A landscape perspective on the green energy transition

– threat or future lifeline?

Anders Larsson, SLU Alnarp

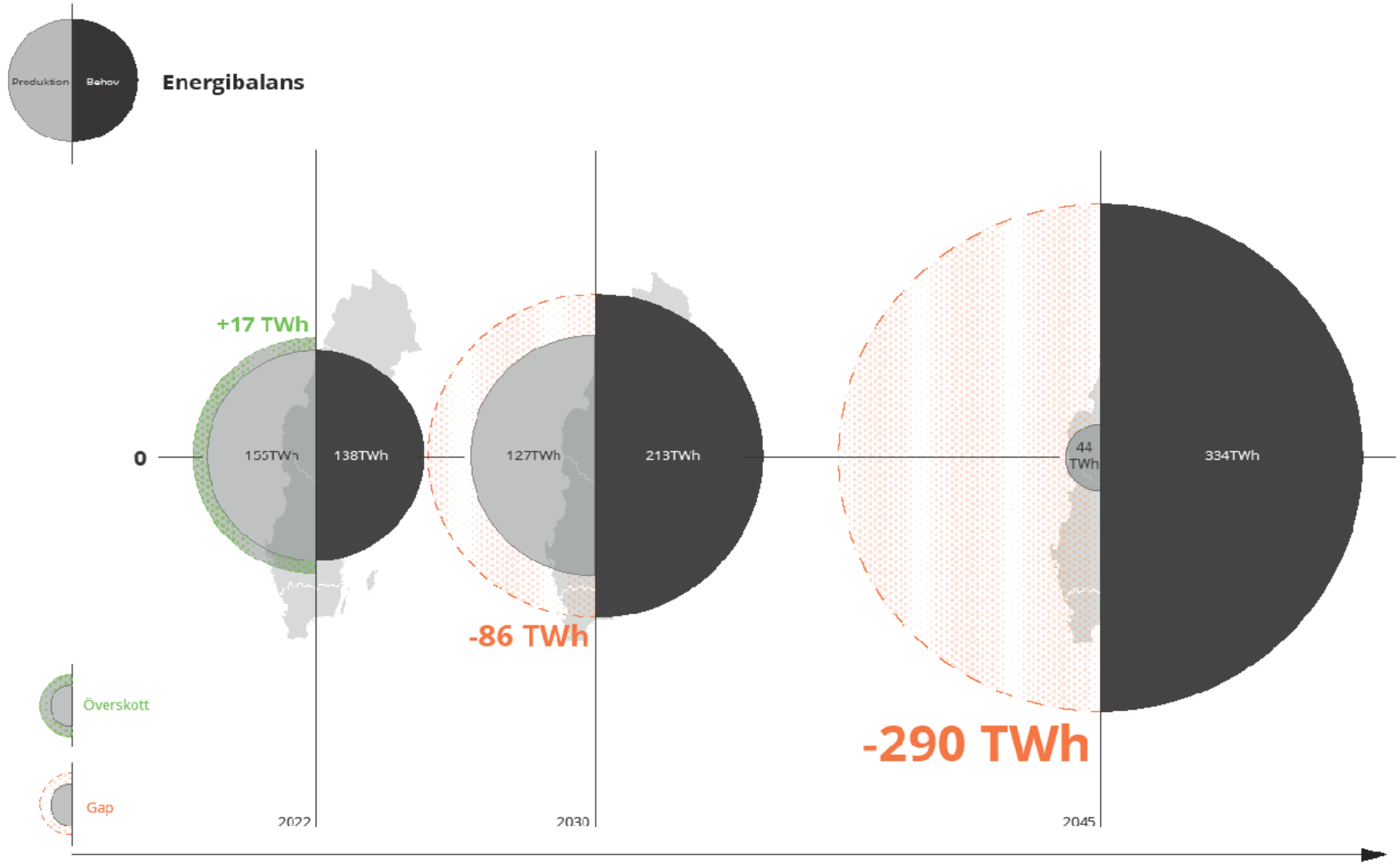
Some things we might, or might not, discuss today:

- Really “green”, or just another shade of grey?
- “Grey” as in rare earth minerals and exploitation?
- Global or local sources, pros and cons for local population?
- Energy savings – part of the “green energy transition”?
- Maybe GHG is the problem, not energy?
- Multifunctional land use (biodiversity, carbon sequestration)?

Some personal statements:

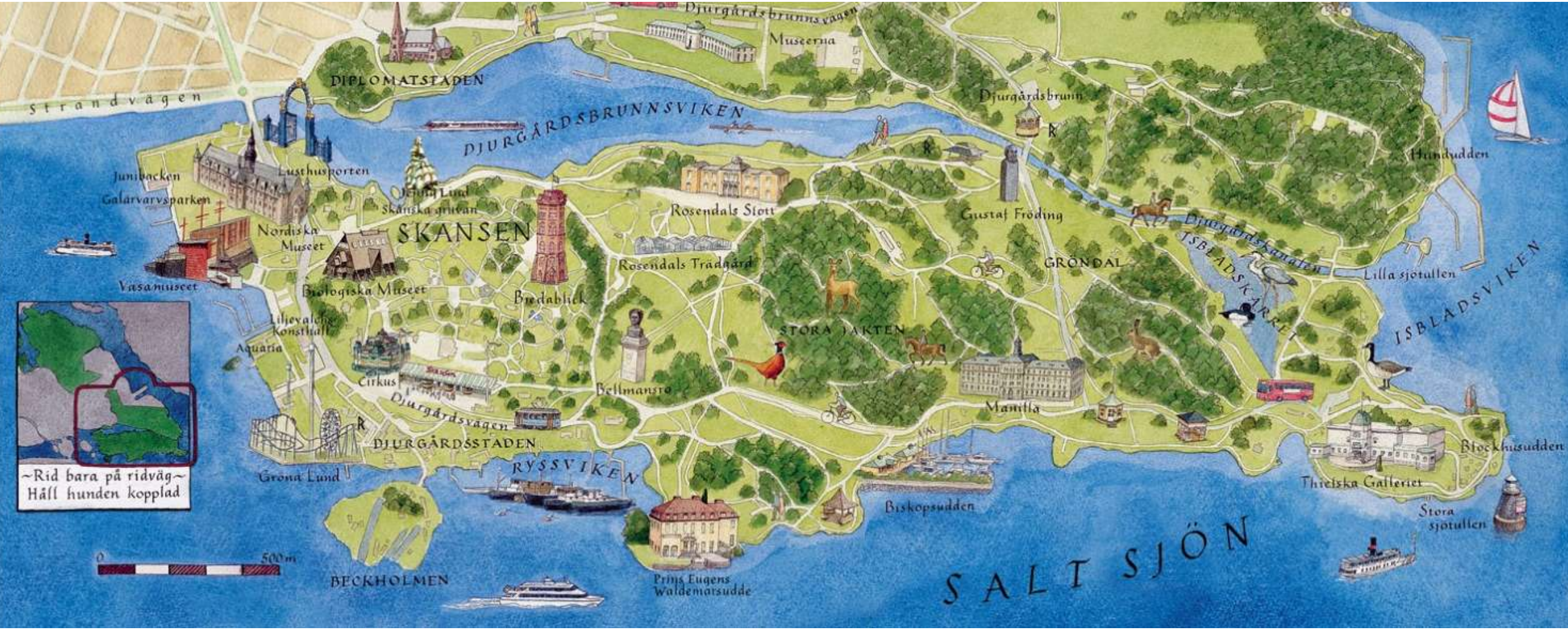
- Climate change is real and both causes and consequences are of top priority to deal with for landscape architects.
- Thus, an energy transition from fossil to post-fossil energy systems is necessary.
- Top priority for a green energy transition must be social, spatial and ecological justice & sustainability.

Consumption versus production - The Swedish case: Energy demand until 2045 about to double, while production decreases



LABLAB

Djurgården, Stockholm

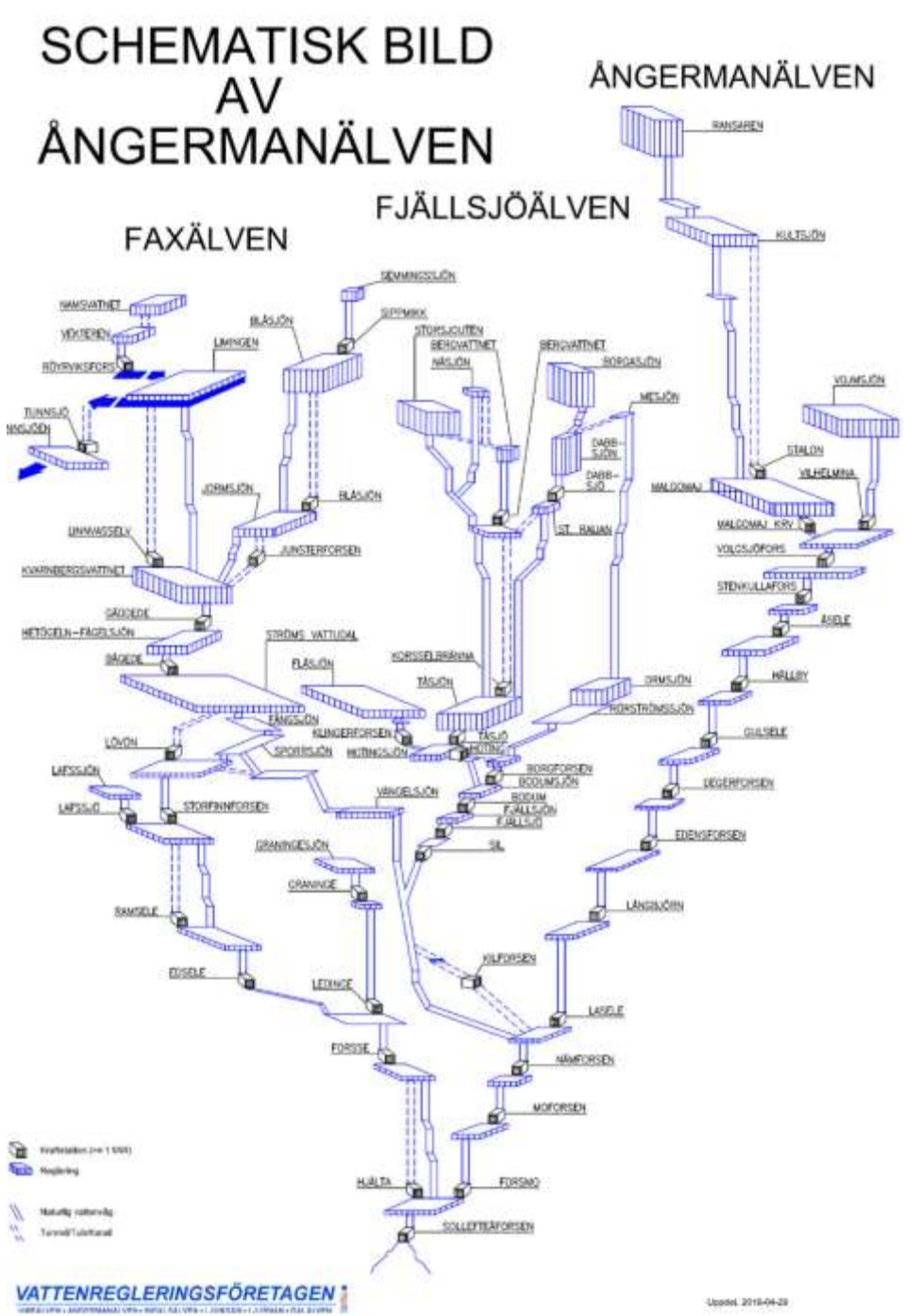



3400 större vindkraftverk, vardera med maxeffekt 6 GWh, skulle uppta 212 kvadratkilometer mark. Det på grund av säkerhetsavståndet på 500 m mellan vindturbinerna. Totalt motsvarar Stockholms läns elkonsumtion 3400 vindturbiner, dvs omkring 100 Djurgården.
0
7,5
15 km

LABLAB

Wind park west of Piteå, Northern Sweden

Dams and hydroelectric power plants along a large river system in northern Sweden



1. Schematisk bild av Ångermanälven med kraftverk och dammar. Figur skapad av Vattenregleringsföretagen

Planetary Mine

Territories of Extraction under Late Capitalism

Martín Arboleda

A video shows the extent of the BYD mega factory in Zhengzhou, China.

Stunning drone footage has revealed the sheer scale of Chinese automaker BYD's vast electric vehicle (EV) mega factory in Zhengzhou, Henan province, that is reportedly larger than the entire city of San Francisco.

The Swedish case: local versus global issues in the green energy era

- Earlier: Devastating for the local population, not at least the indigenous Sami population and their very landscape situated culture. No or few global consequences.
- Today: Devastating for the local population, in other countries. Great for Swedes to have solar panels and electric cars.
- But what about landscape, countryside, multifunctional land-use etc?

This is what we study in the Studio Project Large Scale Structures, Analysis & EIA – theme: Green Energy Transition

- Group work, testing & understanding landscape character assessment, energy issues, environmental and social impact
- Excursions and seminars, reading literature and exploring regional landscapes & large-scale interventions
- Learning from national and international experts
- Individual project

Figure 12: Illustration by Emilia Rodriguez (2026).

Figure 13: Illustration by Emilia Rodriguez (2026).

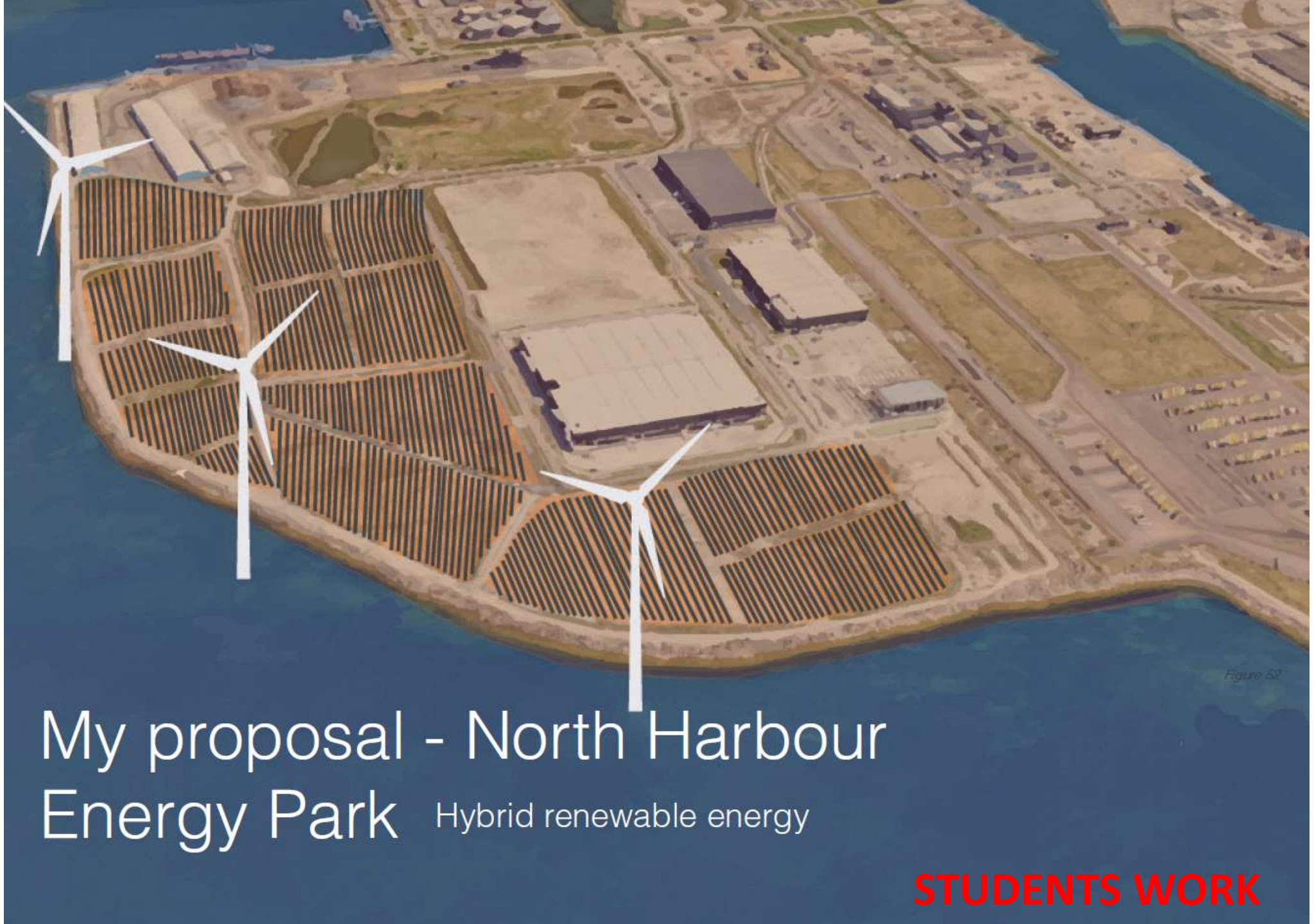
Figure 14: Illustration by Emilia Rodriguez (2026).

Figure 15: Illustration by Emilia Rodriguez (2026).

Figure 16: Illustration by Emilia Rodriguez (2026).

Figure 17: Illustration by Emilia Rodriguez (2026).

STUDENTS WORK



My proposal - North Harbour Energy Park

Hybrid renewable energy

STUDENTS WORK

Image from Uniper's website: https://www.uniper.energy/sverige/nyheter/ny-milstolpe-foer-barsebaeck-clean-energy-park/

Illustration adapted from Wikipedia (2014). Source: Wikipedia, Barsebäck flygbild 06 september 2014. https://sv.wikipedia.org/wiki/Fil:Barsebäck-flygbild_06_september_2014.jpg

STUDENTS WORK

Illustrative images generated using Adobe Firefly (AI). Images are conceptual.

STUDENTS WORK

Clear cut corridors in forested landscape

Forest corridors are very noticeable when standing within or along the sight-lines of the corridor. You can also see a dip in the tree silhouette seen from an open landscape on the left image. From other angles, the surrounding trees can instead obscure the clear-cut area, effectively hiding the power lines from view. Google street view.

Power lines in open landscapes

In an open landscapes, power lines are visible from longer distances and stand out more prominently against the sky. However, the wire zone corridor is not noticeable and usually existing land uses, such as farming, can continue beneath the lines. Left photo: Lundberg (2012), right photo: Öquist (2015).

SI – Baltic Sea cooperation

LEADING PARTNER:

- LABLAB, Sweden

PARTNERS:

- SLU Alnarp, Sweden
- Region Dalarna, Sweden
- Valga Municipality, Estonia
- Linnalabor, Estonia
- Institute for Agricultural and Environmental Sciences, Estonia
- Institute of Contemporary Art, Design and Architecture of the Art Academy of Latvia
- Saldus Municipality, Latvia
- European Humanities University, Lithuania
- Architekturos Fondas, Lithuania

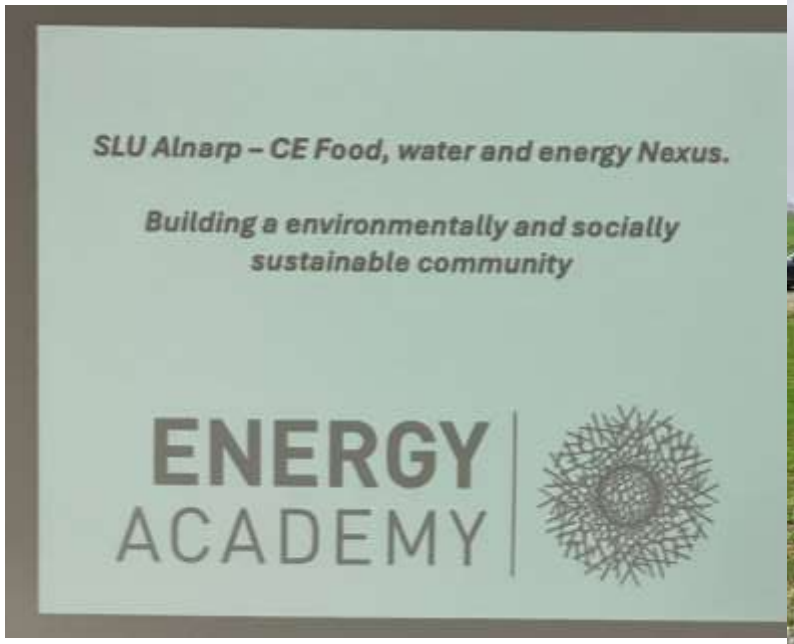
ASSOCIATED PARTNERS:

- IBA Thüringen in Germany
- The secretariat of VASAB, Latvia
- Virserums Konsthall, Sweden

Samsö/SLU Urban Futures:

From regenerative food-energy-water islands to circular cities and regions

As part of a transdisciplinary team including researchers from SLU and the research and design think tank, Lablab, the project will explore the driving factors in the community of Samsö in Stockholm for moving towards an energy island with the goal of securing relevant infrastructure for everyday life on the island. Through a series of study visits and workshops, the project will explore how interventions can be scaled up to city and region scales.



Samsö:

Straw residues used for heating

Biogas and other multifunctional land use?

- Harvest of catch crops + biogas = triple-positive climate effect – really green energy, reducing our dependence on Russian gas & Chinese solar panels.
- Rewetting of agricultural land on organic soils (3% of land in Europe, 25% of GHG from agriculture) – can be combined with paludiculture, energy crops (or PV).
- Local form of energy, local labor and economic gain for land owner, combination with no-till farming reduces energy consumption further.

Living Labs

Halland

Rapeseed stalks in October 2025

- Collaboration with local farmers and biogas producers – a strong team right from the beginning
- Harvest of various biomasses during summer and autumn:
  - green biomass from protection zones at watercourses,
  - chaff from cereals – new harvesting equipment,
  - rapeseed straw,
  - green rapeseed biomass in October 2025 – full rapeseed harvest in August 2026?
- Samples taken for BMP lab tests
- Farmers Conference 4-5th November at Billingehus
- Second WS with LL-stakeholders Halland 12th November

Living Lab

Midtjylland

- ✓ Field trials with cover crops
- ✓ Testing sowing dates, fertilisation, harvesting dates, nutrient leakage, biomass growth…
- ✓ LL Interest group with farmers, biogas companies and others
- ✓ Visits from Nature Energy / Shell Low Carbon, Novo Nordisk
- ✓ Samples of harvested biomass to BMP-tests (AU)

Biogasanläggningen i Jordberga är störst i Sverige idag. Foto: Malin Thelin/Sveriges Radio.

SKÅNE

Nya biogasanläggningar planeras i Skåne

▶ 2 min

Publicerad 30 sep 2022 · kl 19:15 · 1:36 min

- Alla blir större än Sveriges största anläggning Jordberga.

Land4Climate

LAND4CLIMATE

Land4Climate samler aktører på tværs af Øresund og løfter opgaven på tværs af arealdagsordener. Nye værktøjer, mere vidensdeling og et multifunktionelt fokus på arealer. Alt det – og mere til – er fokus i projektet Land4Climate. En fælles indsats, der vil sætte skub under udtagning af lavbundsjorder.

Interreg

Medfinansieret af
Den Europæiske Union

Öresund-Kattegat-Skagerrak

LTV-fakultetens faktablad

2026:2
DOI: https://doi.org/10.54612/a.7c7pgv60vh,
Institution för landskapsarkitektur, planering och förvaltning
Alnarp

Potentialer för kolinlagring inom jordbruket

– delrapport från projektet ”Klimatneutrala Lund och Lomma 2030” (Viable cities)

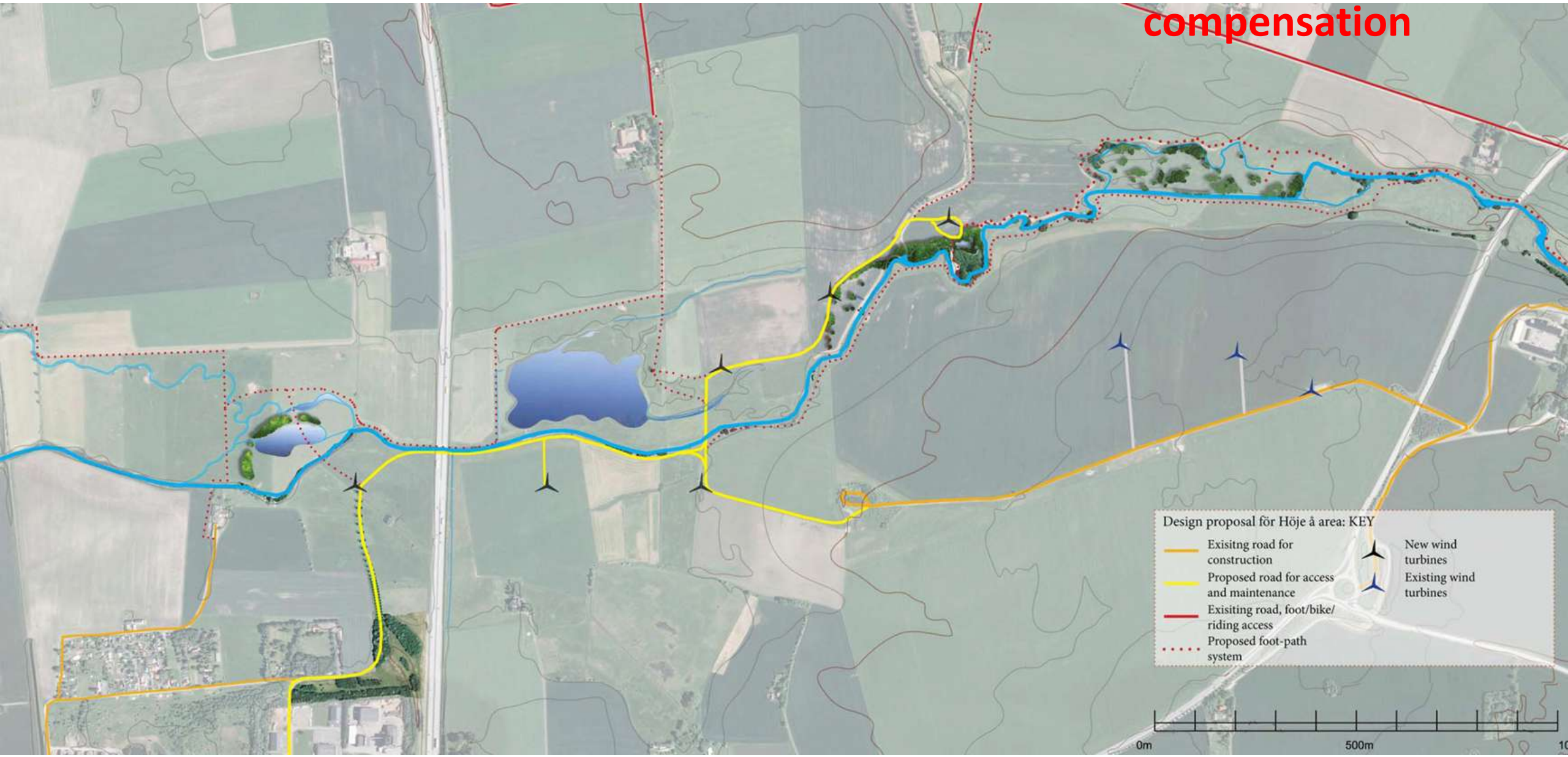
Författare: Anders Larsson, Sven-Erik Svensson

Jordbruket står för en stor del av de nationella utsläppen av växthusgaser (ca 13 %), men det finns också en stor potential gällande att minska utsläppen och öka kolinlagringen. Inom projektet ”Klimatneutrala Lund och Lomma 2030” (Viable cities) har SLU Alnarp haft i uppdrag att undersöka hur kommuner kan arbeta med denna fråga. Ämnet har sina särskilda utmaningar eftersom kommunerna inte har egen rådighet över jordbruksmarken. Därför måste arbetet ske i samverkan med markägare och med hänsyn till olika markägares unika situation gällande mark, utrustning m.m. I denna rapport fokuserar vi på såväl rådighets- och rådgivningsfrågor som olika konkreta metoder för ökad kolinlagring.

Some thoughts on the landscape perspective:

- Consider multifunctional land use and possible added value
- Since planning is exploitation driven, compensation measures should be mandatory – if solar farm on former peat excavation site, then rewetting should be obligatory – if wind farm, then money for nature restauration should be set aside
- Design aspects are important – also consider landscape character and possible energy savings

STUDENTS WORK - compensation



STUDENTS WORK – off-shore wind in combination with artificial reef

ALTERNATIVE 2

The map on the left shows how the second alternative could take shape. Eighteen wind turbines arranged in a hexagonal pattern would capture wind efficiently, but here the layout is explored only on a conceptual level. By allowing the old foundations to remain and supplementing the new wind turbines with artificial reconstructions, a larger area of hard-bottom structures is created. Below are images from a reference project in Ørsted, where artificial reef structures are placed between the wind turbines to support marine life and help the seabed recover more quickly after the construction phase. The images are taken from Windpower Monthly.

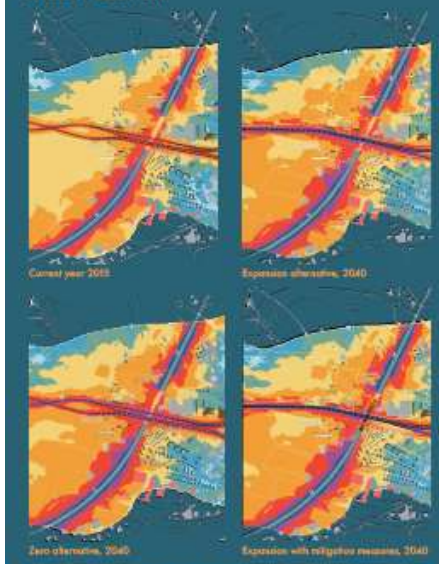
STUDENTS WORK – multifunctionality and more

SUBURAN AREA

The Suburban area is the area between the urban area and the rural area. This area contains mostly industries, offices but also some residential buildings. The highway E4 goes on a bridge that crosses the train track. The suburban area has a more industrial atmosphere and as there are not as many people moving here, the visual and the safety impact will not be as highly important as in the urban area.

The new high speed railway will mostly be drawn in the same stretch as the existing one, except in the western part, where the tracks will be drawn slightly differently.

NOISE POLLUTION

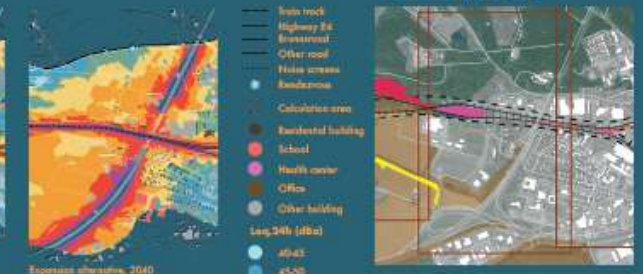


Current year 2015: Since there are not as many residential properties in the suburban area, the area is not as sensitive against noise pollution as the urban area. But there are still some exposed residential properties and offices close by the track.

Zero alternative: Regarding the zero alternative, the noise pollution situation is similar as to the urban area. Since the traffic will increase over the years, the noise pollution will increase as well. This means that the noise pollution in the zero alternative will be higher compared to the current situation in terms of equivalent sounds level.

Expansion alternative, 2040: In the expansion alternative, the tracks are given a partly different stretch. The new tracks will have a more direct direction on the west side of the highway, compared to the existing one. As in the urban area, the noise pollution will be comparable to the zero alternative, due to increasing train traffic, and higher than the current situation. Although the noise levels in this alternative will be comparable to the zero alternative for several residential buildings, the guideline value for equivalent is exceeded.

CLAIMED LANDSCAPE



The expansion of the train tracks will affect some nature values within class 2 and 3. The Suburban area also includes parts of the biotope protected area, but these areas are not within the train track area. The nature class 2 and 3 contains following:

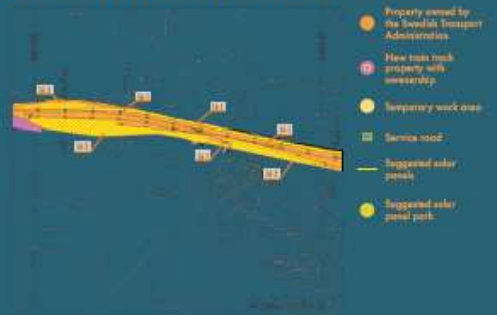
- Gravelly sandy backmeadow soil, high nature value
- Deciduous forest, indicatable nature value
- Parts of flowery slope with herbs and a high value of ecosystem with honeybees and other insects, very high value

Expansion alternative with mitigation methods 2040: Mitigation methods for the noise pollution is suggested in 3 places in order of noise absorption screens. By placing the noise screens the equivalent noise level will be around 55-65 dB(A), which is within the guideline value. The screens are only placed in connection to residential buildings, not offices or other buildings.

NOISE FROM PARKED TRAINS

The map on the left shows where the trains will be parked during night time. At most, there will be about two trains at the same time per night. The fans from the trains will be activated during night time and therefore cause noise pollution. Because the noise from the train tracks are considered as industrial noise, the equivalent noise level for outdoor close to residential households will be applied. According to the Swedish Environmental Protection Agency, the guide value must not exceed 40 dB(A) at night. It is known that the fans from the trains will be switched on 75 percent of the time between 22-06, and even though the noise screens north of the track will be built, the guideline value of 40 dB (A) at night, is barely managed.

DESIGN AND MITIGATION SOLUTION



CALCULATIONS

SA1:
Measurement (height x width, area:) 2,4 x 1382 m = 3317 sqm
Mounting: Noise screens. Angle: 90 degrees. Direction: 190 degrees
Note: Vertically mounted all-black solar panels in "landscape" mode", with a height of 2,4-2,7 m

Efficiency: 74% (compared to optimally inclined solar panels facing due south)

Total amount of 1600 SunPower Maxeon3 Black 410 W panels
Power and annual yield: 656 kW peak power, 542 MWh average annual yield

SA2:
Measurement (height x width, area:) m x m = 0 sqm
Mounting: Ground montage. Angle: 35 degrees. Direction: 180 degrees.
Note: Calculations on the amount of ground mounted solar panels are based on a distance between rows for no shading at mid winter solstice, on horizontal ground.
Each SunPower Maxeon2 500W solar panel then needs, on average, 8,29 sqm ground.
Total area: 4200 + 26500 + 5400 sqm = 36 100 sqm => approximately 4350 solar panels

Efficiency: 100% (optimally inclined solar panels facing south)

Total amount of 4350 SunPower Maxeon3 500 W Commercial panels
Power and annual yield: 2175 kW peak power, 2425 MWh average annual yield

Calculations of the suggested solar panels have been made by the help of Sunny Future.

DESIGN PRINCIPLES

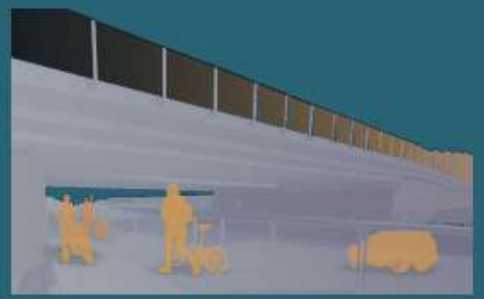
The suburban area enables more space for placing solar panels, than the urban area. Within the marked train track property there will be a lot of space that we call "dead space". These spaces are just areas that have to be there due to safety reasons and are not accessible for the public. For e.g. it has to be approximately 20-25 m of "safety zones" on each side of a high speed railway, where humans and animals are not allowed to access and also there cannot grow any high trees or vegetation. These spaces would be perfect to place solar panels.

The visual impact will not be as important as in the urban area, because there are not as many people that will see the solar panels in the suburban area. In the suggestion SA1, the solar panels are combined with the noise screens. The panels will be placed in a row of a height of 2,4-2,7 meters and will be visible for the train passengers. Therefore the model, SunPower Maxeon 3 Black, is suggested because these panels have the most appealing visual impact. The bigger areas in SA2, which are further away from the urban area and not as visually important, the model, SunPower Maxeon 5 is suggested.

These solar panels will still be visual from the train window, and hopefully, the vision of solar panels will have a positive impact on the passengers and give a feeling of a modern and sustainable environment.

Since the areas in SA2 are much bigger, several rows of solar panels can be placed. This is mentioned as solar panel parks. All the panels will be placed in rows with an east-west direction and the solar panel surface will face south to gain as much solar energy as possible.

The solar panels in SA1 are combined with the noise screens that are suggested in the design proposal. The solar panels will not just have the same function as the noise fences regarding absorbation of the noise pollution, they will also generate renewable energy. The solar panel parks are also placed in areas where there are no noise screens planned, and will therefore absorb noise that was not planned for in the design proposal. For example, the noise pollution from the parked trains will most likely decrease and the residential households in the south part of the tracks will manage the guideline value with bigger margins than without the solar panels.



NOISE POLLUTION MITIGATION

The map shows the noise pollution after the placement of solar panels. Since the solar panels also have a noise absorbing effect, the sound level will decrease in some areas.

FlexAgri Fruit Solar Structure Design for Agrivoltaics and Fruit Trees (Voestalpine Sadef)

STUDENTS WORK – agri- & biovoltaics

Image of Pollinator-friendly Flowers Blooming at Denison University's Solar Array in Ohio, 2019 (Denison)

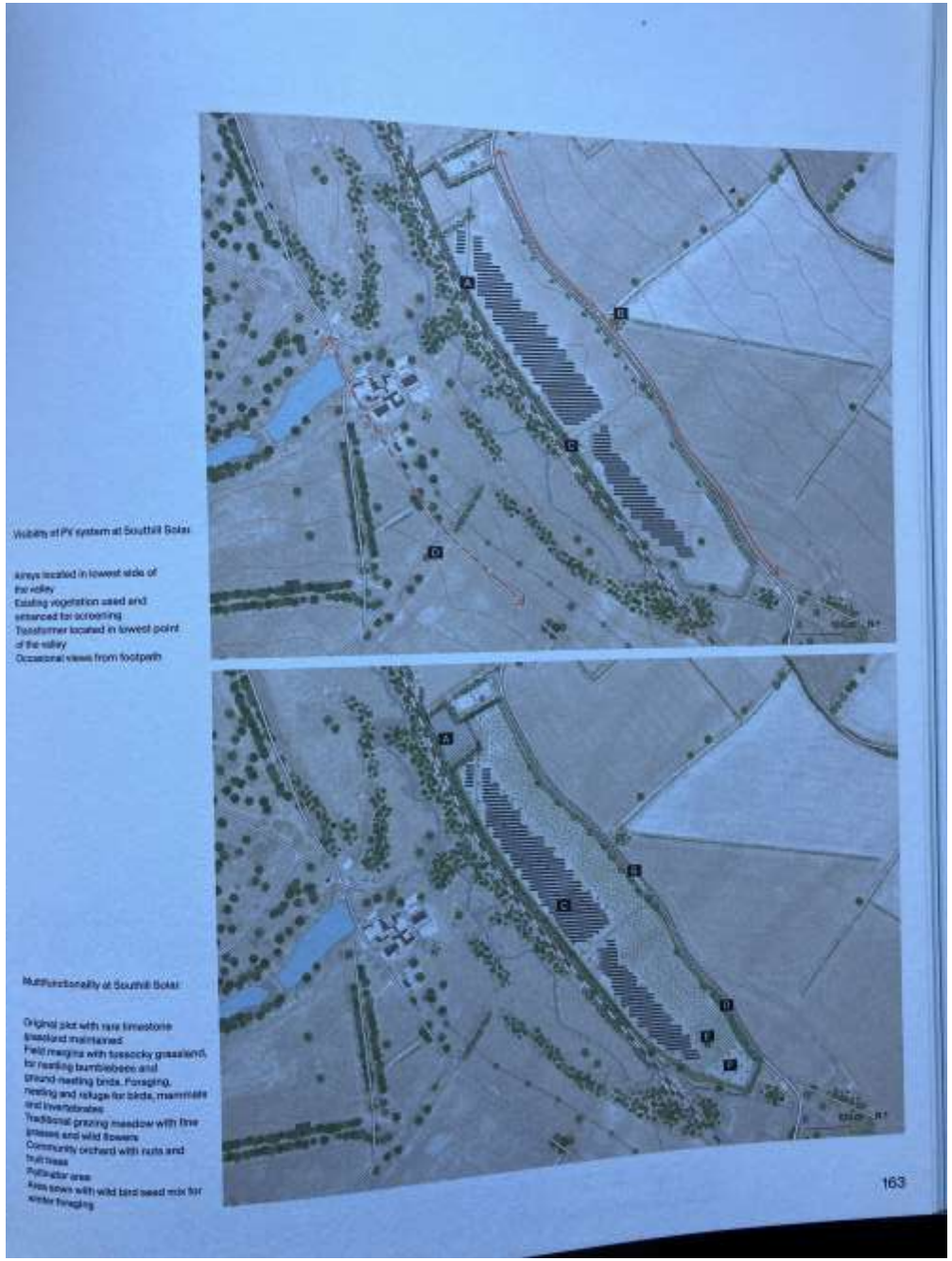
Solar Mountain (design proposal)
- adjacent to Burning Man’s location, at Black Rock City

POWER OF LANDSCAPE

Sven Stremke, Dirk Oudes, Paolo Picchi

Novel Narratives to Engage with the Energy Transition

nai010 publishers



The green energy transition - Threat or future lifeline?

- If like today – then often threat
- *But possibilities are enormous:*
  - Multifunctionality and added landscape value
  - Economic benefits to local communities
  - Exiting design possibilities
  - Ecological & climate benefits