MACHINIC UTOPIAS,
AUTOMATED FUTURES
SCENARIOS OF POTENTIAL
AUTOMATED FUTURES IN WESTLAND

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SPATIAL IMPLICATIONS | TERRITORIAL TRANSFORMATIONS
LARGEST GREENHOUSE CLUSTER IN THE NETHERLANDS

+700 HORTICULTURAL COMPANIES

60,000 JOBS RELATED TO GREENHOUSE HORTICULTURE

2,417,000,000 MLN EUROS PRODUCTION VALUE OF WESTLAND OOSTLAND GREENPORT

Ruimtelijke verdiencapaciteiten
Greenport Westland-Oostland

Greenport Westland-Oostland | Province Zuid-Holland | Gemeente Westland
LEI Wageningen UR | BVR Adviseurs | Van Bergen Kolpa Architecten

Werkboek Westland
RIJMTIJK EKONOMISCHE STRATEGIE GREENPORT 2.0
HOT- GATTOLET INTRA-ENERGIE-PUINT

PROPOSED VISIONS FOR GREENPORT & WESTLAND
GREENPORT WESTLAND & MUNICIPAL VISION

BACKGROUND | CULTIVATION

WESTLAND TOTAL AREA.  9058 HA
TOTAL PRODUCTIVE AREA.  5237 HA
PERCENTAGE PRODUCTIVE AREA  58%
TOTAL GREENHOUSE AREA.  3251 HA
GOALS OF GREENHOUSE OWNERS

- Increasing Production
- Reducing Production Costs
- Maintaining competition in the market
- Increasing Market Shares
- Expanding Greenhouses
- Differentiating Products
- Reducing Labor Costs
- Expanding Greenhouses
- Renewable energy and water costs by shifting to sustainable practices
- Accessibility
  - Enhancing accessibility, flow, and connectivity
- Product Diversity
  - Diversity and variety of products
MACHINIC UTOPIAS, AUTOMATED FUTURES
GREENPORT WESTLAND & MUNICIPAL VISION

COMMON GOALS

ACCESSIBILITY
ENHANCING ACCESSIBILITY, FLOW AND CONNECTIVITY

RENEWABLES
ACCELERATE ENERGY TRANSITION AND SHIFTING TO RENEWABLE RESOURCES

LEADING POSITION
MAINTAINING THE GREENPORTS’ LEADING POSITION

DIFFERENTIATING PRODUCTS

INCREASING PRODUCTION

BUNDLING ACTIVITIES

LIVABILITY
AND ENHANCING LIVABILITY AND SUSTAINABILITY

AGRICULTURE AREAS
ACCELERATE ENERGY TRANSITION AND SHIFTING TO RENEWABLE RESOURCES

INNOVATION
STRENGTHENING KNOWLEDGE AND INNOVATION

GREEN + BLUE INFRASTRUCTURE
IMPROVING ECOLOGICAL CORRIDORS AND GREENBLUE INFRASTRUCTURE

SOCIAL COHESION
MAINTAINING SOCIAL COHESION AND IDENTITY

PRODUCT DIVERSITY
DIVERSITY AND VARIETY OF PRODUCTS

COMMON GOALS MUNICIPAL GOALS GROWERS’ GOALS

EXPANDING GREENHOUSES

REDUCING PRODUCTION COSTS

REDUCING LABOR COSTS

INCREASING MARKET SHARES

INCREASING HOUSING STOCK

MODERNIZING AND RESTORING OF GREENHOUSES

STRENGTHENING KNOWLEDGE AND INNOVATION

MAINTAINING SOCIAL COHESION AND IDENTITY

DIVERSITY AND VARIETY OF PRODUCTS

COMMON GOALS MUNICIPAL GOALS GROWERS’ GOALS
THE GREAT DECOUPLING
**PROPONENTS**

- *The Fourth Industrial Revolution*
  - Klaus Schwab

- *Mastering the Robot: The Future of Work in the Second Machine Age*
  - Robert Blasi

- *The Inevitable* (German edition)
  - Kevin Kelly

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**OPPONENTS**

- *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies*
  - Erik Brynjolfsson
  - Andrew McAfee

- *RISE OF THE ROBOTS: TECHNOLOGY, AND THE THREAT OF Ajobless Future*
  - Martin Ford

  - Jeremy Rifkin

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**THE DEBATE ON AUTOMATION**
DECOUPLING | LABOR VS. PRODUCTIVITY

THE GREAT DECOUPLING IN THE DUTCH AGRICULTURE SECTOR
DECOUPLING | SPACE VS. OWNERSHIP

THE GREAT DECOUPLING IN THE DUTCH AGRICULTURE SECTOR
TECHNOLOGIES

SPADING FORK
DISK HARROW
CONVEYOR BELTS
AUTOMATED SORTING SYSTEMS

GREENHOUSE SIZE & TYPE

FRAME AGAINST BRICK WALL
VINERY
HEATED GLASSHOUSE COMPLEX
HI-TECH VENLO GREENHOUSE

GROWTH OF HORTICULTURAL CLUSTER

TIME
COMMON GOALS

ACCESSIBILITY
Enhancing accessibility, flow and connectivity

RENEWABLES
Accelerate energy transition and shifting to renewable resources

LEADING POSITION
Maintaining the greenports’ leading position

DIFFERENTIATING PRODUCTS

INCREASING PRODUCTION

BUNDLING ACTIVITIES

LIVABILITY
And enhancing liveability and sustainability

AGRIBUSINESS AREAS
Accelerate energy transition and shifting to renewable resources

INNOVATION
Strengthening knowledge and innovation

GREEN + BLUE INFRASTRUCTURE
Improving ecological corridors and greenblue infrastructure

SOCIAL COHESION
Maintaining social cohesion and identity

PRODUCT DIVERSITY
Diversity and variety of products

COMMON GOALS

MUNICIPAL GOALS

GROWERS’ GOALS

NEGATIVE EFFECTS

NO COLOR CHANGES = POSITIVE EFFECTS

NEUTRAL EFFECTS

CONFLICTING GOALS

EXPANDING GREENHOUSES

REDUCING PRODUCTION COSTS

REDUCING LABOR COSTS

INCREASING MARKET SHARES

INCREASING HOUSING STOCK

AUTOMATION’S EFFECTS ON GOALS

MACHINIC UTOPIAS, AUTOMATED FUTURES

THE GREAT DECOUPLING
In the context of **greenhouse automation**, how could **spatial strategy and design** affect technological, productive, and socio-economic processes to conduce **Westland** to **sustainable modes of urbanization**?
3

METHODOLOGY
TRENDS


2nd place for the Netherlands in the ranking of largest agricultural exporters in the world

8.3 billion euros worth of flowers and plants exported in 2015
OCHIDS PRODUCTION IN WESTLAND & GLOBAL DISTRIBUTION

TOP IMPORTERS OF BULBS
- Germany: 15%
- Netherlands: 12.5%
- Benelux: 7.5%
- Sweden: 6.5%
- China: 6%
- Korea: 4.5%
- UK: 4.5%
- Australia: 4%
- Spain: 3.5%
- Switzerland: 3%

TOP SUPPLIERS OF ORCHIDS
- Thailand
- Ethiopia
- Australia
- Colombia in South East Asia

PRODUCTION PROCESS

COMPANY 1

Propagation

Soil mixing

Potting

Scanning

Sorting

Shipping

Decorum

Royal Flora

COMPANY 2

Transportation

Packaging

Sorting

Scanning

ROLLING BENCHES WITH AUTOMATED SHUTTLES

AUTOMATED SORTING SYSTEM

AUTOMATED VERTICAL CULTIVATION SYSTEM

LED LIGHTS

3D OVERHEAD CRANE

WALL-MOUNTED CRANE TECHNOLOGIES
MACHINIC UTOPIAS, AUTOMATED FUTURES

SCENARIOS FOR WESTLAND

EXTRAPOLATED SCENARIOS
INTEGRATED SCENARIOS
THE WESTLAND’S PRODUCTIVE LOWLINE
THE HIGH-RISE CAPITALIST
TIME HORIZON | 2040

MACHINIC UTOPIAS, AUTOMATED FUTURES

SCENARIOS

TIME HORIZON | 2040

EXTRAPOLATED SCENARIO
MINIMUM AUTOMATION
PARTIALLY CIRCULAR
DIVERSIFIED CULTIVATION

INTEGRATED SCENARIO

HIGH RISE CAPITALIST SCENARIO
MAXIMUM AUTOMATION
FULLY CIRCULAR
SPECIALIZED CULTIVATION

WESTLAND’S LOWLINE SCENARIO

UNDERGROUND
MACHINIC UTOPIAS, AUTOMATED FUTURES

SCENARIOS FOR WESTALND | THE HIGH-RISE CAPITALIST
**SUMMARY**

**EXTRAPOLATED SCENARIO**

**THE HIGH-RISE CAPITALIST**

**THE INTEGRATED SCENARIO**

**THE WESTLAND’S PRODUCTIVE LOWLINE**

**COMMON GOALS**

**ACCESSIBILITY**
- Enhanced accessibility and flow of commodities

**RENEWABLES**
- Accelerated energy transition, shifting towards renewable resources

**LEADING POSITION**
- Maintaining the green ports leading position

**DIFFERENTIATING PRODUCTS**
- Increasing product diversity and variety of products

**INCREASING PRODUCTION**
- Enhancing accessibility, flow, and connectivity

**BUNDLING ACTIVITIES**
- Differentiation of products

**LIVABILITY**
- Improved livability and sustainability

**AGRIBUSINESS AREAS**
- Accelerated energy transition, shifting towards renewable resources

**INNOVATION**
- Strengthening knowledge, experience, and innovation

**GREEN + BLUE INFRASTRUCTURE**
- Maintaining social cohesion and identity

**PRODUCT DIVERSITY**
- Enhancing accessibility, flow, and connectivity

**COMMON GOALS CONFLICTING GOALS BOTH**

**EXPANDING GREENHOUSES**
- Reducing labor costs

**REDUCING PRODUCTION COSTS**
- Increasing market shares

**MODERNIZING AND RESTRICTING OF GREENHOUSES**
- Increasing housing stock

**MAINTAINING THE GREENPORTS’ LEADING POSITION AND ENHANCING LIVEABILITY**
- Accelerating energy transition and shifting to renewable resources

**STRENGTHENING KNOWLEDGE AND INNOVATION**
- Improving ecological corridors and green-blue infrastructure

**MAINTAINING SOCIAL Cohesion AND IDENTITY**
- Diversification and variety of products

**DIVERSITY AND VARIETY OF PRODUCTS**
- Social cohesion and identity

**SUMMARY**

**COMMON GOALS**

**MUNICIPAL GOALS**

**GROWERS’ GOALS**

**NEGATIVE EFFECTS**

**NO COLOR CHANGES + POSITIVE EFFECTS**

**NEUTRAL EFFECTS**
VALUES: CURRENT

ECONOMIC STABILITY
MONOTONOUS ECONOMY
BASED ON HORTICULTURAL PRODUCTION

MARKET RESILIENCE

COMPETITIVENESS
5

CHALLENGES & POTENTIALS OF WESTLAND & SURROUNDING AREA
WEAKNESSES & THREATS IN WESTLAND
LACK OF SPACE
WEAKNESSES & THREATS IN WESTLAND
INFRASTRUCTURE
WEAKNESSES & THREATS IN WESTLAND
RISK OF FLOODING
WEAKNESSES & THREATS IN WESTLAND
NARROW WATERWAYS AND CHPs
WEAKNESSES & THREATS IN THE WESTLAND
AGING GREENHOUSE CLUSTER
WEAKNESSES & THREATS IN THE WESTLAND

POPULATION & AUTOMATION OF JOBS
OPPORTUNITIES & STRENGTHS
IN THE WESTLAND
GEOTHERMAL POTENTIAL
CO2 & PROPOSED HEAT NETWORK
OPPORTUNITIES & STRENGTHS
IN THE WESTLAND
NATURA 2000 PROTECTED AREAS
OPPORTUNITIES

ECOLOGICAL NETWORK & ACCESSIBILITY
OPPORTUNITIES
EDUCATION & RESEARCH INSTITUTIONS
SUMMARY
VALUES: PROPOSED

- INTEGRATION
  Integration of immigrants, residents & new-comers

- ENVIRONMENTALISM

- HEALTHY CITIES

- ECONOMIC + SOCIAL DIVERSITY
  Economic + social diversity

- EQUAL OPPORTUNITIES
  Between immigrants, residents & new-comers

- SOCIAL ENGAGEMENT + INCLUSIVENESS

- COMMUNITY RESILIENCE

- INNOVATION
  Innovation

- EQUAL PAY + EQUITY
  Equal pay + equity
COMMON GOALS
- Accessibility
  Enhancing accessibility, flow and connectivity
- Renewables
  Accelerate energy transition and shifting to renewable resources
- Leading Position
  Maintaining the Greenports' leading position
- Agribusiness Areas
  Accelerate energy transition and shifting to renewable resources
- Innovation
  Strengthening knowledge and innovation
- Livability
  And enhancing liveability and sustainability
- Social Cohesion
  Maintaining social cohesion and identity
- Product Diversity
  Diversity and variety of products

PROPOSED GOALS
- Landscape as a Backbone
- Public Transport
  Enhancing accessibility and connectivity through public transport
- New Typologies
  Shifting and changing typology of production areas
- Mixed-Use
  Mixed use areas with integrating production + housing + commercial premises
- Sustainability
  Sustainable exchange or use of resources water + energy
- Recreation
  Enhancing recreation routes
- Agro-Tourism
  Strengthening agro-tourism
- New Activities
  Enhancing recreation activities
- Urban Farming
  Increasing recreational spaces - urban farming
PROPOSED GOALS

MACHINIC UTOPIAS, AUTOMATED FUTURES

VISION

- ATTRACT HIGH SKILLED LABOR
- DIVERSIFY JOBS IN THE AREA
- EDUCATION AND KNOWLEDGE INSTITUTIONS FOR TRAINING & UPGRADING SKILLS
- RETAIN LOW SKILLED LABOR + IMMIGRANTS
- JOB OPPORTUNITIES AND COMPANIES RELATED TO AI, ROBOTICS, AND AGRO-FOOD INDUSTRY, FOOD RESEARCH
- CREATING AGRIBUSINESS AND TRADE AREAS
- RESEARCH AND EDUCATION INSTITUTIONS
- SOCIAL HOUSING
GREEN + BLUE INFRASTRUCTURE
MAJOR STOPS OR STATIONS
EXISTING ROADS - PERSONAL TRANSPORT & FREIGHT
PROPOSED LIGHT RAIL IN WESTLAND
EXISTING RAPID TRANSIT
MACHINIC UTOPIAS, AUTOMATED FUTURES VISION

INEFFICIENT USE OF SPACE

CLIMATE CONTROLLED GROWTH COMPARTMENTS

CHPS

AUTOMATED SORTING SYSTEM & PROCESSING AREA

UNLOADING AREA

AUTOMATED 2D SHUTTLES AISLES ELIMINATED TO INCREASE PRODUCTION & SAVE SPACE

AUTOMATED PHENOTYPING SYSTEMS TO SCAN PLANTS' VIABILITY

PRIVATE SINGLE DWELLINGS HOUSING OWNERS OR WORKERS
Furrows of artificial light lend an otherworldly aura to Westland, the greenhouse capital of the Netherlands. Climate-controlled farms such as these grow crops around the clock and in every kind of weather. [Image]. Retrieved from https://www.nationalgeographic.com/magazine/2017/09/holland-agriculture-sustainable-farming/
STRATEGY

7
OVERALL STRATEGY THE SPLIT
OVERALL STRATEGY: THE SPLIT

1. CUT
2. SPLIT
3. FLIP
MACHINIC UTOPIAS, AUTOMATED FUTURES

STRATEGY

REASONING | AUCTION HOUSES
MACHINIC UTOPIAS, AUTOMATED FUTURES

STRATEGY

REASONING | RECREATION & OPEN SPACES GREENHOUSES
OVERALL STRATEGY THE SPLIT
LEISURE
CIVILIZED
TAKEOVER

INTEGRATED PRODUCTION
EXTENSION AREAS WITH RECREATION & AGRO-TOURISM ACTIVITIES

OVERALL STRATEGY THE SPLIT
WORK

THE

MEGA-MACHINE
SITES FOR DEVELOPMENT AS BUSINESS PARKS
MUNICIPAL CLASSIFICATION OF AREAS FOR HOUSING & LONG TERM DEVELOPMENT

MUNICIPAL VISION CLASSIFICATION
GREENHOUSES SMALLER THAN 2 HA
GREENHOUSES BUILT BEFORE 1990
GREENHOUSES BUILT BEFORE 1990
GREENHOUSES SMALLER THAN 2 HA
GREENHOUSES SMALLER THAN 2 HA & BUILT BEFORE 1990
AREAS WITH GREENHOUSES SMALLER THAN 2 HA & BUILT BEFORE 1990
AUCTION HOUSES AS POTENTIAL PILOT PROJECTS
...we do not consider moving to another area as we are keen to staying near Flora Holland.

Robert Stolker – Deliflor

AUCTION HOUSES AS POTENTIAL PILOT PROJECTS
MACHINIC UTOPIAS, AUTOMATED FUTURES

STRATEGY

MUNICIPAL AREAS FOR HOUSING & LONG TERM DEVELOPMENT
AREAS THAT ENCOMPASS OLD & SMALL GREENHOUSES
AUCTION AREAS & DISTRIBUTION CENTERS
SITES UNDER CONSTRUCTION

OVERALL POTENTIAL PILOT PROJECTS
MACHINIC UTOPIAS, AUTOMATED FUTURES

TER HEIJDE

ABC WESTLAND

HONDERLAND NORTH

MAASDIJK NORTH

SELECTED PILOT PROJECTS
PILOT PROJECT | ABC WESTLAND
PILOT PROJECTS | MAASDIJK NORTH & HONDERLAND
PILOT PROJECTS | MAASDIJK NORTH & HONDERLAND

GREENHOUSES BUILT BEFORE 1990

MACHINIC UTOPIAS, AUTOMATED FUTURES
STRATEGY
MOVING NORTHERN SITES TO SOUTHERN SITES
SIMPLY PROJECTING TER HEIJDE TO MAASDIJK
### Inventory of Ter Heijde

<table>
<thead>
<tr>
<th>Year of Establishment</th>
<th>Type of Cultivation</th>
<th>Automation</th>
</tr>
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<tbody>
<tr>
<td>Older than 1980</td>
<td>Cutflowers</td>
<td></td>
</tr>
<tr>
<td>1981 - 1990</td>
<td>Potted Plants</td>
<td></td>
</tr>
<tr>
<td>1991 - 2000</td>
<td>Vegetables</td>
<td></td>
</tr>
<tr>
<td>After 2001</td>
<td>Seedlings / Research</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unknown</td>
<td></td>
</tr>
</tbody>
</table>

#### Details by Land Size

- **0.1 - 0.9 HA**
  - 0.1
  - 0.1
  - 0.1
  - 0.2
  - 0.3
  - 0.3
  - 0.3
  - 0.3
  - 0.4

- **1.0 - 1.9 HA**
  - 1.0
  - 1.0
  - 1.1
  - 1.4
  - 1.6

- **2.3 HA**
  - 2.3

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**Legend**
- Blue: Older than 1980
- Purple: 1981 - 1990
- Cyan: After 2001
- Red: Cutflowers
- Pink: Potted Plants
- Orange: Vegetables
- Light Blue: Seedlings / Research
- Gray: Unknown

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**Source:** MACHINIC UTOPIAS, AUTOMATED FUTURES PILOT PROJECT

**Inventory of Ter Heijde**
GREENHOUSE

X

GREENHOUSE
GREENHOUSES

INITIAL LARGE SCALE
LARGE SCALE PRODUCTION

+ 

PROPOSED
POTTED PLANTS & SEEDLINGS

= 

FINAL
POTTED PLANTS & SEEDLINGS

INITIAL LARGE SCALE
LARGE SCALE PRODUCTION

+ 

PROPOSED
MERGING | ALL PLANT TYPES

= 

FINAL
MERGING | ALL PLANT TYPES
GREENHOUSE

x

(REsources + Recreation)
COMMON RESOURCES
COMMON CO2, HEAT & ENERGY STRUCTURES FROM SUSTAINABLE RESOURCES

COMMON RESOURCES
UNDERGROUND WATER RESERVOIRS

COMMON RECREATIONAL SPACES
WITH UNDERGROUND WATER STORAGE

COMMON RECREATIONAL SPACES
TRANSFORM UNSUSTAINABLE COMPONENTS TO OPPORTUNISTIC ELEMENTS

COMMON INFRASTRUCTURAL ELEMENTS
CAROTRAMS TO TRANSPORT PRODUCTS + LIGHT RAIL FOR PUBLIC TRANSPORT

COMMON RECREATIONAL SPACES
TRANSFORM THE COASTAL AREA FROM A PRODUCTIVE SPACE TO A RECREATIONAL AREA

GREENHOUSE x RESOURCES x RECREATION
GREENHOUSE
X
HOUSING
X
OPEN SPACES
X
NETWORKS
FUNCTIONAL STREET

URBAN STREET

RESIDENTIAL STREET
HOW CAN EXISTING GREENHOUSES IN TER HEIJDE FIT IN MAASDIJK NORTH WHILE TRANSFORMING THE LATTER INTO A MORE LIVABLE & SUSTAINABLE URBAN AREA?
MOVING NORTHERN SITES TO SOUTHERN SITES
01

PROPOSED GRID
02
EXISTING SINGLE DWELLINGS

SEVENTH ITERATION
03
HORIZONTAL TYPOLOGIES

SEVENTH ITERATION
04

VERTICAL TYPOLoGIES

SEVENTH ITERATION
INDUSTRIAL AREA

SEVENTH ITERATION
MACHINIC UTOPIAS, AUTOMATED FUTURES

PILOT PROJECT

EVALUATION | ACCESSIBILITY

UNDERGROUND CARGO TRAM & PUBLIC LIGHT RAIL NETWORK

UNDERGROUND SUB-DISTRIBUTION CENTER

DISTRIBUTION CENTER & SHARED RESOURCES AREA

HIGH DENSITY PRODUCTION AREAS

COMMERCIAL AREAS

INDUSTRIAL AREA

UNDERGROUND CARGO TRAM LINE & ABOVE GROUND LIGHT RAIL

N 220

N 223

N 213
SUSTAINABLE STRATEGIES | EXISTING TYPOLOGIES | PROPOSED TYPOLOGIES

- GEOTHERMAL SYSTEM
- SOLAR ENERGY HARVESTING
- CO₂ DISTRIBUTION FROM PORT
- NATURAL VENTILATION
- GREYWATER REUSE
- RAINWATER HARVESTING
- COMMON OPEN SPACES
- GREEN ROOFS & FACADES

TYPOLOGIES x ECOLOGICAL PRINCIPLES
RENEWABLES

SUMMER SOLISTICE

WINTER SOLISTICE

ECOLOGICAL PERFORMANCE
SUMMARY
Furrows of artificial light lend an otherworldly aura to Westland, the greenhouse capital of the Netherlands. Climate-controlled farms such as these grow crops around the clock and in every kind of weather. [Image]. Retrieved from https://www.nationalgeographic.com/magazine/2017/09/holland-agriculture-sustainable-farming/
CLIMATE CONTROLLED GROWTH COMPARTMENTS

CHPS

AUTOMATED SORTING SYSTEM & PROCESSING AREA

UN/LOADING AREA

AUTOMATED 2D SHUTTLES AISLES ELIMINATED TO INCREASE PRODUCTION & SAVE SPACE

AUTOMATED PHENOTYPING SYSTEMS TO SCAN PLANTS' VIABILITY

PRIVATE SINGLE DWELLINGS HOUSING OWNERS OR WORKERS