



$\frac{\text{kWh}}{\text{m}^2}$

DIRK SIJMONS

---

# LANDSCAPE AND ENERGY

---

DESIGNING TRANSITION

nai010 publishers



# LANDSCAPE AND ENERGY

---

**DESIGNING TRANSITION**

Edited by Dirk Sijmons  
Jasper Hugtenburg, Fred Feddes  
and Anton van Hoorn



**nai010 publishers**

$$\frac{\text{kWh}}{\text{m}^2}$$



kWh/m<sup>2</sup> is an initiative of  
Dirk Sijmons and H+N+S Landscape Architects

## **06 NETWORK AND STORAGE**

---

- 326 Footprints
  - 326 Electricity Network
  - 328 Heat Network
  - 330 Gas Network
  - 332 Electricity Storage
  - 334 Thermal Energy Storage (TES)
  - 336 Fuel Storage
  - 338 Survey
- 340 Case Study / The Northern Netherlands

## **TECHNOLOGICAL TRANSITION**

---

- 366 The Technological Transition
- 368 Essay / The Technological Landscape

## **07 HUMAN SCALE**

---

- 384 Case Study / Household Consumption

## **EMOTIONAL TRANSITION**

---

- 398 The Emotional Transition
- 400 Essay / The Emotional Landscape

## **08 EPILOGUE**

---

- 414 Epilogue

## **APPENDIX**

---

- 420 Lexicon
- 424 Bibliography

## **CREDITS**

---

- 430 Credits







# CONTENT

## 01 INTRODUCTION

---

- 10 The Reciprocity of Energy and Space

## 02 PAST, PRESENT AND FUTURE

---

- 24 Past / A Brief History of High-Energy Life
- 50 Present / Introduction to the Knowledge of Energy Use and Energy Chains
- 70 Future / Spatial Scenarios for the Energy Transition
- 86 Case Study / Europe

## 03 ELECTRICITY

---

- 114 Footprints
  - 114 Nuclear Power
  - 118 Coal
  - 122 Lignite
  - 126 Waste Incineration
  - 130 Hydropower
  - 134 Solar
  - 138 Wind
  - 142 Survey
- 144 Case Study / Arnhem

## MOBILITY TRANSITION

---

- 170 The Mobility Transition
- 172 Essay / The Mobility Landscape

## 04 HEAT

---

- 192 Footprints
  - 192 Geothermal Energy
  - 196 Residual Heat
  - 200 Peat
  - 204 Natural Gas
  - 208 Shale Gas
  - 212 Biomass
  - 216 Survey
- 218 Case Study / Rotterdam

## ECONOMIC TRANSITION

---

- 248 The Economic Transition
- 250 Essay / The Economic Landscape

## 05 FUEL

---

- 266 Footprints
  - 266 Petroleum
  - 270 Tar Sands
  - 274 Biofuel
  - 278 Algae
  - 282 Survey
- 284 Case Study / The 'Green Metropolis'

## POLITICAL TRANSITION

---

- 308 The Political Transition
- 310 Essay / The Political Landscape

原  
书  
缺  
页  
第  
1  
—  
8  
页





















01

---

INTRODUCTION



## INTRODUCTION

THE RECIPROCITY OF  
ENERGY AND SPACE

Just as energy and mass are linked in Albert Einstein's famous formula  $E=mc^2$ , energy and space can also be seen in relation to each other. Throughout human history, there has been a notable interaction between the use of energy and the use of space, between the production of energy and spatial design. To work the earth – to mine, to organize, operate and redesign it – major energy investments have been made, via human and animal muscle power, and also with the help of machines that are powered by fuels. Conversely, for every form of energy generation, spatial interventions are required, and every form of energy has a spatial footprint. Ever since the taming of fire, trees have been felled, and even entire regions have been deforested to get fuel. Fossil fuels such as coal, oil and gas are 'solidified sunshine', and they need to be released, dug up, drilled and pumped out of the earth, and then transported and processed. The ditches and peat-bogs in the Dutch landscape are the silent witnesses to the peat extraction of the past. Open-pit mines for lignite and coal are among the largest human artefacts.

In the reciprocal relationship between space and energy, it cannot unambiguously be said which is leading, and which is following; it might be both. When we want to work the earth in a certain way, we look for the appropriate type and amount of energy. And once we have access to a large source of energy, we think of new applications that we previously could not have imagined. Energy and space change each other, and they change together over the course of history. It is not far-fetched to divide human history into periods based on the dominant form of energy, and each energy period also has its own characteristic spatial manifestations. We can characterize the period beginning in about 1800 as the era of 'fossil expressionism'.<sup>1</sup>

---

1 Term borrowed from German philosopher Peter Sloterdijk.