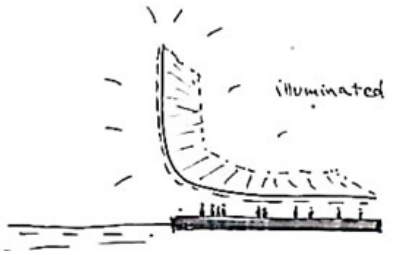
Active architecture: *blowing crystal curtain*

wall that grows from the earth into the sky, transparent construction, barrier against the sea, woven structure, background for the little mermaid, roof for the visitors



Social activity: *see a different background for the Little Mermaid*

avenue for walks, processions, celebration, exhibition, movie premiere, community painting



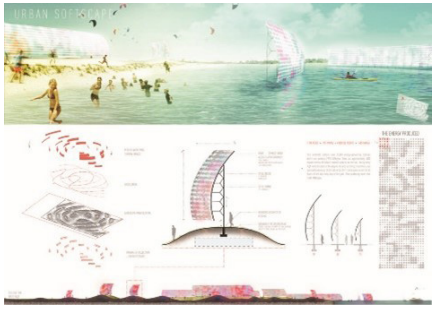
Project 6.2: Pixelated Wind

Team: Ryan Helle, Delaney Rockwell, Marcus Farr

Energy Technologies: small compact acceleration wind turbines (CWAT)

Design inspiration: the power of wind

Design goal: creating a mysterious experience



Author's concept description:

One of Copenhagen's most valuable assets just happens to be invisible; wind. PIXELATED WIND strives to ignite the creative human energies by showcasing the powerful invisible force that powers the city. Situated on a site that overlooks rich Danish culture and surrounded within a changing fabric of Copenhagen's industry, Refshaleoen conveys the ideal convergence of a unique urban fabric. This site presents itself as a flat canvas, ideal for an art form that converges earth and sky.

Beginning with landform manipulations, a series of mounds ripple from the center of the site, flowing into Copenhagen's harbor. Placed on top of the mounds in specific directions to harvest the most wind possible, are the windscreens. The screens are a surface of pixelations created by small, circular wind turbines. The turbines can collectively manipulate wind to produce energy, and at the same time allow for a memorable and unique interaction through imbedded LED lights that change color based on wind speed.

Wind screen

Flow

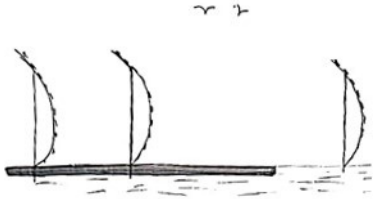
Energetic flow: wind to electricity

Social flow: experience of a wind screen indicator

Transformation

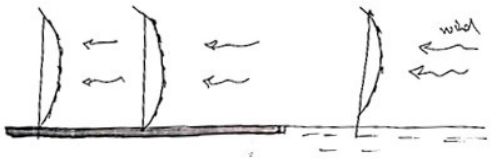
Atmospheric term: *wind Screen*

Colourful life, positive wall, enthusiastic projection, digital effects, pixeled us, wrapped lights, color dots



Active architecture: *reacting by color*

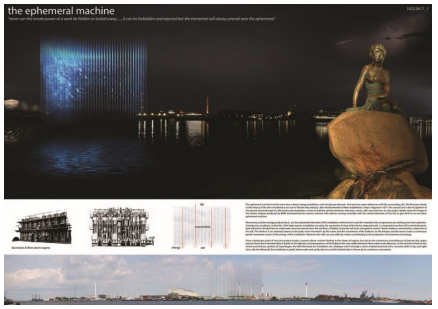
vivid and colorful design, combination of technology and curved forms, luminous surface, room forming labyrinth, high rising walls, hypnotizing pulsation of light and colors walls

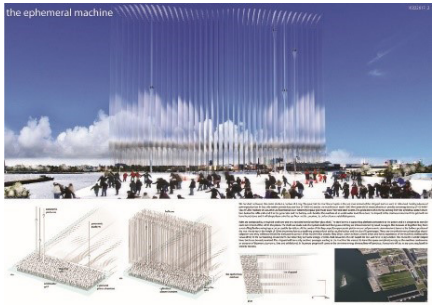


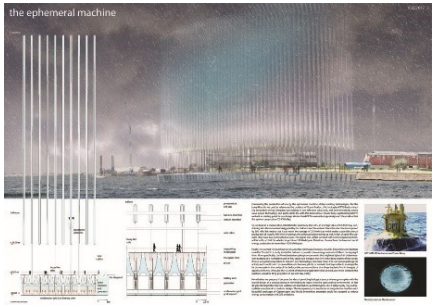
Social activity: see the color of everchanging wind force

advertising wall, dance floor, festivals, trade fair, emmergancy meeting point, teach / learn, information exchange, art competition, concerts

Project 6.3: The Ephemeral Machine







Team: Alfio Faro, Denise Leclerc

Energy Technologies: thin film photovoltaic (balloons), APB 350 (Autonomous Power Buoy® by OPT)

Design inspiration: history and harbor landscape

Design goal: integrate the structure seamlessly into the landscape

Author's concept description:

The ephemeral machine is at the same time a dense energy installation, and a landscape element that sets two major references with the surrounding site. The first pays tribute to the history of the site considered as an icon of Danish ship industry after that Burmeister & Wain established a major shipyard in 1871. The second one is the recognition of the present day landscape of a flat harbor punctuated by a series of marking vertical elements: chimneys, cranes, silos and antennas. So, the project ideally mixes the image of the steams engines produced by B&W (characterized by massive volumes with pistons moving vertically) with the vertical elements of the site to give birth to an evocative ephemeral machine.

So the breezes and the waves create a continuous gentle movement source of the energy of the installation. Moreover the rafts are accessible by visitors contributing to the production of movement and energy.

Glowing cat walk

Flow

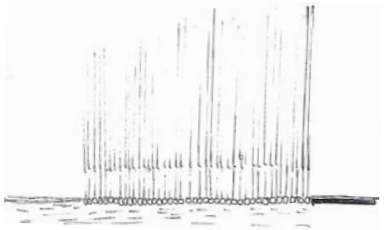
Energetic flow: wind, wave and solar to electricity

Social flow: experience of cat walk

Transformation

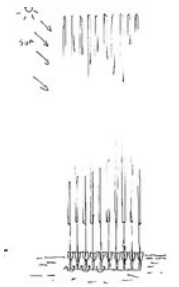
Atmospheric term: *glowing catwalk*

Mystical screen, magic wall, reflective water sticks, poetic drops, calming view



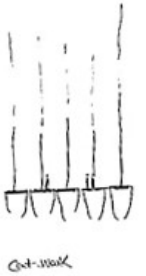
Active architecture: *blurring the sky*

huge cubic basic form, transparent and at the same time luminous, monumental character, reflection of sky and sea, practically invisible, like falling rain

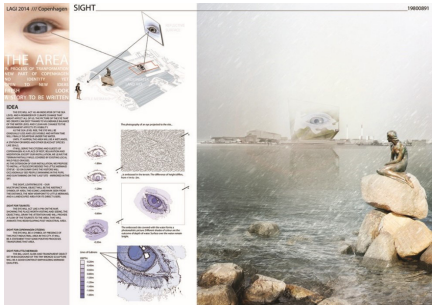


Social activity: *watching the blurred clouds*

Lighting art, outdoor party, mood wall, discotheque, theatre performance, exhibition



Project 6.4: Sight

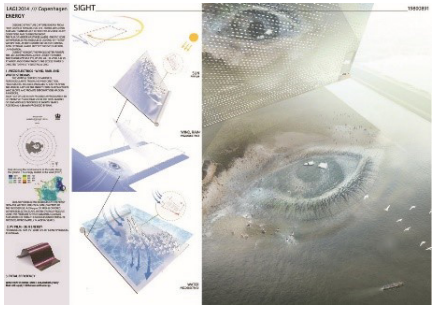


Team: Michal Pajakiewicz, Magdalena Rolka

Energy Technologies: piezoelectric generators, photovoltaic thin film

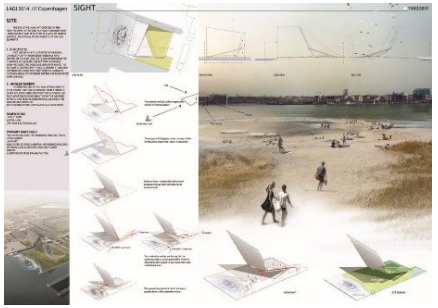
Design inspiration: the human eye

Design goal: gaining another perspective on the site



Author's concept description

The eye will act as an indicator of the sea level and a reminder of climate change that might affect all of us. the picture of the eye that we create can exist thanks to vulnerable balance of the water level and clean air. change to the environment affects its visibility. as the sea level rise, the eye will be gradually less and less visible and within time will finally disappear under the water. until it happen, the area will be a wetlands, a station for birds and other seacoast species like seals. it will serve the citizens and guests of Copenhagen as a place of rest, relaxation and meditation. except our installation, we leave the terrain partially wild, covered by existing local wild field grasses. as the extension of our installation, we propose to install a telescope besides the little mermaid statue - so on sunny days the visitors will occasionally see people swimming in the pupil and sun tanning on the "lagi" site - mirrored in the sky.



Volumetric screen

Flow

Energetic flow: solar to electricity

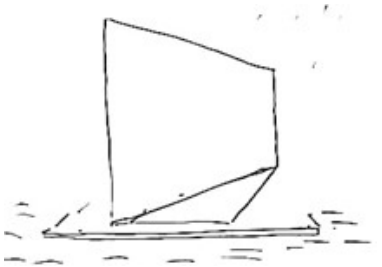
Social flow: experience of wall screen of a cultural building

Transformation

Atmospheric term: *Volumetric Screen*

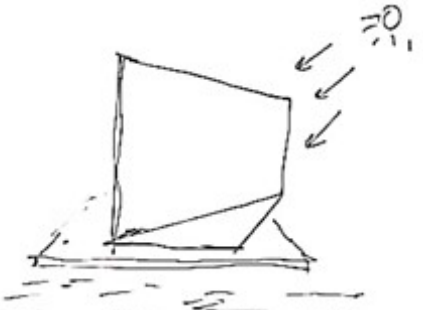
reflected eye, observed control

energy binding, uncanny look, trojan horse, stone view, water connection, the look



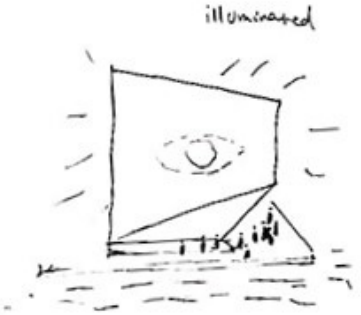
Active architecture: *communicating screen eye*

reflective surface, projection of images, geometric square and closed body, connection to the sun and water, reflecting surfaces make the sculpture practically invisible, cold materials



Social activity: *pay attention to the message of the building*

beach activities, sport, swimming, art installation, concert, sunbathing



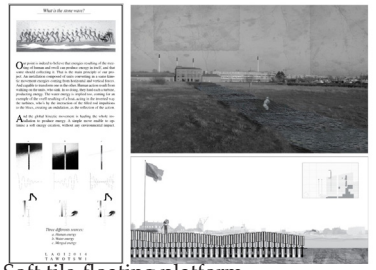
Cluster 7

Endless Maze

The atmospheric terms in this cluster, are: massive sheet-pile, mysterious maze, green ziggurat, soft tile-floating platform.

In this cluster the space is designed to be explored by flowing in the path.

The spaces remind a maze to get lost and be found. It brings the sense of contemplation to the social floe walking through the roads.



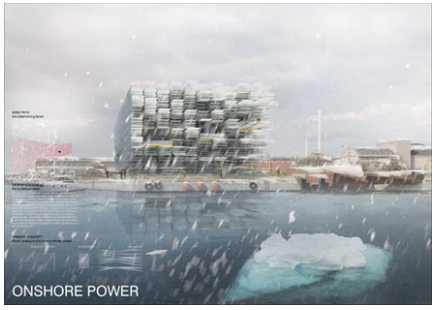
Soft tile-floating platform

Mysterious maze

Green ziggurat

Massive sheet-pile

Project 7.1: Onshore Power



Team: Han Bao and Feng Xu

Energy Technologies: wind-driven hydraulic cylinder generators

Design inspiration: minimalistic but effective changes

Design goal: Normalize water vehicles as transport system

Author's concept description:

It is the finest designs that change people's lives, and it is the smallest changes that lead us to challenge our every day perspectives. Onshore Power is situated at the interface between energy producing infrastructures and human use and program. It achieves this through an integration of ecological flows, ie. wind and water with anthropogenic needs of energy production and mobility.

Ships are the key intermediary that connects both human and energy and coalesces the design to reflect the quintessential intents of the landscape design – picturesque, problem-solving and infrastructural. Onshore Power creates possibilities for the foreseeable future, and it raises the questions: who we are and what we are connecting with.

Onshore Power is at once a generator, a recharger for boats, a dock and a destination. It is made up of layers of flexible plates aligned to the course of the wind, with walkways and lookout points traced through its insides. As wind blows across the structures, the movement generated in the plates creates energy that is converted and stored in the micro-tubes that scaffolds the structure.

Massive sheet pile

Flow

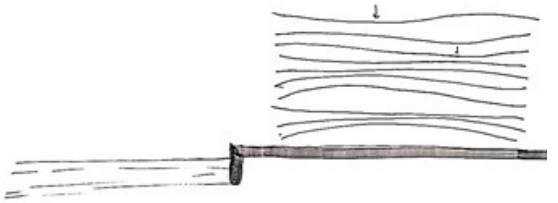
Energetic flow: wind to electricity

Social flow: water activities

Transformation

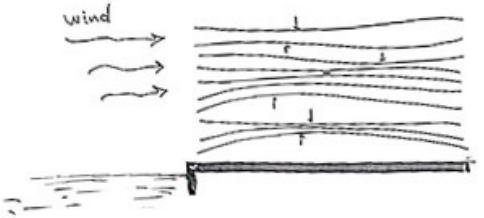
Atmospheric term: *shaking waterfall*

rain, crystal palace, giant stairs, dangerous needles, acupuncture, huge show, big audience, travelling, bright stairs/needles, lighthouse, hanging vertical louver, waterfall from the sky



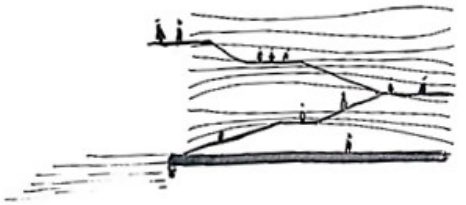
Active architecture: *shaking by the wind*

reflection effect, moving landmark, repetition of a form, transparency of material, suspended structure, cubic abstract of the complete shape



Social activity: *entertaining under waterfall*

jumping, climbing, light, travelling, theater, music, flying fox



Project 7.2: Quiver

LAGI 2014 2nd Place Winner

Team: Mateusz Góra, Agata Gryszkiewicz

Energy Technologies: biofuel, aeroelastic flutter (WindbeltTM)

Design inspiration: a lush garden

Design goal: creating an adventurous experience

Author's concept description:

Wall of greenery, with a gap in the middle suggest the way "into the wild". We are entering the garden without knowing what we will experience upon the road. Only sure thing, what we can see and what draw our attention at the first time, is our aim. Monolithic, ephemeral tower, shining on the horizon. During the way through the field we discover that this high mass of greenery is not only an obstacle on the road. It creates spatial experience with variety of niches, corridors and chambers. Getting closer to the tower we can notice that it quiver on the wind along with surface of the field. Leaving the garden we are entering under the elevated tower into the wooden square with forest-like structure. In front of us, framed panoramic view of Copenhagen and above mass that pulsate, filter the sun and sky.

Mysterious maze

Flow

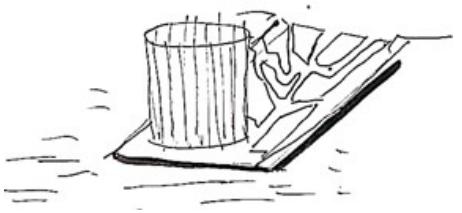
Energetic flow: wind and biomass to electricity

Social flow: walk through a labyrinth

Transformation

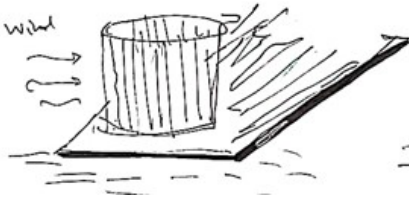
Atmospheric term: *mysterious maze*

amazing maze, airy labyrinth, fluffy feeling, organicfield, baroque egg, full bales of straw, artistically balls



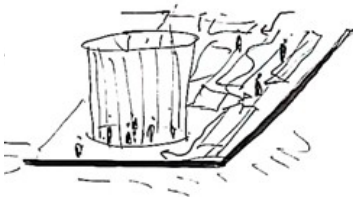
Active architecture: *spreading an ever-changing maze*

Mutant architecture, Catching the wind on the façade, Solid and Void, Soft and hard, Standing and laying architecture, Artificial and natural, Urban garden

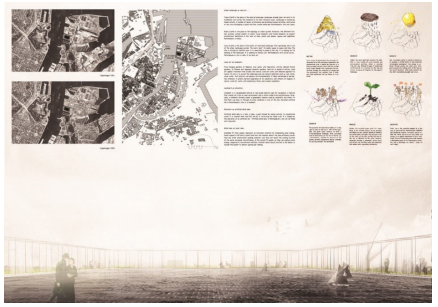


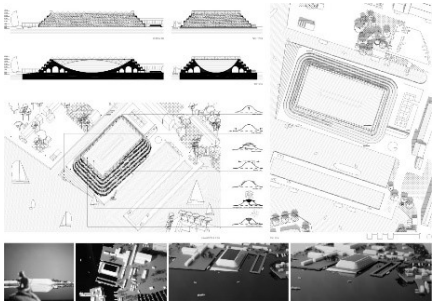
Social activity: *discovering the path*

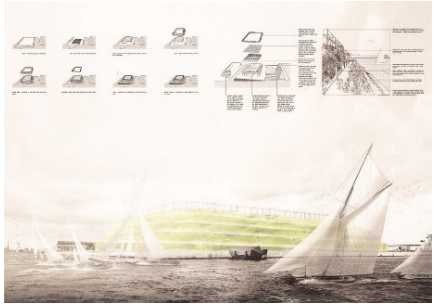
Thinking and contemplation, go curious, getting lost, step through and embracing the challenges, Finding the path, drown in nature, feeling the scale of the nature, Promenade along the lake, Resting place, refueling, taking a break, wandering into the distance, feeling for nature, space to recharge your batteries



Project 7.3: Landmark







Team: Michal Marcinov, Michaela Kesanova, Marek Kremen

Design inspiration: lack of identity of the site

Design goal: giving the site a meaning in the city

Author's concept description:

Topos (Latin) is the place in the natural landscape. Landscape already does not exist in its fundament, but carries the footprint of its most intensive users. Landscape is marked by human activity. A number of layers of intensive and extensive human activities, which more or less are overlapping in space and time, create landscape. Refshaleøen's site was Topos. Nodus (Latin) is the place in the topology of urban system. Moreover, the different formal systems contain implicit or latent visual elements and formal elements as explicit architectonic definitions in the form of lines, points and planes, spaces and sightlines. Refshaleøen is Nodus. Locus (Latin) is the place in the matrix of cultivated landscape. The Lagi design site is out of the urban landscape system. "No man's land." An empty space in space and time. The site is missing its faithful user. It is searching its place in the city. It is looking for its meaning in the landscape. It is seeking its Genius Loci. Refshaleøen's site will be Locus.

Green ziggurat

Flow

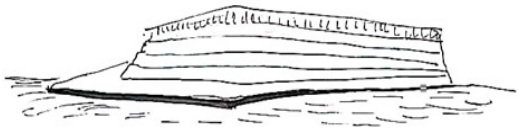
Energetic flow: solar to electricity, water storage

Social flow: ramp up a panoramic hill

Transformation

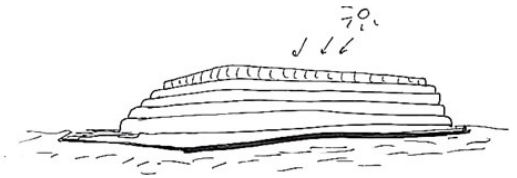
Atmospheric term: *green ziggurat*

quiet oasis, peaceful holidays, scent of light, deep heartedness, old times, permeable balustrade park, island lake, weekend space



Active architecture: *standing still and solid*

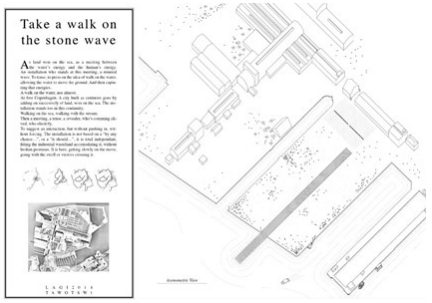
terraced mountain, overgrown walls, create new perspectives on the city and the sea, massive appearance, shape as a reference to surrounding buildings, a raised piece of sea, from the outside a building from the inside a water bowl



Social activity: *climb up to the top*

recreation area, sports events, swimming, performance, huge concerts

Project 7.4: Stone Wave

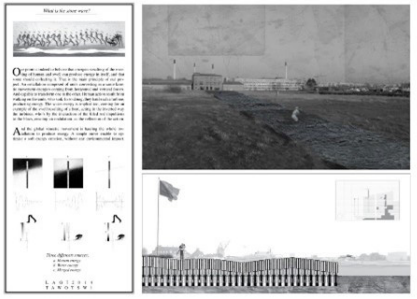


Team: Michal Pajakiewicz, Magdalena Rolka

Energy Technologies: piezoelectric generators, photovoltaic thin film

Design inspiration: energy of humans and waves

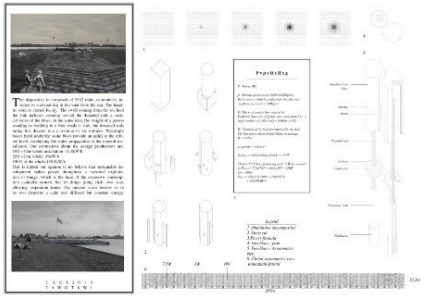
Design goal: evoke an interaction between humans and the water movement



Author's concept description:

Our point is indeed to believe that energies resulting of the meeting of human and swell can produce energy in itself, and that some should collecting it. That is the main principle of our project. An installation composed of units converting in a same kinetic movement energies coming from horizontal and vertical forces. And capable to transform one in the other. Human action result from walking on the units, who sink. In so doing, they haul each a turbine, producting energy. The water energy is implied too, coming for an exemple of the swell resulting of a boat, acting in the inverted way the turbines, who's by the interaction of the filled rod impultions to the blocs, creating an ondulation, as the reflection of the action.

And the global kinectic movement is hauling the whole installation to produce energy. A simple move enable to optimise a soft energy creation, without any environmental impact.



Soft tile floating platform

Flow

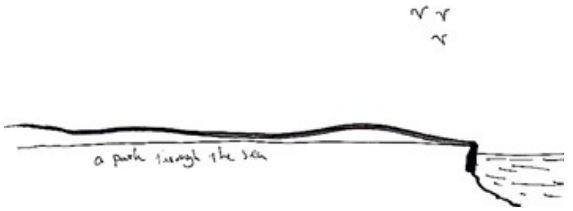
Energetic flow: solar to electricity, water storage

Social flow: move through a flexible platform

Transformation

Atmospheric term: *soft tile-floating platform*

run forest, run! , childish stairs, try you, artistic athletics, wave stairs, pleasurable fun, simple kids



Active architecture: *transforming the sea to the land*

flat but moving surface, follows the flow and movement of the sea, pulsating floor, floating above the water, no optical reference point within the structure

Social activity: *stepping on the soft platform*

playground, obstacle cours, marches, run

Cluster 8

Futuristic Exhibition

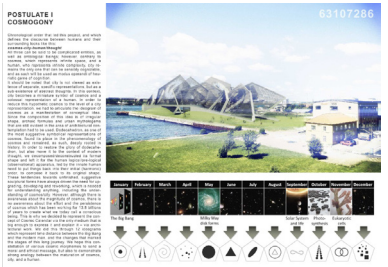
In this cluster the atmospheric terms are elaborated in advenced technological presentation.

These atmospheric terms are: futuristic gallery, futuristic museum

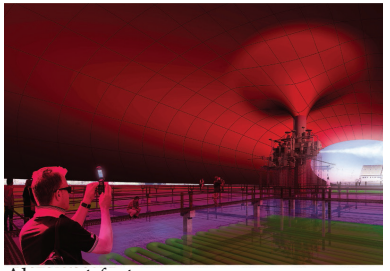
algae art-factory, balancing-sculptur park, floating duck sculpture

digital robots.

This cluster's terms seem to be more aligned to the latest technology by essence of the words like futuristic, factory, digital robot and floating sculture. Also they appear as exhebition, museum and, etc.



Futuristic museum


Algae art-factory

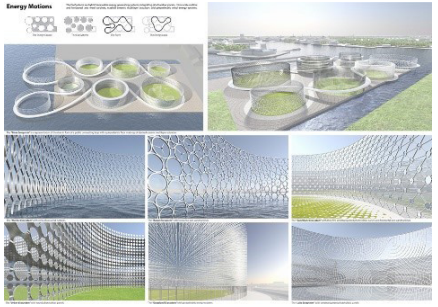

Balancing-sculptur park

Digital robots

Floating duck sculpture

Futuristic gallery

Project 8.1: eMotions: Energy Motions and Art Emotions



LAGI 2014 3rd Place Winner

Team: Antonio Maccà, Flavio Masi

Energy Technologies: photovoltaic panels, micro-scale vertical axis wind turbines (VAWT) and horizontal axis wind turbines (HAWT), stacked ceramic multilayer actuators, piezoelectric wind energy systems

Design inspiration: nature of Denmark

Design goal: to evoke artistic emotions and motions of nature

Author's concept description

eMotions is an energy-generating artwork: a symbolic representation of the Nature of Denmark, harnessing energy from the natural environment and converting it into electricity for the European Green Capital of 2014 – the city of Copenhagen. The project showcases different artistic interpretations of the different danish ecosystems, each varying in materials, energy technologies, dimensions and textures, so as to display Denmark's biodiversity – and to ideally engage different communities of the city. The cylindrical volumes are renewable-energy-generators: positioned so as to remind the geography of the islands of Denmark, they propose different artistic representations of natural phenomena, conveying the particular identity and activity peculiar to the different ecosystems. The artwork is also meant to evoke the image of a big Generator: its viewing loop representing the generator's "belt" – as well as the infinite production of clean energy of the micro-scale generators. The variety and beauty of Denmark engages us in constantly changing emotional experiences, thus stimulating our imagination in relation to the different atmospheres of the EcoSystems.

Futuristic gallery

Flow

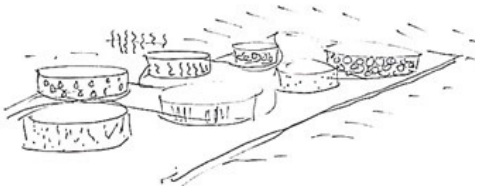
Energetic flow: wind and solar to electricity

Social flow: move through a modern energy exhibition

Transformation

Atmospheric term: futuristic gallery

Hollow gallery, cutting-edge technology museum, Elegant reflecting rooms, filigree ellipses, permeability knitting work, water and land combination, closed yet open, fine fabric poetry

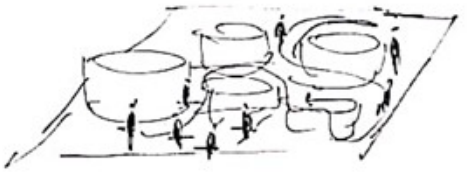


Active architecture: *exhibiting patterned galleries*

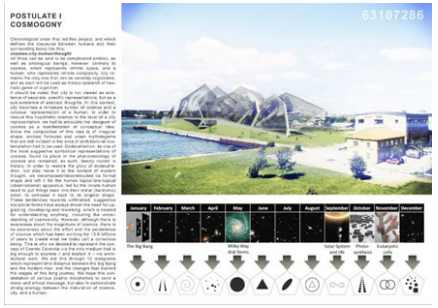
repetitions based upon patterns- Simplification and minimalism- contrast between rigid and organic figures- porous façade

Social activity: *getting in touch to the creative patterns*

explore the exhibition- experiencing different scenarios of renewable technologies, make people thinking of the latest human achievements in micro design. For private parties outside, wedding, meditation rings



Project 8.2: Postulate

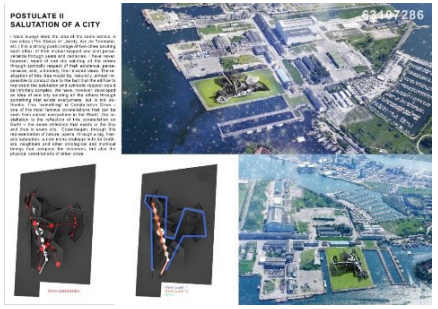


Team: Luka Stojanovic, Djordje Subaric, Milica Didic, Marko Babic

Energy Technologies: photovoltaic panels

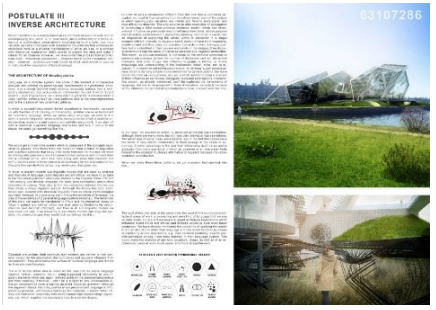
Design inspiration: cosmos and the form of a dodecahedron

Design goal: demonstrate the importance of renewable energies



Author's concept description:

The work that is before you is completely conceptual in nature, as well as the ideas it represents. The principle by which we are led, which the competition set as main goal, is awakening people about renewable-energy and possibility of application of these materials in the manifestation of architectural, philosophical, linguistic, historical and astronomical ideas. With the advancement in science and progress of the solar panels, the selection, arrangement and appointment of the panel can be changed. Symbols that serve as representations of certain concepts are also subject to change, as well as the rest of the sculptures are suitable for any type of mutation, permutation, etc.



Futuristic museum

Flow

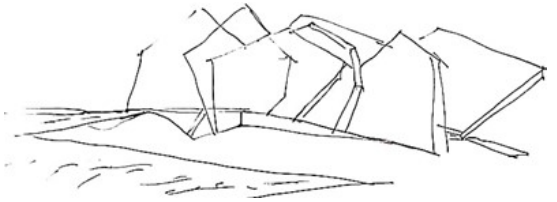
Energetic flow: solar to electricity

Social flow: move through a modern energy sculpture

Transformation

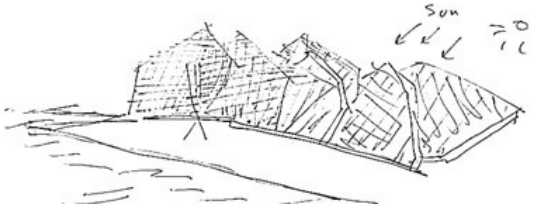
Atmospheric term: *futuristic museum*

outdoor art, futuristic 1972, Olympia mountain, cool industry, pointed entrance, shifted panels



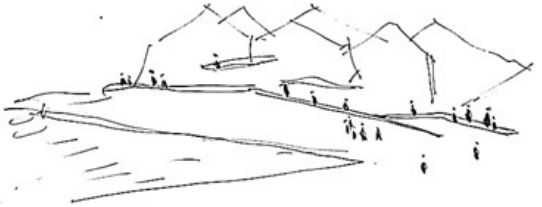
Active architecture: *exposing patterned skin*

geometric angular shapes, shards stuck in the floor, transparent and reflective surfaces, confusing composition, room forming walls, cold colors and materials

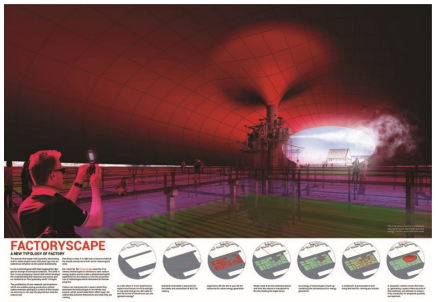


Social activity: *taking a journey of discovery*

Walk-on platforms, resting, working, festivals, concerts, refugee shelter, movie premiere, sound installation



Project 8.3: Factoryscape

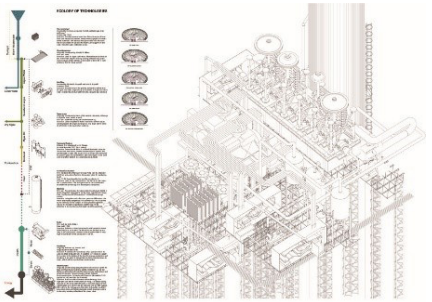


Team: Yasin Toparlar, Onur Can Tepe, Huseyin Penbeoglu

Energy Technologies: algae photobioreactors, boiler/steam turbine

Design inspiration: the importance of focusing on renewable energies

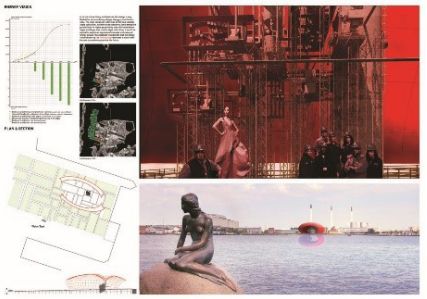
Design goal: gaining as much energy as possible



Author's concept description:

The journey that began with the humanity interlocking coal to steam engine some 200 years ago, has escalated our influence on the planet dramatically. So dramatically, it has reached to a level in which self-destruction of our species seems possible unless we act.

It was a technological shift that triggered the dangerous change of ecological balances. This shift in turn is now prompting a social shift which develops the understanding that resources are scarce and our existence on "the spaceship earth" is fragile.



The proliferation of new research and inventions which are enabling energy production without carbon emission perhaps is a result of the climate we are living in, not only the physical but also the cultural one.

One thing is clear, it is right now a must to mobilize the human resources as well as the technological ones.

Algae art factory

Flow

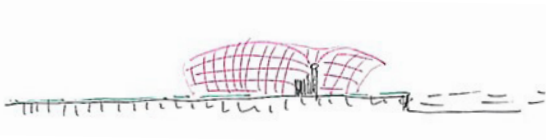
Energetic flow: wind to electricity

Social flow: water activities

Transformation

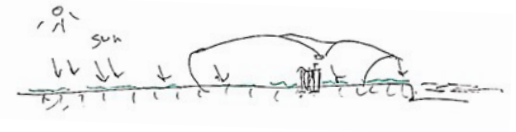
Atmospheric term: *algae art factory*

Spherical egg, artificial cave, red security, bloody ellipsoid, colorful dome, double ways, red kangaroo



Active architecture: *urbanizing a factory*

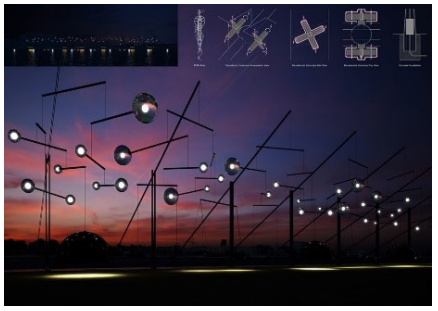
dark cave, surreal factory, covering the sky, industrial components, red surreal coloring, industrial materials, picture frame to the outside



Social activity: *visiting the dwarfed machine*

concert hall, disco, dance room, workshops, trade fairs, "red light room", theatre, art exhibition, conference

Project 8.4: BALANCE | IMBALANCE



Artist: Hideaki Nishimura

Energy Technologies: buoy-type wave converter with Electroactive Polymer Artificial Muscle (EPAM by SRI International and Bayer Material Science), Sphelar® photovoltaic, piezoelectric film

Design inspiration: all the different elements that come together at the site

Design goal: showing the balance and imbalance between opposing units

Author's concept description:

The site can be interpreted as an intersection area between land and ocean, human and nature.

The main concept of this kinetic sculpture is to demonstrate the beauty of balance and imbalance between contradict entities. There are three types of energy harvesting technologies; floating buoys with EPAM (Electroactive Polymer Artificial Muscle) system for wave energy from ocean, spherical photovoltaic cells for solar energy from sky, and piezoelectric film system for kinetic energy from motion by wave, wind and human activities.

The artwork has two arms and EPAM buoy is suspended at the ocean side. The movement of attached weight elongates and contracts EPAM and electricity will be generated. Spherical solar devices are installed at the land side. The combination of solar system and wave power system compensated each other. In heavy weather day wave power device will cover the output amount of electricity by solar device, and vice versa in calm weather.

Balancing sculptur park

Flow

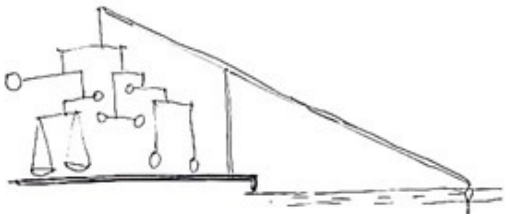
Energetic flow: wind and solar to electricity

Social flow: visit a sculptural land art

Transformation

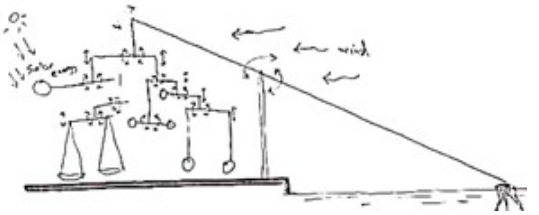
Atmospheric term: *balancing-sculpture park*

outdoor mobiles, touch and move, sitting and swinging, balancing balls, sushi collector, wave forks, disbalanced waves, vibrating black bells



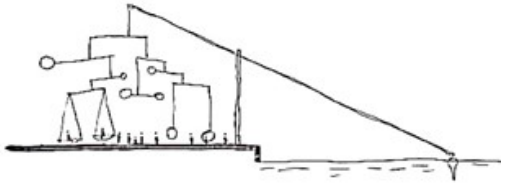
Active architecture: *balancing with the wind*

repetitive structure, reflective components, movement of the individual components and playful handling of the movement, everyday object upscaled, glowing at night, touching the sea, slim and round structures in contrast

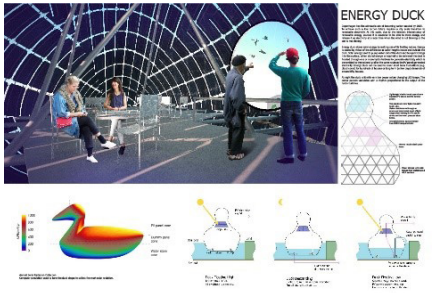


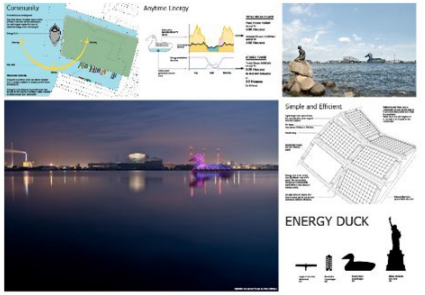
Social activity: *playing seesaw game*

linger and rest, bringing oneself into balance, games, playground, follow the movement, meditation, siting in the bowls



Project 8.5: Energy Duck





Team: Hareth Pochee, Adam Khan, Louis Leger, Patrick Fryer

Energy Technologies: photovoltaic panels (Panasonic HIT or similar), hydraulic turbines (Kaplan, Francis, or similar 100–500 kW capacity)

Design inspiration: the common eider duck

Design goal: creating a fun experience

Author's concept description:

Energy Duck is an entertaining, iconic sculpture; a celebration of local wildlife; a renewable-energy generator, store and exporter; a habitable destination and a city scale information beacon. The common eider duck is resident in great numbers in Copenhagen, however its breeding habitat is at risk from the effects of climate change. Energy Duck takes the form of the eider to act both as a solar collector and a buoyant energy store. Solar radiation is converted to electricity using low cost, off the shelf PV panels. Some of the solar electricity is stored in the form of gravitational potential energy via water pressure. At night, when there is no solar radiation the water pressure can be released through hydro turbines within the duck's belly providing renewable electricity at all times. The floating height of the duck is an indicator of the amount of city wide energy use relative to the renewable generation.

Floating duck sculpture

Flow

Energetic flow: solar to electricity, water storage

Social flow: move through a gigantic modern sculpturew

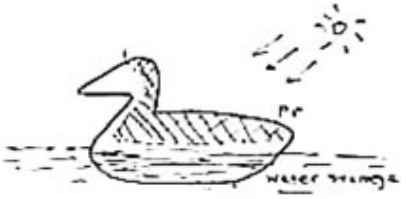
Transformation

Atmospheric term: *floating duck sculpture*

modern bird, water art, comic project, funny impression, night eye-catcher, childish bird

Active architecture: *exposing to the sun containing water*

surreal oversizing of everyday creatures, playful character, reflective surface, new perspectives from the interior, sculptural character



Social activity: *looking at the sculpture*

climb, jump into water, workshops, meetings, gatherings, fairs, lounges, interviews

Project 8.6: #HelioTweet

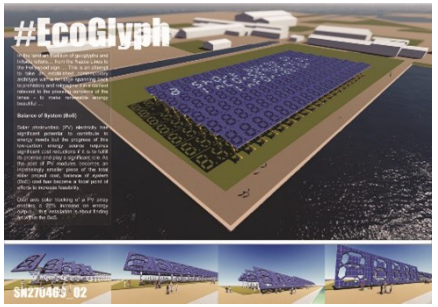
Team: Simon Nummy

Energy Technologies: heliotropic photovoltaic panels

Annual Capacity: 2,490 MWh

Design inspiration: the movement of the sun

Design goal: supporting freedom, art and the celebration of the sun



Author's concept description:

The #HelioTweet is seen as having the potential to act as a reimagined "speaker's corner" - an installation where analogue and digital meet, encouraging freedom of thought/ expression. The balance of system or BoS encompasses all components of a photovoltaic system other than the photovoltaic panels. This includes wiring, switches, support racks, an inverter, and batteries in the case of off-grid systems. In the case of free-standing systems, land is sometimes included as part of the BoS.

Multi-axis tracking in the Copenhagen latitude enables a projected 22% increase on energy output. The #HelioTweet installation is a celebration of this dynamic response to the sun's path throughout the year.

Digital robots

Flow

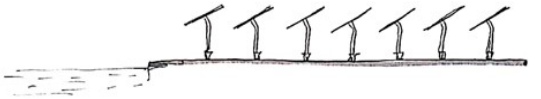
Energetic flow: solar to electricity

Social flow: dance under a series of sheltering robots

Transformation

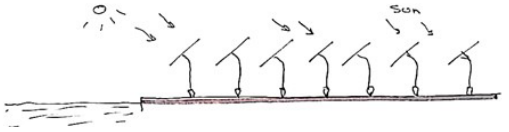
Atmospheric term: digital robots

technical roof, solar collectors, sterile arena, cinema spectators, flat roof, open sun hall



Active architecture: *filtering the sun light*

repetitive components, monotonous appearance, playful effect through changeable screen displays, creation of a roof, futuristic but industrial character



Social activity: *dancing electro*

rest in shadow, weather protection, big events, cafe, festival, concert, community gatherings

Cluster 9

Cultural Storage

In this cluster the atmospheric terms with storage of cultural concept has been collected.

A historical element can be found in the atmospheric terms of this category. They namely are: glorious fortress, framing cloister

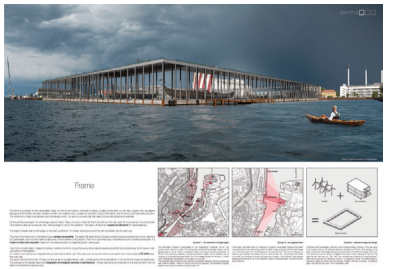
steam locomotive.

The mentioned wards are fortress, cloister and locomotive. They, all, remind the history and some stories from the past.

The spaces with their character contains and store something from the culture and memories.

Glorious fortress

Steam locomotive


Framing cloister

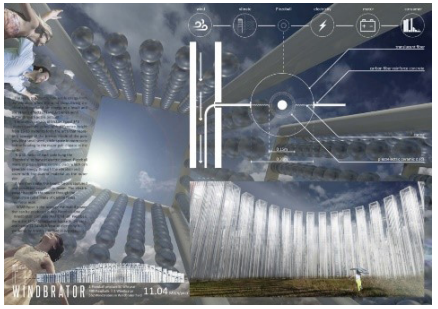
Project 9.1: Windbrator

Team: Chanin Sheeranangsu, Phatra Wongsantimeth

Energy Technologies: piezoelectric ceramic discs

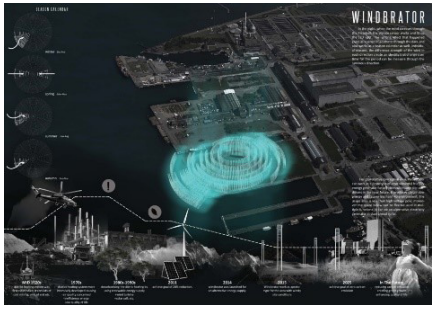
Design inspiration: concept of the breeze

Design goal: celebrating the wind in an artsy way



Author's concept description:

The key is to generate renewable-energy from the vibration when the wind blows. Giving the clean and inexhaustible energy as a result and the various effects of Land Art when wind flutters through as the outshot. The project consists of 552 sectional 3*3 meter quadrate poles, with difference height from 15-35 meter to form the arch that represent concept of the breeze. Inside of the pole provide a small semi-public space in room scale before heading to the major public space in the center. Top 10 meter of each pole hung the 'Piezoballs' to harvest electric power. Piezoball made of piezoelectric ceramic discs which can generate energy through the vibration and cover with translucent material as the outer skin. When they shake, the kinetic force is captured and converted into electric power. The electric power is sent to the source through the conductive cable made of Carbon fibers reinforce resin. 50Wh/year is the average estimated power that can be produced in one Piezoball, One Windbrator contains 400 unit of Piezoball, there are 552of Windbrator house in the area, and hence 11.04MWh/year of electricity is produced by Windbrator field in average.



Glorious fortress

Flow

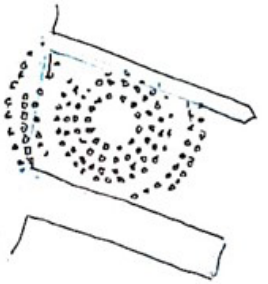
Energetic flow: wind and human energy to electricity

Social flow: gathering in a crystal fortress

Transformation

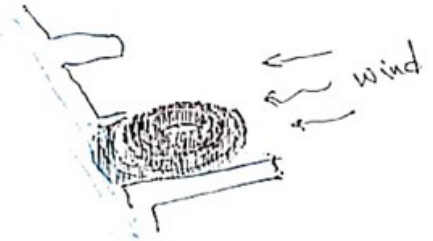
Atmospheric term: *glorious fortress*

blue labyrinth , inserting energy, effective circles, open sky, magic crop circles, space ship, infinity sky, solid wall



Active architecture: *catching the most out of the wind*

high rising poles, creation of space through the arrangement of the poles, repeated element, connection of land and sea, lighting effect at night, smaller elements form larger elements which themselves form a large whole, pulsating form, transparent materials



Social activity: *walk to the opening center*

light art, inner circle as protected space, meditation, spiritual gathering, shamanic rituals, relax, study

Project 9.2: Frame

Team: Aucant Jordan, Marlhoux Lola, Aucant Mélissande

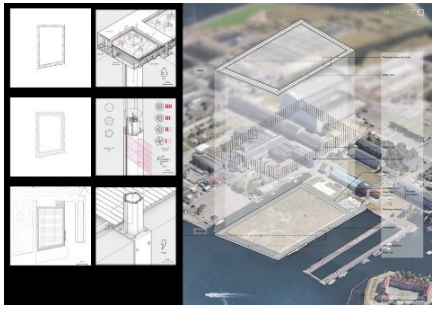
Energy Technologies: vertical axis wind turbines

Design inspiration: the power of the site

Design goal: creating a new icon for the city

Author's concept description:

The frame is a cloister on the metropolitan scale, a mirror to the horizon, a temple of energy, a place-on-demand, a wind field, a green roof, an elegant background for the little mermaid, a bright monolith, an exhibition room, a place for concerts, a ship in the harbor, and it's simply a roof and poles structure. The framework is there to enhanced uses that already exists. We are in a powerful site that needs to be emphasized and protected.



So the architectural object will not change people's habits. Today, it is a brownfield plot that is sometimes informally used. By his presence, the construction will reveal this place as a necessity and will encourage its use by the residents. The place will become a space-on-demand for Copenhageners. The object is literally built on the edges of the plot in a offset of 11m deep, leaving the rest of the site completely free for open use.

Framing cloister

Flow

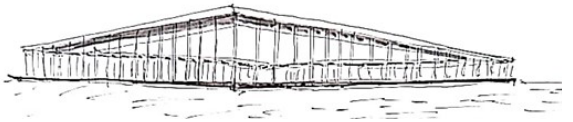
Energetic flow: wind to electricity

Social flow: gathering corridors

Transformation

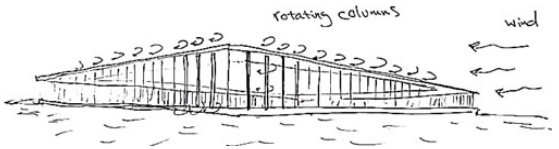
Atmospheric term: *framing cloister*

dramatic frame, open hall, wind exposition, protected grid, roman arena, Italy 60s atrium



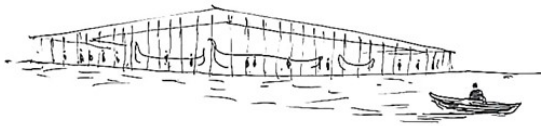
Active architecture: *rotating columns*

basic rectangular shape, raised transparent frame, cold materials, thickness of what is inside the frame, creating a roofed corridor, moving components



Social activity: *walking between inner garden and outer sea*

performance, theatre, concerts, evening walks, teach/learn, sport events, celebration



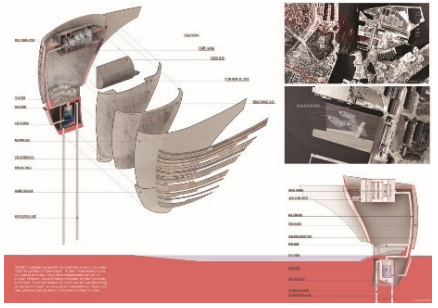
Project 9.3: CLOUD

Team: Laura Maria Gonzalez, Amir-Behan Jahanbin

Energy Technologies: flash geothermal with carbon nanotubes

Design inspiration: the history of the place

Design goal: creating a connection between earth, water, sky and people



Author's concept description:

A once stirring site for grand shipping machines defines the heart of Refshaleøen Holding. Deep carvings in the earth pronounced the birthplace of vessels, as they arose from the earth to travel the billowing seas. Within the depths of Refshaleøen Holding exists another flux however: geothermal energy. Craving to rise and weave with the water and the sky, the intertwining of these elements is the foundation from which CLOUD arises. The project seeks to bring the elemental earth and water together to establish a ritual of cleansing environment and body as one, connecting people and nature in a dynamic system of ever changing currents and flows. CLOUD evokes the culture of Copenhagen. A series of three steaming sculptures in the landscape of Refshaleøen Holding give rise to a cleansing ritual of body and environment. The landscape is altered to create a shallow pool on the north end in which three sculptures are anchored. Careful consideration was taken to ensure that no earth was removed from the site, but instead earth dug out for the shallow pool would be used to create a raised area that would contain changing chambers below.

Steam locomotive

Flow

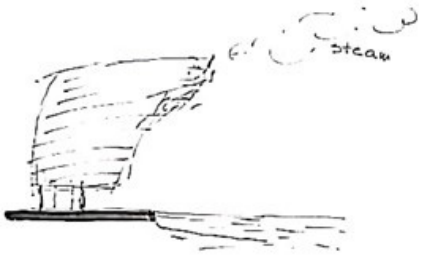
Energetic flow: geothermal to electricity

Social flow: water and steam activity

Transformation

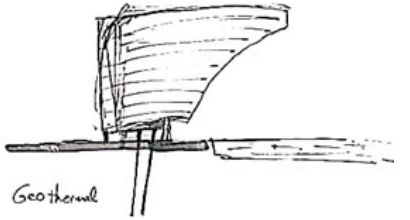
Atmospheric term: *steam locomotive*

emotional train, impressionistic shoe, agitated letter P, dramatic engine, smoking gun



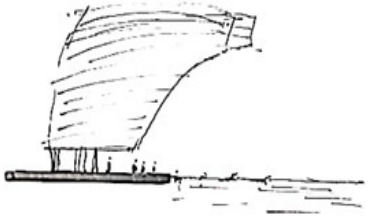
Active architecture: *flashing the hot steam*

floating form, massive but light-looking body, connection between heaven and earth, monumental character, merging with the clouds through steam, neutral surface and color



Social activity: *visiting the steam turbines*

cafe, workshop, sauna, restaurant, recreation, warming up



5.2.2 Framework for future design

The *Flow-station model* helped to observe and analyze the projects from another point of view as a new lens to look at the same thing. Hence, the outcome is different with a morphological analysis or engineering technical approach.

Since the atmospheric terms are obtained from a free brain storming, and the clusters are the general type of the atmospheric term collections, we reached to a pattern language of a *Station*.

The outcome is the nine clusters holding the 64 atmospheric terms, that can be seen as known (see Chapter 4) or newly discovered characteristics of a *Station*. According to this fact, the clusters are considered as *Station* characteristics that we consider it as a powerful thinking material to proceed a meaningful design for renewable-energy power plants.

This outcome produced new knowledge in this field and may inspire the artist, designers and architects to take part of this crucial movement to a vital nature friendly future.

The summary of categorizing 64 projects of LAGI 2014 are (Fig. 5.6):

Cluster 1: Alienated natural phenomena

Cluster 2: Cozy by vital nests

Cluster 3: Mysterious naves (navis)

Cluster 4: Sonorous halls

Cluster 5: Lightweight construction

Cluster 6: Illuminated architecture

Cluster 7: Endless maze

Cluster 8: Futuristic exhibition

Cluster 9: Culture storages


Shaking waterfall
colorful fog
paving waves
unfurled-animal tree
ribbon waves
tornado volcano
golden field
blooming flower garden
mountain sunset
forest park
snake garden
smoke forest
shards forest
tulip garden
red sail-forest
rolling landscape
textile forest
recycle forest
artificial reed field
lifted algae-sea
floating winter forest
under construction forest
hive nest
soil nest
organic nest
warm rooms
nesting boxes
sunk ship
sacred dome
incense smoky church
flying phantom
open-air church
ship illusion
playful sail boats
alienated natural phenomena
cozy by vital nests
mysterious naves (navis)
sonorous halls
lightweight construction
illuminated architecture
endless maze
futuristic exhibition
culture storages
urban wind harp
embedded horn
rusty horns
giant cage
landed sailing-chain
sailing shades
mesh sail-tower
feathery scaffold
pixeling scaffold
unfinished structure
timing sun ring
crystal curtain
wind screen
glowing cat walk
volumetric screen
massive sheet-pile
mysterious maze
green ziggurat
soft tile-floating platform
futuristic gallery
futuristic museum
algae art-factory
balancing-sculpture park
floating duck sculpture
digital robots
glorious fortress
framing cloister
steam locomotive

Previous page

Fig. 5.6: Summary of clustering the atmospheric terms from 64 projects of LAGI 2014

The contribution of this thesis to a new design project can occur based on the understanding of the *Flow-station model* (Chapters 4 and 5) and the clusters as a pattern language outcome for renewable-energy power plants.

Designers can take the idea from the final clusters to generate a meaningful space that interact with both energetic and social flows. In the next chapter (Chapter 6), the outcomes are applied to a pilot study as the framework for designing a new power plant in Seville, Spain.

Conclusion

Following the methods and selection of date in chapter 4, in this chapter, the selected data (the 2014 LAGI projects) as the case studies has been analyzed and clustered.

For each project, the *Flow-station model* was employed for atmospheric analysis and an interpretative approach helped to cluster the atmospheric terms. In this way, from the specific data we analyzed, the brownfield at sea in Copenhagen opposite to a landmark, the outcome was nine clusters that describes different strategies, framework or typologies for designing a social renewable energy power plants.

The contribution of this outcome can

Main references

Sören Schöbel. Windenergie und Landschaftsästhetik. Jovis Verl., 2012.

Nicholas T. Dines, et al. Public spaces, social relations and well-being in East London. Policy Press, 2006.

Christopher Alexander. A pattern language: towns, buildings, construction. Oxforduniversity press, 1977.

6
Pilot study: Energy island

6.1 *Reading, concepts, and methodology*

This chapter aims to test the findings of the present thesis achieved in Chapter 5. The findings include nine clusters that inspire to define a general atmospheric strategy according to the characteristics of the environment and need of the society, taking advantage of the current renewable natural energetic flow of the site to transform into electricity and shifting the social flows into a meaningful activity or interaction in the space according to the current status. This aim is addressed via a pilot study. A pilot study often tests the design of the full-scale experiment which later can be adjusted. It has the potential to give a valuable insight and any missing part in a pilot study can be added later to the full-scale project to improve the possibility of a clear outcome (Thabane, 2010).

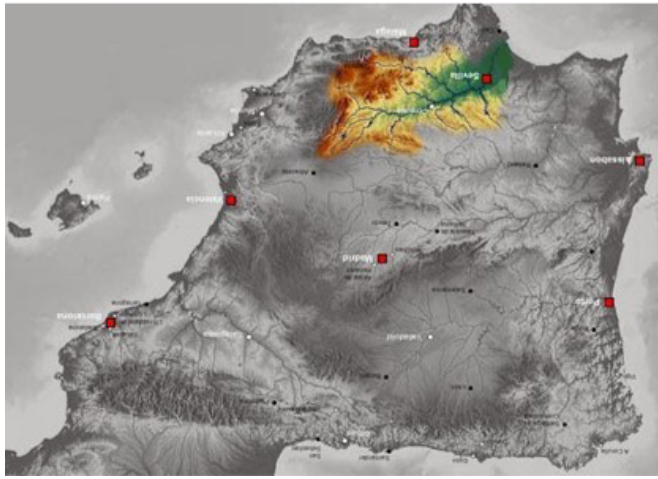
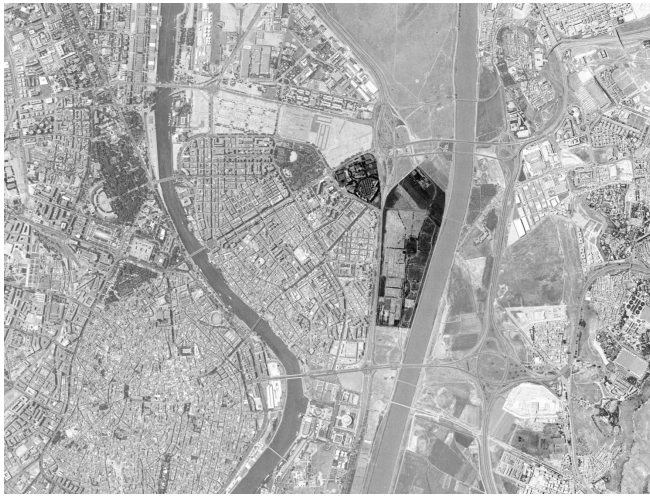


Fig. 6.1: Position of Sevill in territory and landscape. In the Guadalquivir basin. Photo: by Port(u*o)s, based on an image of http://www.maps-for-free.com

Fig. 6.2: Fig. 6.1: Position of the site (Virgen Del Carmen on the left and Charco De La Pava on the right) in regional scale



6.1.1 *Reading: Seville and the site potentials*

In this section, the focus is on the analysis and the reading of a specific site basically by the *Flow-station model*. It is also important to know the requirement and desire of the society and citizens in this area. Therefore, it is possible to choose a right cluster as the main strategy to go through the process of design.

The aim is regenerating inhabiting urban landscapes and revitalizing a social housing

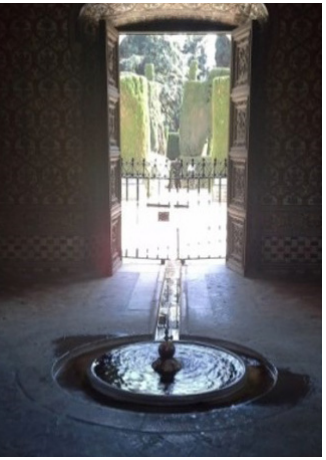


Fig. 6.3: Alcázar, Seville
Photo by author

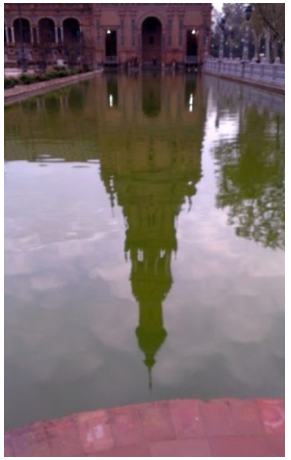


Fig. 6.4: Plaza de España, Seville
Photo by author

Fig. 6.5: Sun element in the stairs of Alcázar,Seville
Photo by author

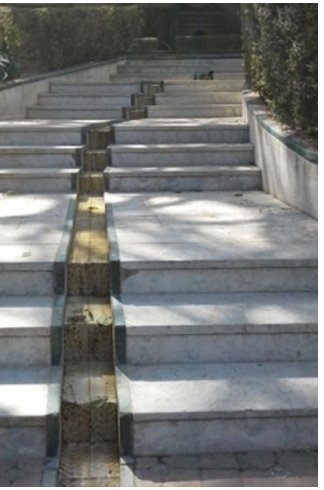


Fig. 6.6: Architecture of sun and water, Alcázar, Seville
Photo by author

neighborhood in the west part of Seville next to the mobility infrastructure and the river, in a sense at the edge of the city.

The social housing area is called Virgen Del Carmen in a sector of the city called Triana and the vast open space between the infrastructure and the river is called Charco De La Pava. The aim is vitalizing the society and social life via rethinking of the architecture of social housing and open spaces, between open and build up environments as the connecting spaces.

The criteria of this project include regenerating the space by providing qualities like permeability, connectivity, re-naturalization, multi-functionality, urban scale and inclusion.

Seville is the capital city of Andalusia region in southern Spain and is located in the Gaudalquivir basin along a river that flows through Córdoba and Seville until the Gulf of Cádiz, in the Atlantic Ocean (Fig. 6.1). The site is located between two rivers of Guadalquivir and Teriana being connected to the former (Fig. 6.2).

Water and sun are two important natural factors of Seville. Owing to the geographical and historical relation between the city and the river, the future changes of the area is inevitable, being predictable as well. Not only in regional scale but also from an urbanistic point of view, the role of water as an essential element in Seville architecture is noticeable (Figs. 6.3 and 6.4).

The culture of Seville is interwind with the river and sun. It has an annual average of 19.2 °C. After the city of Córdoba (also in Andalusia), Seville has the hottest summer in Europe among all cities with a population over 100,000 people, with an average daily highs of 36.0 °C, in July (Fig. 6.5 and 6.6).

From urbanistic point of view, the site is located between the last dense housing area of city on eastern side and the river on the western side of the site. The site is a void and flat area next to Guadalquivir river in comparison to the dense volumetric city (Fig. 6.7 and 6.8).

As mentioned, rethinking and regenerating of the open spaces of the area of Virgen Del Carmen and Charco De La Pava is the aim and the criteria of the program. In Section

6.2, the focus will be on a strategy based on the energetic flows (basically water and sun) and social flows following the need of the social life according to the site characteristics. Virgen Del Carmen and Charco De La Pava are separated by the strong infrastructural barrier and a traffic node. (Fig. 6.9). The community of Seville is already aware of the necessity of an increased social life. During the interviews with the local people, we realized that the people are planning for more social activities. This is another reason to rigorously consider social aspects of the architectural designs.(Fig. 6.10).

Fig. 6.7: North view of Charco De La Pava in relation to the height of the city

Next page:

Fig. 6.8: : Sequence of city, infrastructure, flat area (the site) and the river from the south view. The western area of Triana and the Charco de la Pava.
Phot: JESÚS MORÓN
https://www.elmundo.es

Fig. 6.9: Small garden that neighbors have mounted in the infrastructural barrier between social housing (Virgen Del Carmen) and the open area (Charco De La Pava)
Photo by: Marta Franco

Fig. 6.10: Interview with some members of the Virgen Del Carmen's community (2013).
Photo by: Marta Franco

6.1.2 Concepts and methodology: Flow-station model

Based on the energetic and social flow analysis in Seville, we understand the specific status of the site in relation to RES, namely sun and water.

The location of the site is significantly exposed to the energy of sun and water. Moreover, the scale of Charco De La Pava, the big land restricted between the infrastructure and the river is comparable with the scale of the solar parks which usually we can find across the landscape and countryside. The scale, the position, and the characteristics of Charco De La Pava renders the project suitable for designing a renewable-energy power plant. It is

a vast area of approximately 77,000 square meters.

The energetic flows of water and sun and the large scale of the land provide a good opportunity for designing a renewable-energy power plant that can be a *Station* or several *Stations* to transform the social flows. According to the nature of the site and flooding risks, we need a strategy to fulfill the need of environment, for the social activities and collecting the infinite solar energy. Therefore, an idea of an energy island as one Station that can contain several *stations* generate the concept of this pilot study (see Fig. 6.11).

The method is defining atmospheric terms as result of *Flow-station model* reading according to the unique potential of space and society.

The energy island is the island to regenerate the urban landscape through cultivating

Fig 6.11: Strategy of the energy island

Fig 6.12: Nests Island master plan

energy, culture, connection, and aesthetics to the space as well as bringing the citizens and visitors together to educate, entertain and interact.

The Masterplan (see Fig. 6.12) shows the entire energy island that holds three concepts of *Stations* inside.

First, the cultural rooms to bring shelter, services and a bright safe and large space for cultural activities that basically are powerplant to produce clean energy.

Second, the two bridges to connect the city and the social housing neighborhood to the river. They are also landmarks and eye catchers as well as art galleries as a recreational and contemplative space. A ramp to a viewpoint to the nature and river is the attraction of this bridge in connection to the sky and the landscape. In this *station*, the shelter that provides shadow, produces electricity.

And the third *station* is the swimming pool and the energy floor that is on the north part of the island. This area is designed for the families and children to play and enjoy swimming in the hot days of Seville. In this Station, the service roof and the playground produce electricity.

Fig 6.13: South elevation

6.2 Strarategies and design: Nests Island

6.2.1 Cozy nests Station: Sevillana nests

As Seville is a city with a strong culture in dance, this site could be a right place for dancers and lovers of moving freely in a cozy room. Therefore, cozy nest can be a right cluster for this wonderful live activity for the citizens.

The site is an enormous vast land at the end of the city between infrastructural structure and the Guadalquivir river. Therefore, the design should give a good feeling to the people and feeling of a warm, friendly and community space.

social flow

Among the clusters, the warm friendly feeling can be found in *"Cozy by vital nests"*. This cluster is chosen because it matches the atmosphere of warm and cozy rooms in the human scale where people can feel themselves as part of a community.

energetic flow

The *"Nests"* can also be formed efficiently to get the maximum of solar energy.

Energy production

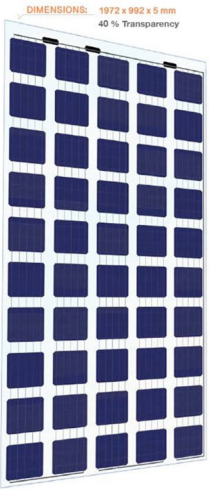
The skin of the nests is a temperate solar glass with antireflective coating that contains photovoltaic monocrystalline silicon 6 inches modules providing 40% of transparency. This allows daylight to enter the building, creates a nice atmosphere with small shadows of the modules on the floor while producing a large amount of electric energy.

Solar cell specifications	
Solar Cell	Monocrystalline silicon 6 inches
Maximum Power at P(max)	240 W
Module Efficiency	0,13
Operating Module Temperature	-40 °C to +85 °C
Dimensions	1972 × 992 × 5 mm
Module area	1,96 m²
Weight	24 kg
Front/Back Glass	2 mm heat strengthened glass
Fire Safety Class	Class A

Table 1: Solar cell specifications

By an average of 5h sun per day each 240 W panel produces 1200 W per day or 438 kWh per year.

Fig 6.14: Monocrystalline solar cell



Total annual capacity of the nests: 9.252 MWh

Solar cell area [m²]	
Nest 1	9.263
Nest 2	13.020
Nest 3	7.366
Nest 4	7.176
Nest 5	4.578
Total area	**41.403**
Required panels	**21.124**

Table 2: Solar cell area

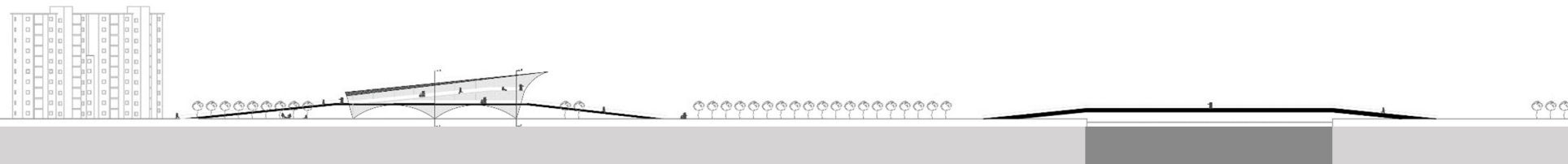


Fig 6.15: inside Sivillana Nest, a cozy dance hall

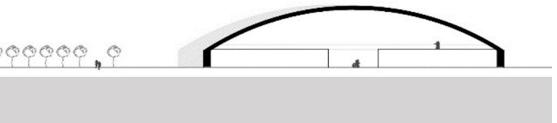
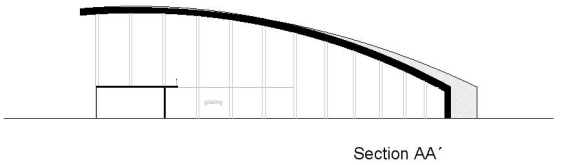


Fig 6.16: North urban section and Sivillana nest section



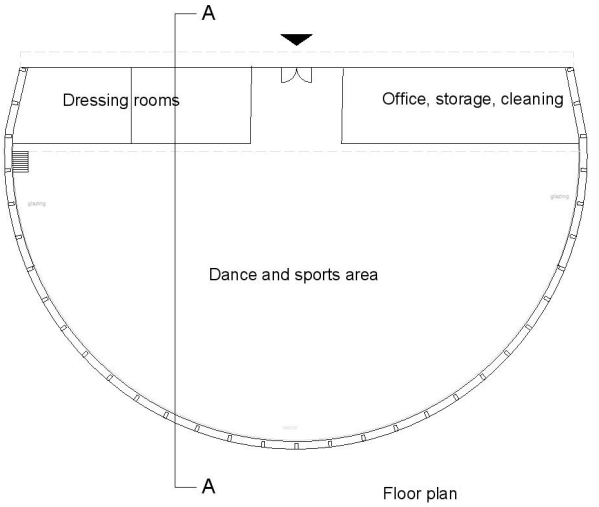


Fig 6.17: Section AA and dance floor plan

6.2.2 *Futuristic exhibition Station: Eye catcher gallery*

Atmospheric term: Eye catcher gallery

According to the analysis of the site, the atmospheric term for the bridge to connect the city to the energy landscape, can be Futuristic exhibition, a metaphor for transition to nature and sustainable clean future.

Connecting the social housing to the river means passing a big obstacle of infrastructure by two bridges that can also remind the possibility of passing the obstacle of global warming by using clean energy and going through a natural and environment friendly future.

social flow

For this purpose, "Futuristic exhibition" can satisfy the goals in the most reasonable way, owing to its characters towards the future of education, social, technological and clean environment. It can remind us contemplation and thinking of future.

energetic flow

"Futuristic exhibition", works well with the solar technology and its exposition.

Energy production

The south façade of both bridges is built with double glass photovoltaic modules with 40% of transparency.

The total photovoltaic area of both bridges is 2.302 m² and is covered by 1.175 modules, achieving an annual capacity of 511 MWh.

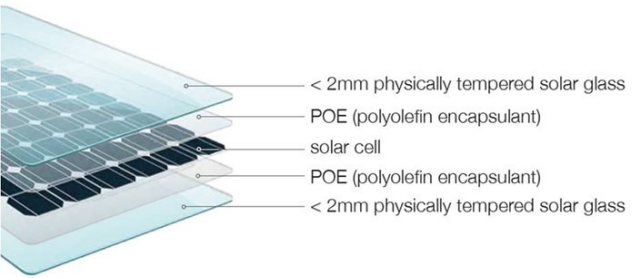


Fig 6.18: Solar cell construction. Source: GridParity AG - next generation photovoltaic

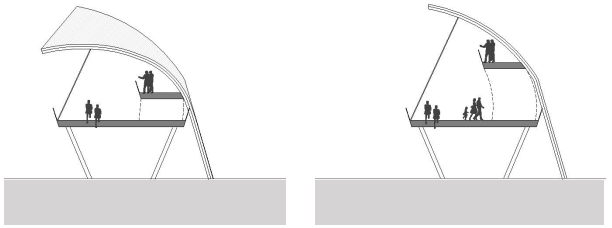


Fig 6.19: Bridge elevation and bridge section

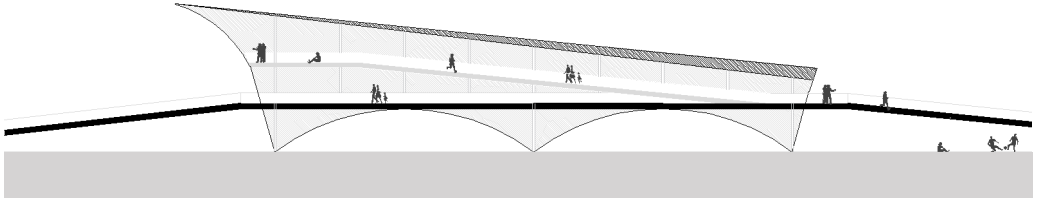


Fig 6.20: Bridge longitudinal section

Fig 6.21: The futuristic exhibition ramping to the park and direction of the energy island

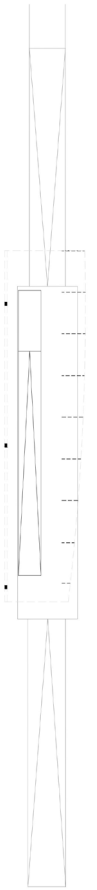


Fig 6.22: Bridge plan

6.2.3 Alienated natural phenomena Station: Playful hills

"Playful hills" is an artificial soft ground to produce energy as well as offering a playground to kids and people to experience the movement on an energy floor. The kids by playing on the energy floor produce electricity for the furniture around the pool and the playground, so that parents and visitors can charge their smart phones and their laptops while sitting in the nature.

Together with the sun, water is an important element in Sevilla and represents an important component of the City´s open and public spaces. An open-air swimming area next to the playful hills provides the citizens with refreshment and relaxation.

Presence of a semi-abandoned social housing increases the importance of revitalization for this site. Hence, we require a new attractive space like an interactive park for the community including the children.

social flow

"Alienated natural phenomena" is chosen because it can be a fun and creative space for children.

energetic flow

"Alienated natural phenomena" is the type of cluster with a high range of energetic transformation possibilities.

Fig 6.23: Energy floor diagram. Source: https://pavegen.com

Energy production

the energy floor of the playground produces up to five watts of power while someone is walking. Considering 10 persons walking (or kids playing) per hour during an average of five hours per day, would produce 250 Wh per day and an annual capacity of 91 MWh.

In addition, the playground and pool the area consider dressing rooms, toilets and a coffee shop with a solar roof of 300 m². Considering, for example, a solar collector that produces 806 W/m², this roof would produce 242 MW with an annual capacity of 441.650 MWh.

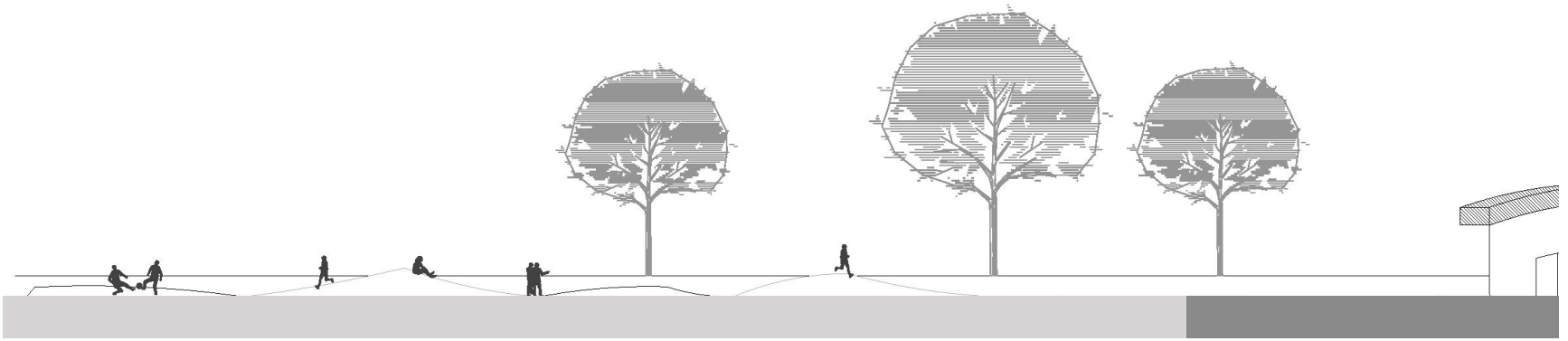


Fig 6.24: Energy floor at the open swimming pool section

Fig 6.25: Energy floor at the open swimming pool

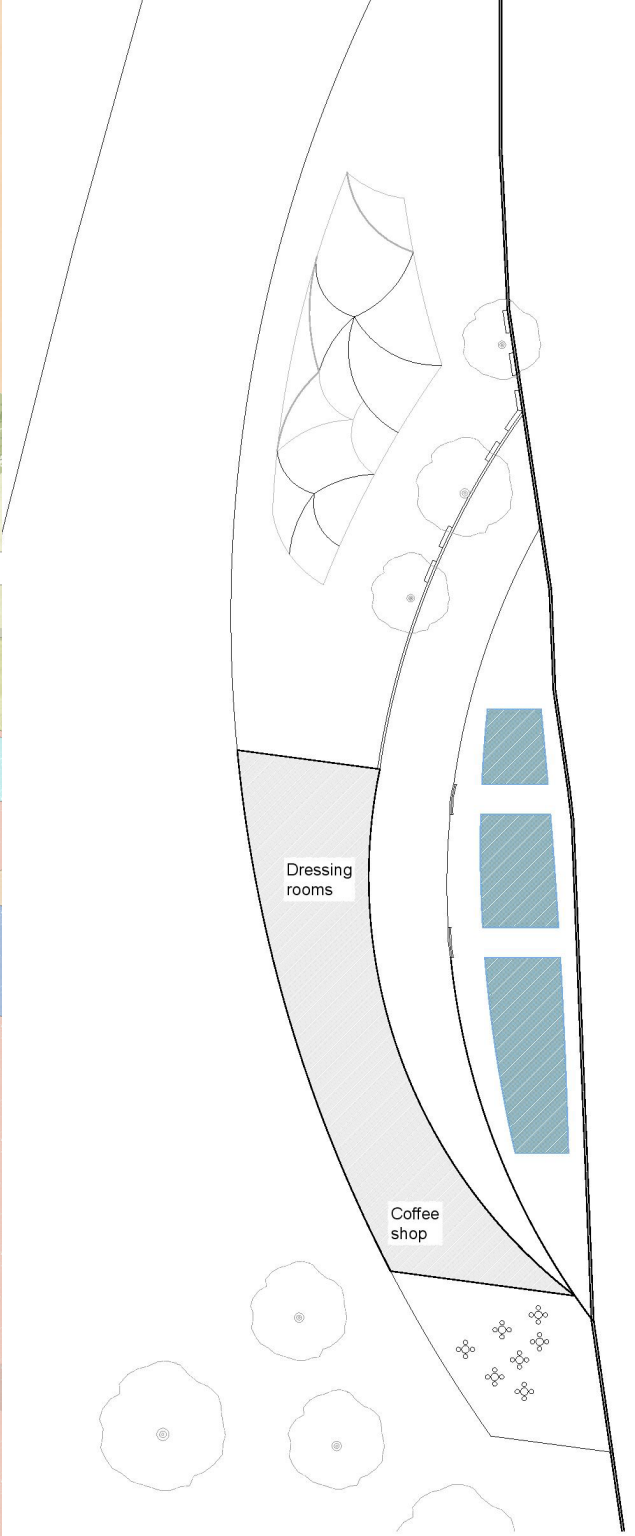


Fig 6.26: Energy floor at the open swimming pool plan

Conclusions

In summary, this research turned to be a relevant work facing the current global issues. The significance of growth in clean energy brought an urge to build more of the renewable-energy power plants across the globe. In this way, one of the main obstacles till now has been the lack of aesthetics and social acceptance. Although aesthetics, social and spatial issues are the subjects of architecture field, It has not been developed any framework and systematic studies around this area to connect designers and architects to the field of renewable-energy.
However there are some realized projects that have considered the transformation of social flows and the aesthetics, But we have no typology, framework, or a common language between clean energy power plants and architecture. Discovering a framework, hence, became an objective for the present thesis.

Data scarcity is the result of insufficient amount of realized social renewable-energy power plants. Therefore, the data in this thesis, has been exploited from the creative and radical ideas from creative minds attended to a competition suggested how renewable-energy power plant can be beautiful and human friendly. The goal of this competition was to encourage designers from all over the world, to focus on the meaning and aesthetics of form and human activities in addition to the efficient production of the clean energies.

This thesis attempted to classify the atmospheric terms as the result of the atmospheric analysis by the means of the hypothesis or the *Flow-station model*. The *Flow-station model* helps to read and extract the energetic and social *flows* as well as the *transformations* in the atmosphere, architecture, and social activities.

Based on the atmospheric terms as the identification for each case study, the projects were then classified into nine clusters according to the characteristics of the atmospheric terms. In this regard, nine clusters has been generated that each, proposes a general strategy for limitless atmospheric designs. This clustering provides a framework or a language pattern for atmospheric and meaningful spaces of renewable-energy

production aligned to the social values.

This thesis by applying the hypothesis of the *Flow-station model*, not only connects the concepts of renewable- energy to architecture, but also gives a broader vision to designers to discover more of the atmospheric terms and therefore more of the clusters to add to the list created in this thesis. Depending on different state and variable scale of a project, the location and different available energetic and social flows, the atmospheric terms and the clusters can alter.

Station and *flow* are the keywords to generate additional clusters. The nine clusters was discovered in this thesis based on the data that was in a brownfield in Copenhagen. So, depends on different conditions, locations and available energetic and social flows, the potential atmosphere, the architecture and the social activities can vary, hence the clusters would be different that can be added to the clusters initiated in this thesis.

And eventually, a pilot project in the last chapter was proposed as a test for the achieved results of the thesis that is the nine clusters as the general spatial concepts. The new project started with reading of the site by *Flow-station model* to understand what are the potential flows and stations in the site. The social studies helped also has a crucial role to know the need of the citizens in that special site and the potential value that could transform the living qualities to another level. This comprehensive reading can help to choose a right cluster as the main strategy to go through the process of design.

The next step was finding the missing value that the new design can offer to the space and society. According to the studies, the missing values (in both spatial and social area), were connection to the river and inhabiting urban landscape, a vital social housing neighborhood and cultural rooms for dancers, artists as well as pop up and creative activities.

Considering the flow of sun and water as energetic flows and transforming the social flow into contemplation and interaction, led the design to three certain concepts and strategies from the nine achieved clusters. Afterwards, choosing three strategies they become more specific and unique by defining atmospheric terms for them along stepping into the design.

As result, according to the big scale of the site in Seville, we arrived to a general *Station*

idea (an energy island) that contains three smaller *Stations* inside. This pilot study can demonstrate that the vast open area of the chosen site, is the potential *Station(s)* to transform the social flow into a vital, interactive and contemplative one.

As closing, rethinking the architecture of renewable-energy power plants led this research through the most creative and alternative given ideas that aim to transform the energetic flow and the social flows and by designing an atmosphere by the means of active architecture placed in the environment, turns the space into a meaningful form and meaningful social activities whether with the space or with each other.

As of a station that transforms the social flows, this research aims to construct a pattern language following Christopher Alexander (1977) with the focus of social and well-being (Dines et al., 2006), rather than economy of energy production in the first place. Using the clusters can fulfill the aim for aesthetics of renewable-energy power plants as well as transforming the social flows to meaningful and sensible activities.

Source of figures

Fig. 1.1: p.28
The Persian horizontal windmill, integrated to the architecture.
Photo by author, January 2008

Fig. 1.2: p.29
The Persian horizontal windmill, in human scale.
Photo by author, Jan 2008

Fig. 1.3: p.30
The Persian horizontal windmill, the first practical windmill.
Photo: Kaboldy's own work, CC BY-SA 3.0

Fig. 1.4: p.31
An overview of a part of the collection of Shooshtar mills and waterfalls, Iran.
Photo by author, February 2008

Fig. 1.5: p.32
Scale of a man in comparison to a regular wind turbine.
Photo: UCS, https://blog.ucsusa.org

Fig. 1.6: p.32
A solar farm covering a large area in landscape.
Photo courtesy of SunEnergy
https://news.mit.edu

Fig. 2.1: p.40
A view to the German Pavilion at the 2015 EXPO Milano.
Designed by SCHMIDHUBER.
Photo by author

Fig. 2.2: p.41

Hexagonal organic photovoltaic

modules Produced by OPVIUS and installed in the German Pavilion at 2015 EXPO Milano. Designed by SCHMIDHUBER.

Photo by author

Fig. 2.3: p.42

A panda-shaped PV project built by Panda Green Energy.

Photo: UNDP

www.pv-magazine.com

Fig. 2.4: p.43

Applications for the integrated PV renewable-energy plants (Wirth, 2020).

Fig. 2.5: p.44

BIG opens Copenhill power plant topped with rooftop ski slope in Copenhagen.

Photo: www.dezeen.com

Fig. 2.6: p.45

Hydro-electric PowerStation by

Becker architekten, Kempten, Germany (2010)

Photo by: Brigida González

www.archdaily.com

Fig. 2.7: p.46

Solar power bikeway, the Netherlands 70 Meters long.

Photo: www.solaroad.nl

Fig. 2.8: p.46

The first solar cycle lane in Erftstadt, Germany: a 90-meter track made up of 150 solar modules that look like cobblestones. Photo: Rupert Oberhauser / Alamy Stock

Fig. 2.9: p.46
The bike lane, covered in solar panels in the middle of a highway in South Korea:
32 km long between two cities
Photo: www.itsmysun.com

Fig. 3.1: p.53
Airport as a significant building type of the space of flows
(Palma De Mallorca Airport, Photo by author,
December, 2018)

Fig. 3.2: p.54
Transformation of the wind flow into a renewable-energy form by converting the rotational motion of the turbine's blades into electricity using a generator
Courtesy of NC Sustainable Energy
association

Fig. 3.3: p.57
Meaning affordances (in color) represented against the design dimensions for placemaking (Hespanhol, 2018).

Fig. 4.1: p.64
An aerial view of the Kowloon Walled City in 1989, Hong Kong
Photo: Ian Lambot cc by-sa 4.0

Fig. 4.2: p.64
Original London bridge
Photo: Peter Jackson, FSA
https://www.ianvisits.co.uk

Fig. 4.3: p.65
Station
Photo: JulianElliott, GettyImages

Fig. 4.4: p.65
Stations: spaces for *transformation of flow*

Fig. 4.5: p.67
The poetry of the skyscraper (sketch by Le Corbusier from Sestoft, Arkitektur, idé og sommenheng)
https://www.idunn.no

Fig. 4.6: p.74
Conception of *Station* as a transformer of flows.

Fig. 4.7: p.76
Land Art Generator: Renewable-energy can be beautiful.
(screenshot: http://landartgenerator.org/)

Fig. 4.8: p.78
Bienniale competition enteries (left to right):
LAGI 2010, Dubai/Abu Dhabi
LAGI 2012, NYC Freshkills Park
LAGI 2014, Copenhagen
LAGI 2016, Santa Monica
LAGI 2018, Melbourne
LAGI 2019, Abu Dhabi
screenshot: http://landartgenerator.org/

Fig. 4.9: p.79
A part of 227 enteries of LAGI 2014 collected from.
(screenshot: http://landartgenerator.org/)

Fig. 5.1: p.86
The Little Mermaid in the foreground of the LAGI 2014 design site.
LAGI 2014 Design Guidelines
Photo: courtesy of Refshaleøen Holding Documen

Fig. 5.2: p.86
LAGI 2014 Design site measures.LAGI 2014 Design Guidelines
Photo: courtesy of Refshaleøen Holding Document

Fig. 5.3: p.87
The Persian horizontal windmill, integrated to the architecture.
Photo by author, January 2008

Fig. 5.4: p.96
The Persian horizontal windmill, integrated to the architecture.
Photo by author, January 2008

Fig. 5.5: p.98
Example of clustering with the master students in the course Research by Design, TUM, Faculty of Architecture
(Photo by author, Dec 2019)

Fig. 6.1: p.247
Position of Sevill in territory and landscape. In the Guadalquivir basin.
Photo: by Port(u*o)s, based on an image of http://www.maps-for-free.com

Fig. 6.2: p.247
Position of the site (Virgen Del Carmen on the left and Charco De La Pava on the right) in regional scale

Fig. 6.3: p.248
Alcázar, Seville
Photo by author

Fig. 6.4: p.248
Plaza de España, Seville
Photo by author

Fig. 6.5: p.248
Sun element in the stairs of Alcázar,Seville
Photo by author

Fig. 6.6: p.248
Architecture of sun and water, Alcázar, Seville
Photo by autho

Fig. 6.7: p.249
North view of Charco De La Pava in relation to the height of the city

Fig. 6.8: p.250
Sequence of city, infrastructure, flat area (the site) and the river from the south view. The western area of Triana and the Charco de la Pava.
Phot: JESÚS MORÓN
https://www.elmundo.es

Fig. 6.9: p.250
Small garden that neighbors have mounted in the infrastructural barrier between social housing (Virgen Del Carmen)and the open area (Charco De La Pava)
Photo by: Marta Franco

Fig. 6.10: p.250
Interview with some members of the Virgen Del Carmen's community (2013).
Photo by: Marta Franco

Fig. 6.11: p.251
Strategy of the energy island

Fig. 6.12: p.252
Nests Island master plan

Fig. 6.13: p.253
South elevation

Fig. 6.14: p.255
Monocrystalline solar cell

Fig. 6.15: p.256-257
Fig 6.15: inside Sivillana Nest, a cozy dance hall

Fig. 6.16: p.256-257
North urban section and Sivillana nest section

Fig. 6.17: p.257
Solar cell construction. Source: GridParity AG - next generation photovoltaic

Fig. 6.18: p.258
Solar cell construction. Source: GridParity AG - next generation photovoltaic

Fig. 6.19: p.259
Bridge elevation and bridge section

Fig. 6.20: p.259
Bridge longitudinal section

Fig. 6.21: p.260-261
The futuristic exhibition ramping to the park and direction of the energy island

Fig. 6.22: p.261
Bridge plan

Fig. 6.23: p.262
Energy floor diagram. Source: https://pavegen.com

Fig. 6.24: p.263
Energy floor at the open swimming pool section

Fig. 6.25: p.264-265
Energy floor at the open swimming pool

Fig. 6.26: p.265
Energy floor at the open swimming pool plan

Bibliography

Christopher Alexander. A pattern language: towns, buildings, construction. Oxford university press, 1977.

Getachew Assefa, and Björn Frostell. Social sustainability and social acceptance in technology assessment: A case study of energy technologies. Technology in society, 29(1): 63–78, 2007.

Guya Grazia Maria Bertelli. OC-Open City International Summer School: Between the city and the river, Architecture of urban relations. Maggioli, 2011.

Gernot Böhme. Atmosphäre: Essays zur neuen Ästhetik. Vol.1. Frankfurt am Main: Suhrkamp , 1995.

Gernot Böhme. The aesthetics of atmospheres. Taylor & Francis, 2016.

Gernot Böhme. Atmospheric architectures: The aesthetics of felt spaces. Bloomsbury Publishing, 2017.

Manuel Castells. The rise of the network society, Vol. 12. John wiley & sons, 2011.

Le Corbusier. Towards a new architecture. Courier Corporation, 2013.

Greig Crysler, Stephen Cairns, and Hilde Heynen. The SAGE handbook of architectural theory. Sage, 2012.

Mihaly Csikszentmihalyi. Flow: The psychology of optimal experience. Vol. 1990.

Harper & Row New York, 1990.

Mihaly Csikszentmihalyi. Flow and the psychology of discovery and invention. HarperPerennial, New York, Vol. 39, 1997.

Mihaly Csikszentmihalyi, and Isabella Selega Csikszentmihalyi. Optimal experience: Psychological studies of flow in consciousness. Cambridge university press, 1992.

Gordon Cullen. Townscape, Reinhold pub. Corp.: New York, NY, USA, 1961.

Patrick Devine-Wright. Reconsidering public acceptance of renewable energy technologies: a critical review. Delivering a low carbon electricity system: technologies, economics and policy, pages 1–15, 2008.

Nicholas T. Dines, et al. Public spaces, social relations and well-being in East London. Policy Press, 2006.

Peter Droege. The renewable city: a comprehensive guide to an urban revolution. Chichester, UK: Wiley-Academy, 2006.

Umberto Eco. Function and sign: Semiotics of architecture in Gottdiener, M. and Lagopoulos, A. Ph.(Eds.) The City and the Sign, 1986.

Klaus Einig and Zaspel-Heisters. Räumlich differenzierte Flächenpotentiale für erneuerbare Energien in Deutschland. Technical Report 08/2015, Bundesministeriums für Verkehr und digitale Infrastruktur (BMVI-Online-Publikation), 2015.

Robert Ferry, and Elizabeth Monoian. A field guide to renewable energy technologies. Land Art Generator Initiative, 2012.

Robert Ferry and Elizabeth Monoian. New Energies: Land Art Generator Initiative, Copenhagen. Prestel Verlag, 2014.

Rolf Kuhn. Internationale Bauausstellung (IBA) Fürst Pückler Land in der Lausit. Landschafts Architekten, 1999

Jan Gehl, and Lars Gemz, et al. Public spaces-public life. Arkitektens Forlag. 2004.

Christopher C Gillis. Still Turning: A History of Aermotor Windmills, Vol. 27. Texas A&M University Press, 2015.

Linda N Groat, and David Wang. Architectural research methods. John Wiley & Sons, 2013.

Mohammadreza Haeri Mazandarani. House, culture, nature. Tehran:Ministry of Rouds and Urban Developement. [in Persian], 2009.

Luke Hespanhol. Making Meaningful Spaces: Strategies for Designing Enduring Digital Placemaking Initiatives. Conference: SAAN:, The First International Conference on Design, Innovation and Creativity. 2018.

Gehl Institute. Twelve quality criteria. Retrieved from https://gehlinstitute.org/wp-content/uploads/2017/08/QUALITY-CRITERIA-FINAL.pdf, 2017.

Susan A. Jackson, and Mihaly Csikszentmihalyi. Flow in sports. Human Kinetics, 1999.

Bryan Jenner, Uwe Flick, Ernst von Kardoff, and Ines Steinke. A companion to qualitative research. Sage, 2004.

Kojin Karatani, Sabu Kohso, and Michael Speaks. Architecture as Metaphor language, number, money. 1995.

Alireza Khaligh and Omer C. Onar. Energy harvesting: solar, wind, and ocean energy conversion systems. CRC press, 2017.

Rem Koolhaas, and Bruce Mau. S, m, l, xl. Monacelli Press, 1998.

Fürst-Pückler-Land, Internationale Bauausstellung, and Bärbel Rechenbach. Projektkatalog/IBA, Internationale Bauausstellung (IBA) Fürst-Pückler-Land 2000 bis 2010. na, 1999.

Elizabeth Monoian, and Robert Ferry. land art generator initiative. In: Gobster, Paul H.; Smardon, Richard C., eds. Visual resource stewardship conference proceedings: landscape and seascape management in a time of change; 2017 November 7-9; Lemont, IL. Gen. Tech. Rep. NRS-P-183., pages 1–19, 2018.

John Montgomery. Making a city: Urbanity, vitality and urban design. Journal of urban design, Vol. 3, no. 1: pages 93–116, Taylor & Francis, 1998.

Charles R. Morris, and Charles H. Ferguson. How architecture wins technology wars. Harvard Business Review, Vol. 71, no. 2, pages 86–96, 1993.

Munjur Moula, Johanna Maula, Mohamed Hamdy, Tingting Fang, Nusrat Jung, and Risto Lahdelma. Researching social acceptability of renewable energy technologies in finland. International Journal of Sustainable Built Environment, Vol. 2, no. 1, pages 89–98, 2013.

Christina Nunez. Renewable Energy, Explained. The National Geographic. Retrieved from https://www.nationalgeographic.com/environment/energy/reference/renewable-energy/, 2019

James O'Shea. Kant's Critique of Pure Reason: An Introduction. Routledge, 2011.

Mohammad Karim Pirnia, and G.H. Memarian. Styles of iranian architecture. Tehran: Sorush Danesh, 2004.

Wolfgang Pomrehn. Heise online. https://www.heise.de, 2020.

Paolo Portoghesi, ed. Dizionario enciclopedico di architettura e urbanistica. Vol. 2, Ist. editoriale romano, 1968.

Friedlind Riedel. Atmospheric relations: Theorising music and sound as atmosphere. In: Music as Atmosphere: Collective Feelings and Affective Sounds. pages 1-42, Routledge, 2020.

Ziyad Salameh. Renewable energy system design. Academic Press, 2014.

Kurt Schmitz, and Alfred Voß. Energiewende?: Analysen, Fragen und Anmerkungen zu dem vom ÖKO-Institut vorgelegte "Alternativ-Bericht". [German], 1980.

Sören Schöbel. Windenergie und Landschaftsästhetik. Jovis Verl., 2012.

Sören Schöbel-Rutschmann. Semantik sozialer freiraumplanung. pages 187-191, 2000.

Kanyinke Sena. Renewable energy projects and the rights of marginalised/indigenous communities in kenya. International Working Group for Indigenous Affairs report, Vol. 21, 2015.

Georg Simmel. Bridge and door. Theory, Culture & Society, Vol. 11, no. 1, pages 5–10, 1994.

Bent Sørensen. Renewable energy conversion, transmission, and storage. Elsevier, 2007.

Felix Stalder. Manuel Castells: The theory of the network society. Polity, 2006.

Elizabeth Stamp. Architectural digest. https://www. architecturaldigest.com, 2020.

Sven Stremke and Jusuck Koh. Ecological concepts and strategies with relevance to energy-conscious spatial planning and design. Environment and Planning B: Planning and Design, Vol. 37, no. 3, pages 518–532, 2010.

Sven Stremke, and Andy van den Dobbelsteen. Sustainable energy landscapes: designing, planning, and development. CRC Press, 2012.

Lehana Thabane, Jinhui Ma, Rong Chu, Ji Cheng, Afisi Ismaila, Lorena P. Rios, Reid Robson, Marroon Thabane, Lora Giangregorio, and Charles H Goldsmith. A tutorial on pilot studies: the what, why and how. BMC medical research methodology, Vol. 10,

no. 1, Pages 1-10, 2010.

Thomas Thiis Evensen. Archetural Archetype. Norwegian University Press, 1987.

Tobias Kelm, Jochen Metzger, Anna-Lena Fuchs, Sven Schicketanz, Dieter Günnewig, and Miron Thylmann. Untersuchung zur Wirkung veränderter Flächenrestriktionen für PV-Freiflächenanlagen. Kurzstudie im Auftrag der innogy SE, 2019.

Jessie Turnbull. Toyo Ito: forces of nature. Chronicle Books, 2012.

Ungers Oswald Mathias. Morphologie: city metaphors. Cologne, Walter König, 2011.

Charles J. Walker. Experiencing flow: Is doing it together better than doing it alone? The Journal of Positive Psychology, Vol. 5, no.1, pages 3–11, 2010.

Kerstine Appunn Freja Eriksen Julian Wettengel. Clean energy wire. https://www.cleanenergywire.org, 2020.

Harry Wirth. Recent Facts about Photovoltaics in Germany, Fraunhofer ISE, download from https://www.pv-fakten.de, version of January 7, 2020

Peter Zumthor, and Iain Galbraith. Atmospheres: Architectural Environments, Surrounding Objects. Birkhäuser, 2006.