HOGESCHOOL ZUYD

A roadmap to energy neutral districts

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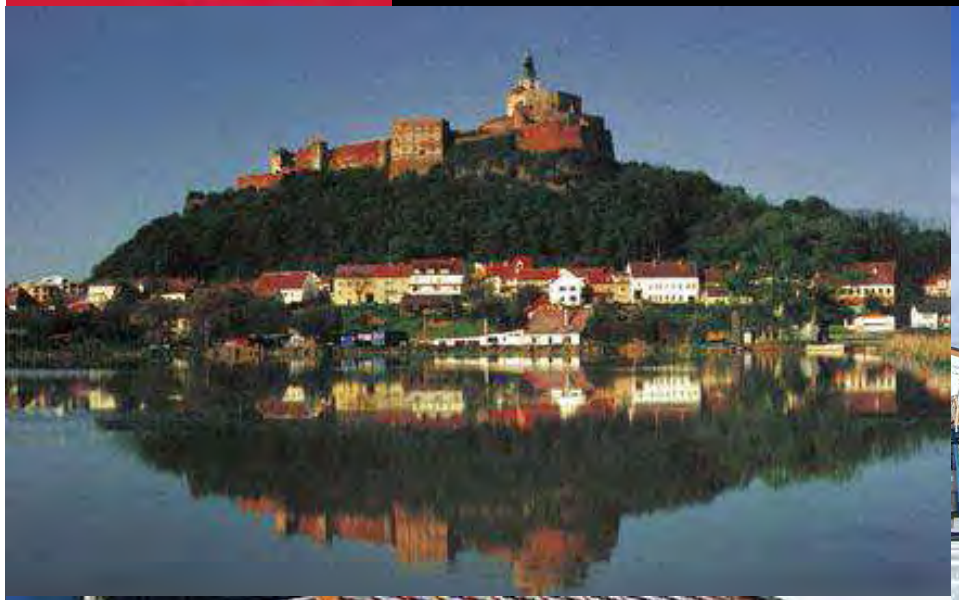
Programme manager Energy Strategy and Transition at the Agency of the Ministry of Economic Affairs in the Netherlands

HOGESCHOOL ZUYD

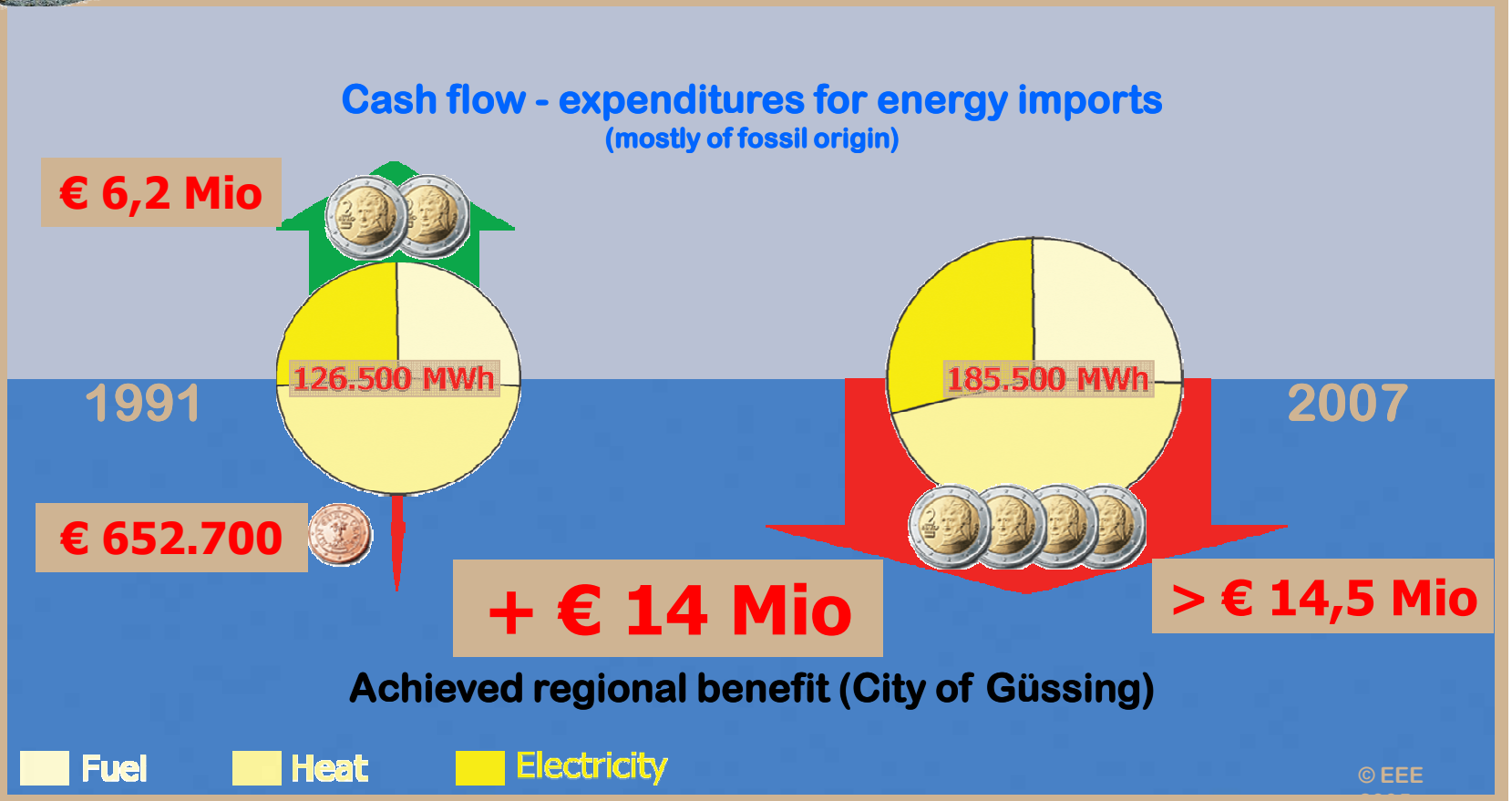
Güssing (Austria): first energy neutral city in the world!



EUROPÄISCHES ZENTRUM
FÜR ERNEUERBARE ENERGIE
GÜSSING GMBH

A roadmap to energy neutral districts

Background Idea



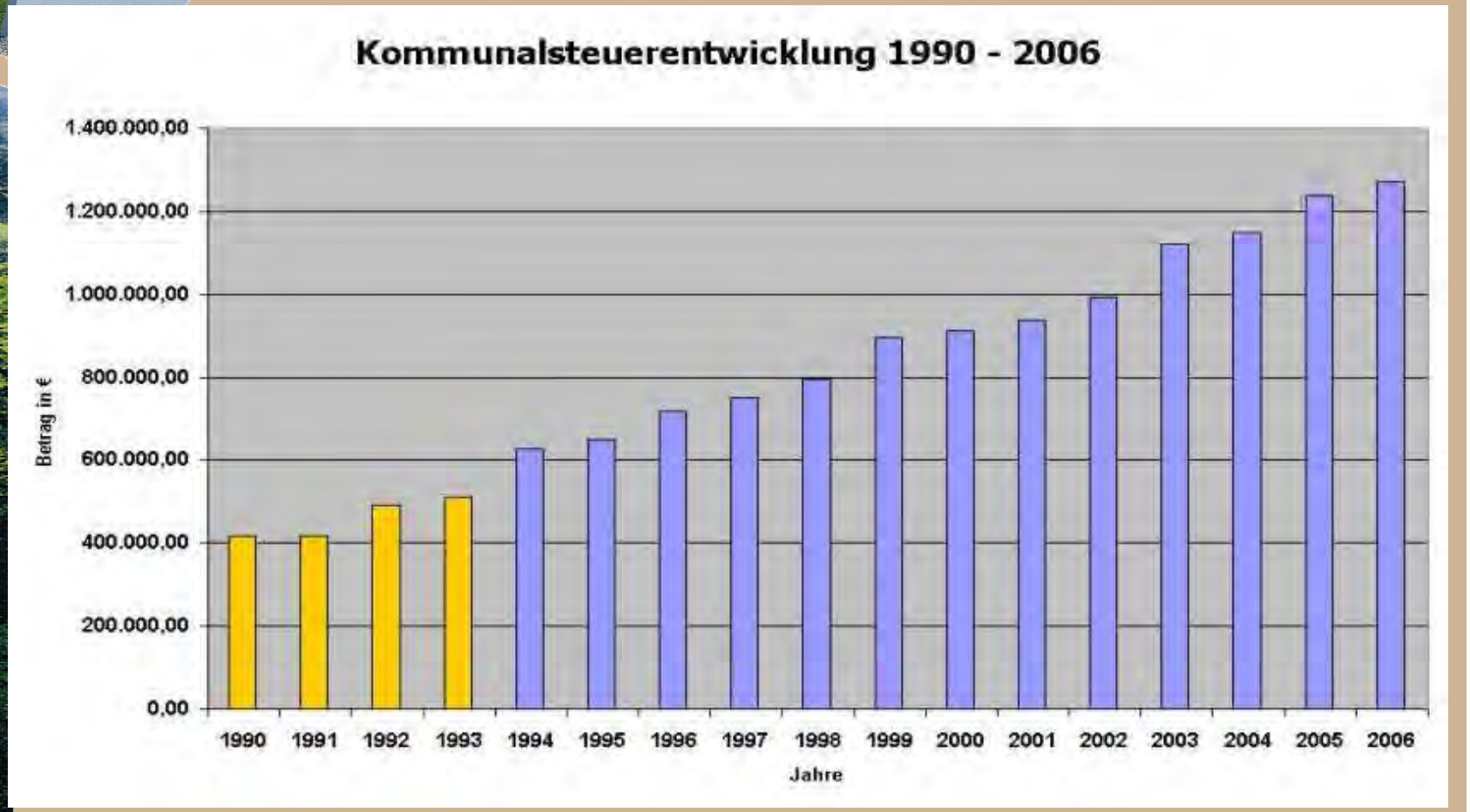
Energy-Turnaround

Benefits of going for regional renewable energy supply

- ✓ Values remaining within the region
- ✓ New jobs (tax income raising)
- ✓ Less traffic due to less commuters
- ✓ Independency
- ✓ Stable prices
- ✓ Secured supply
- ✓ No political tensions
- ✓ CO_2 - reduction

Urbersdorf Combined Plant

Municipal Tax Development

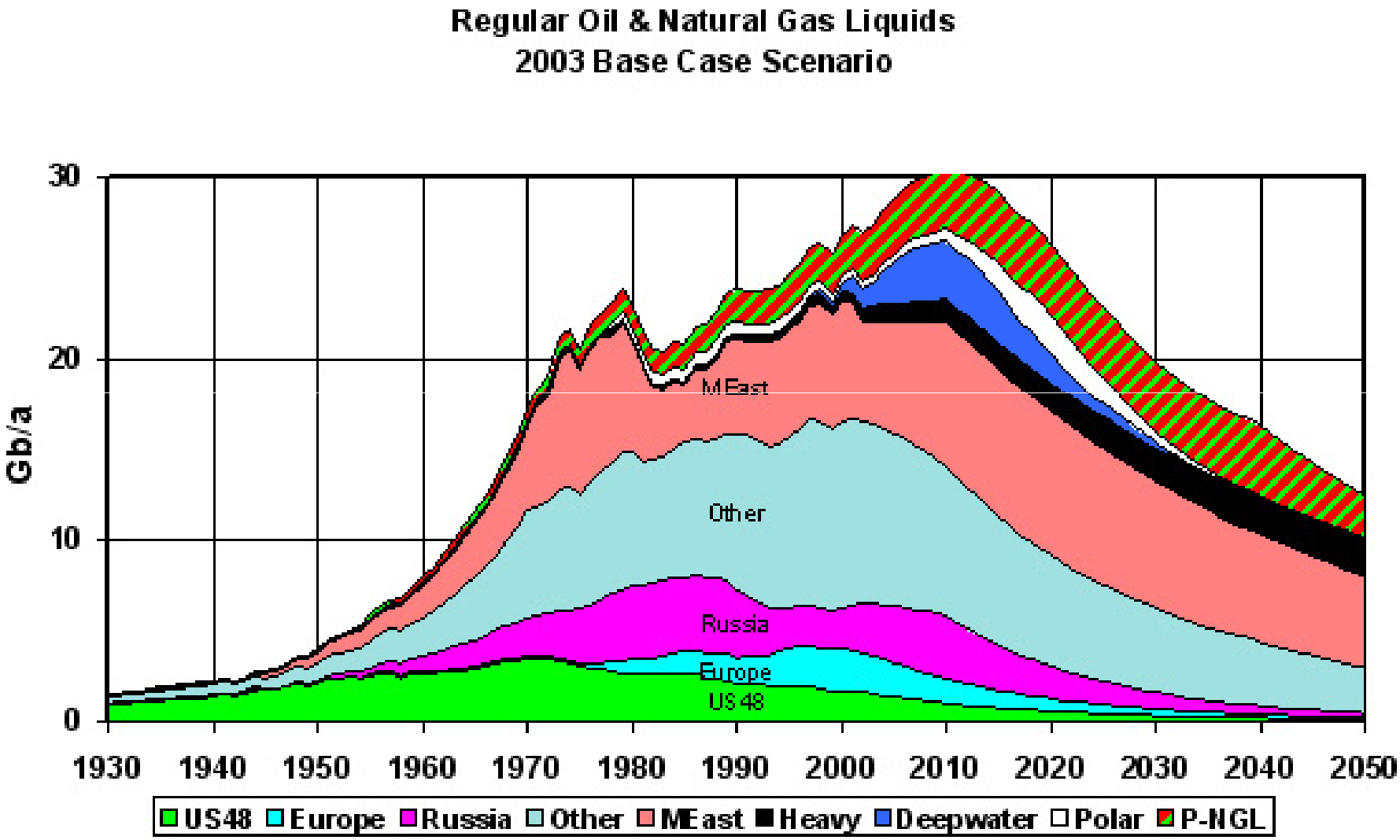


HOGESCHOOL ZUYD

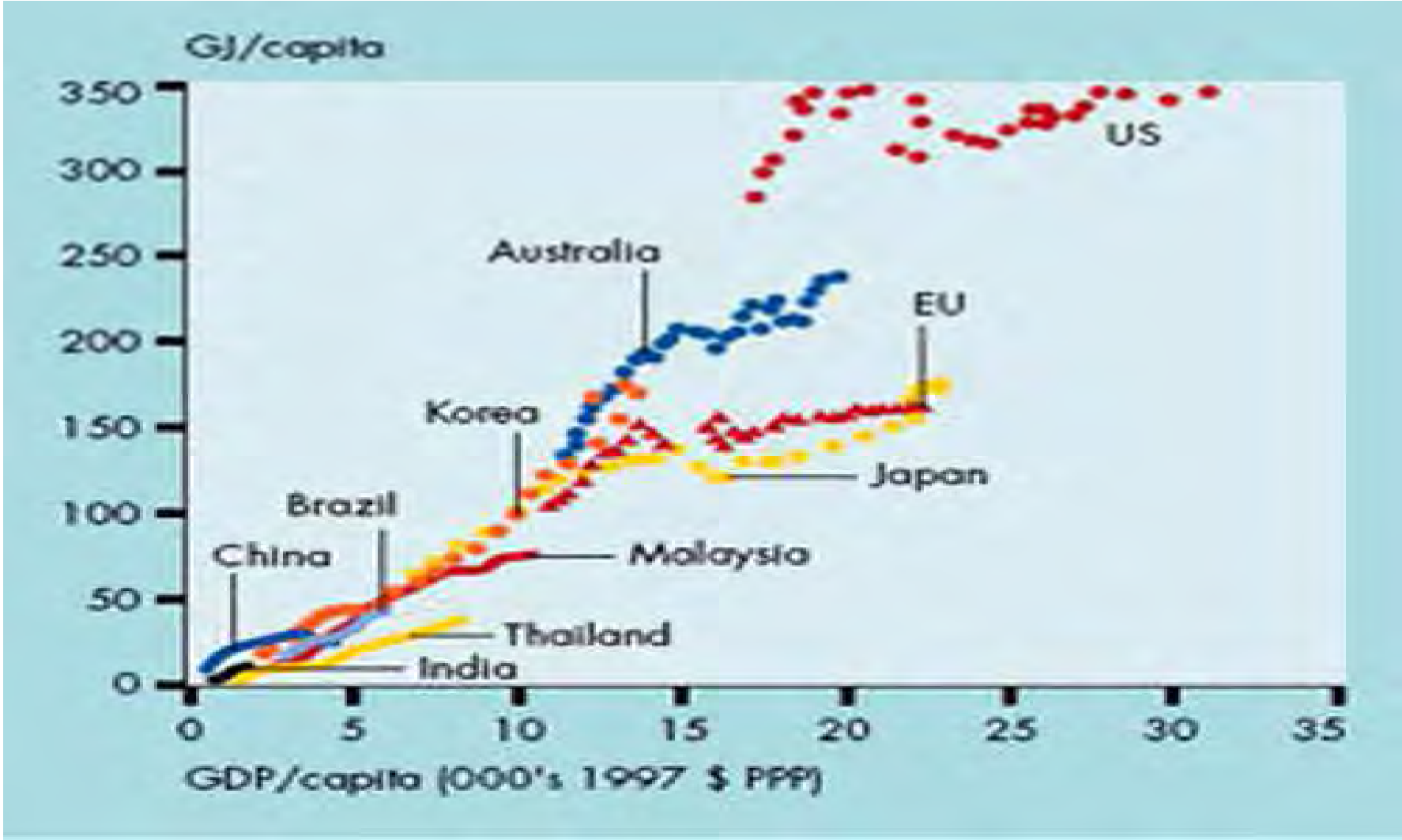
Glacier in Switzerland

Is there a problem?

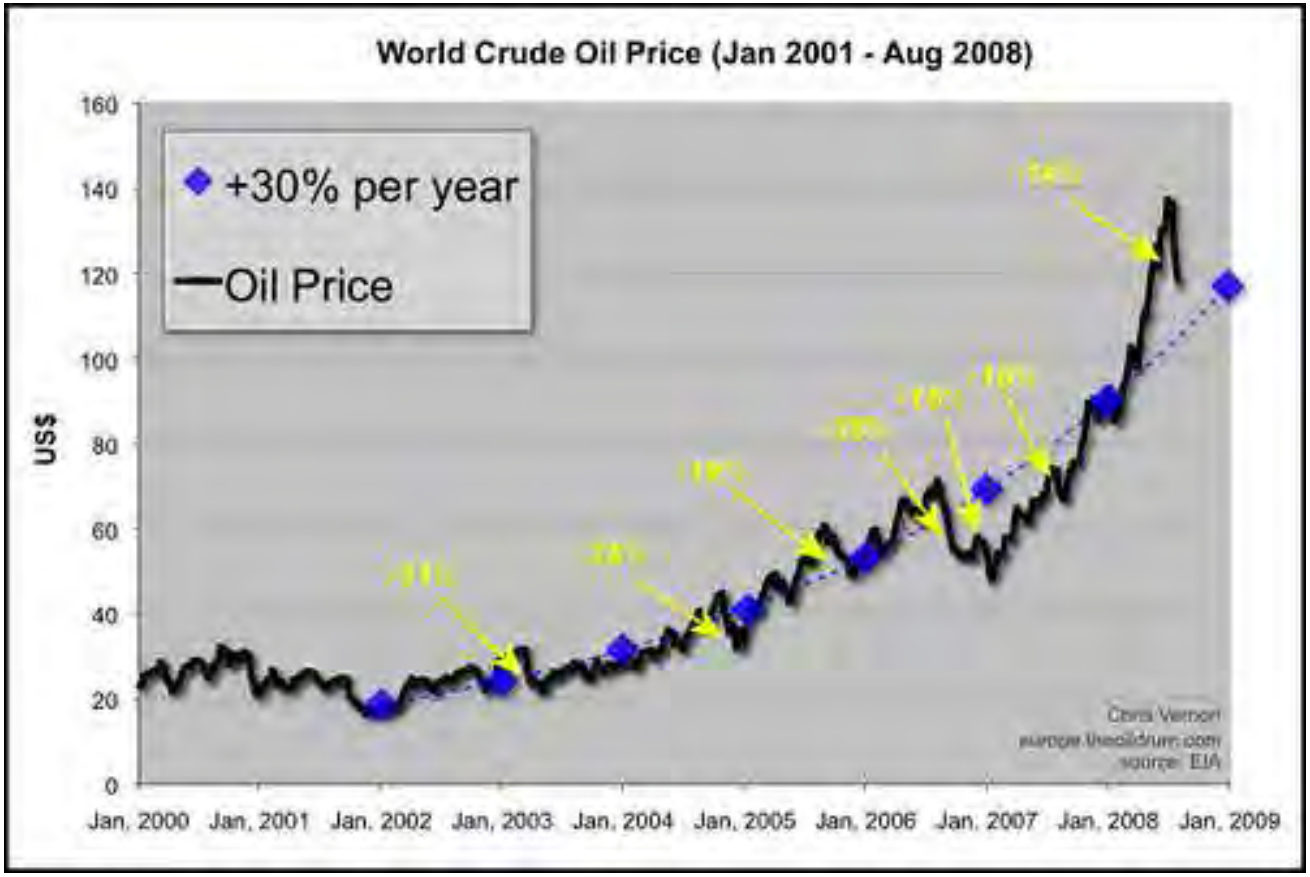
Are the oil prices going to increase?



What about the energy demand?

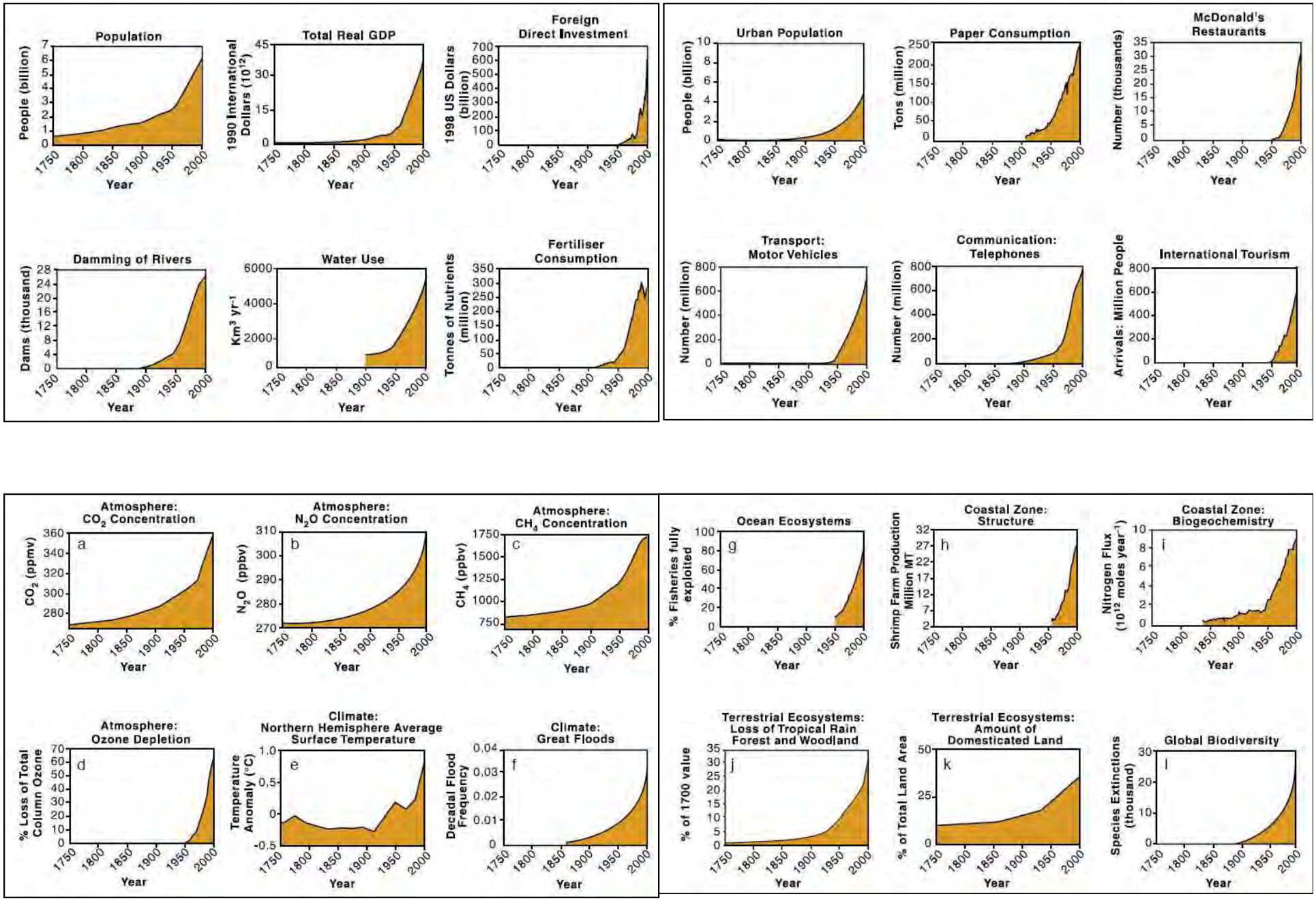


Verification of the prediction

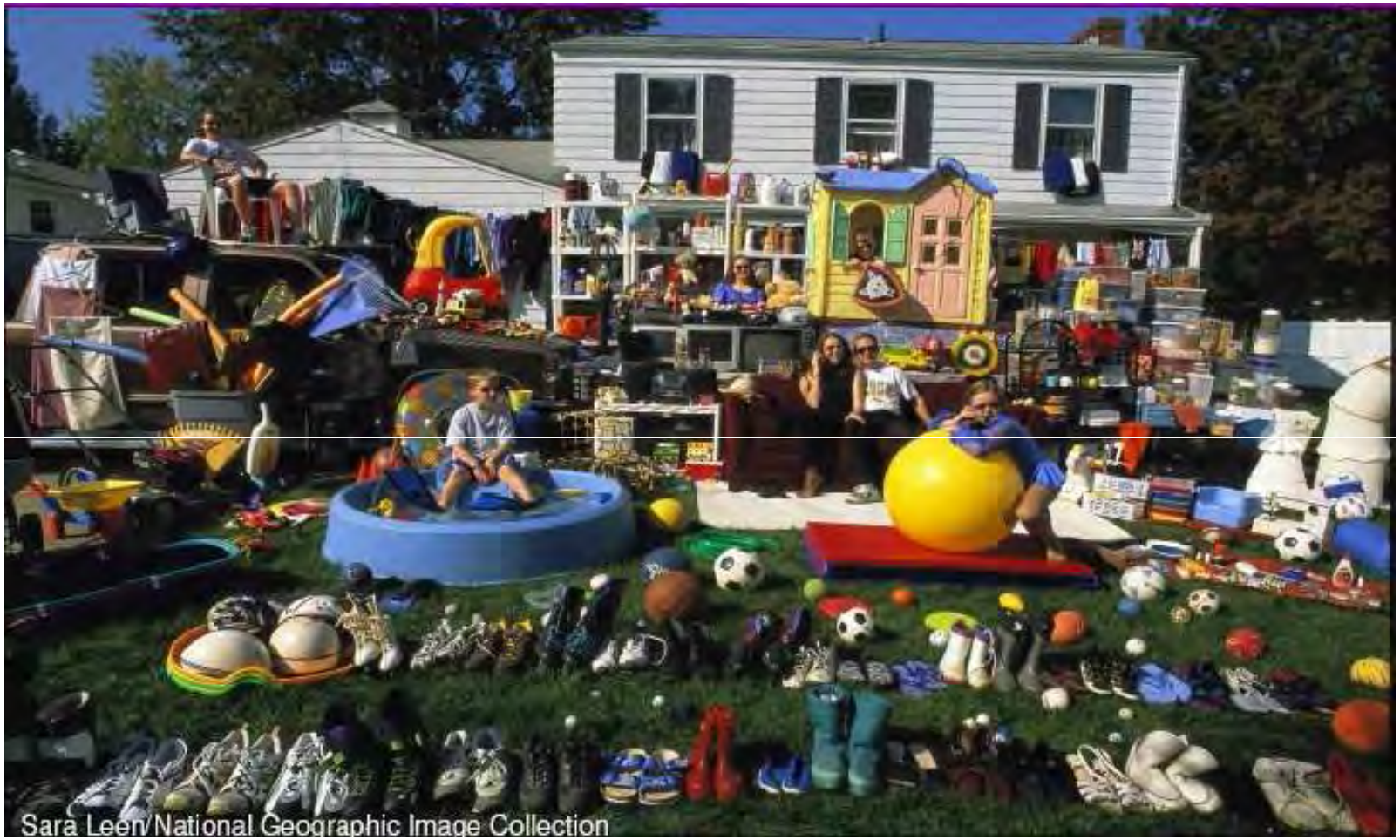


Oil prices?

NATIONALGEOGRAPHIC.COM/MAGAZINE
JUNE 2004
NATIONAL GEOGRAPHIC
THE END OF CHEAP
Oil
The Shiites of Iraq 2
Under Monterey Bay 36
Cliff-Hanging Tombs 54
Sprawl on the Mall? 60
At Home With Flickers 72
ZipUSA: Pawtucket, RI 110
BONUS Tear-out Map of Washington, D.C.



International Geosphere-Biosphere Programme



Sara Leen/National Geographic Image Collection

Transition management:

New Way of Thinking

ZU
YD

What do you like more?

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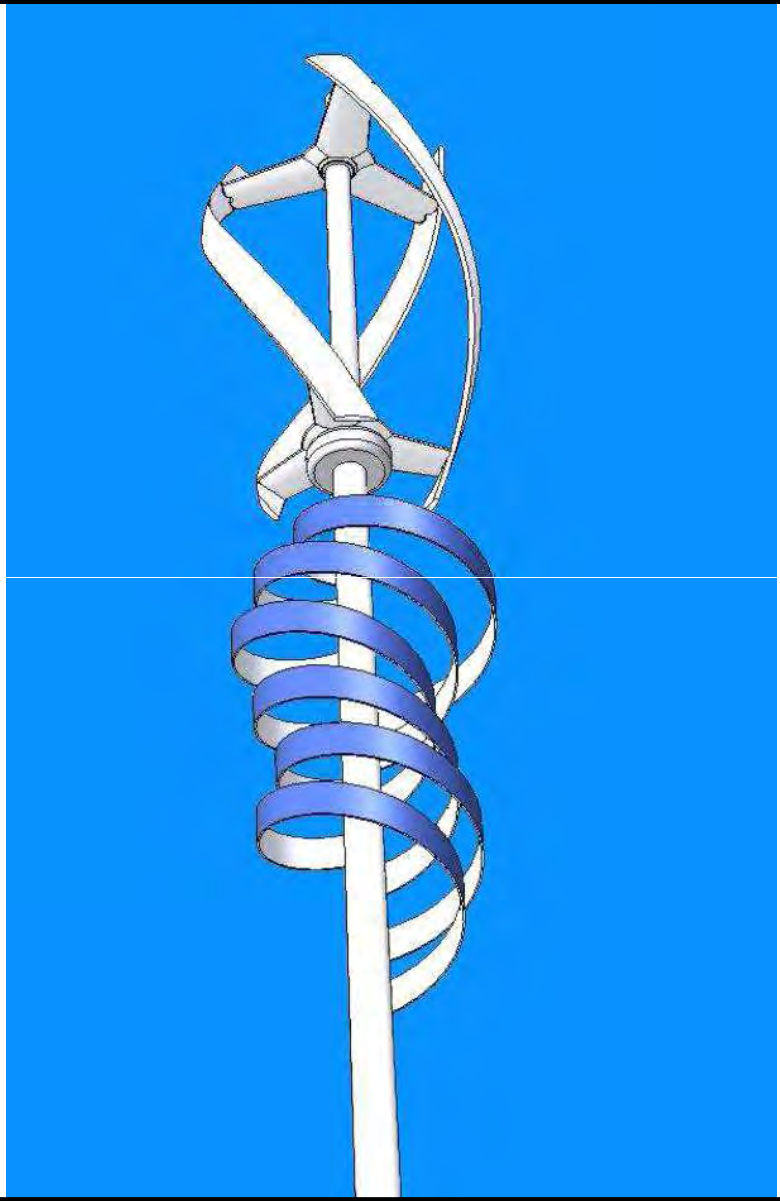
Wind energy in the Dutch landscape

New Energy, a different way of thinking

The district of Tommorow: Raywavers



Which renewable energy source is the most efficient?

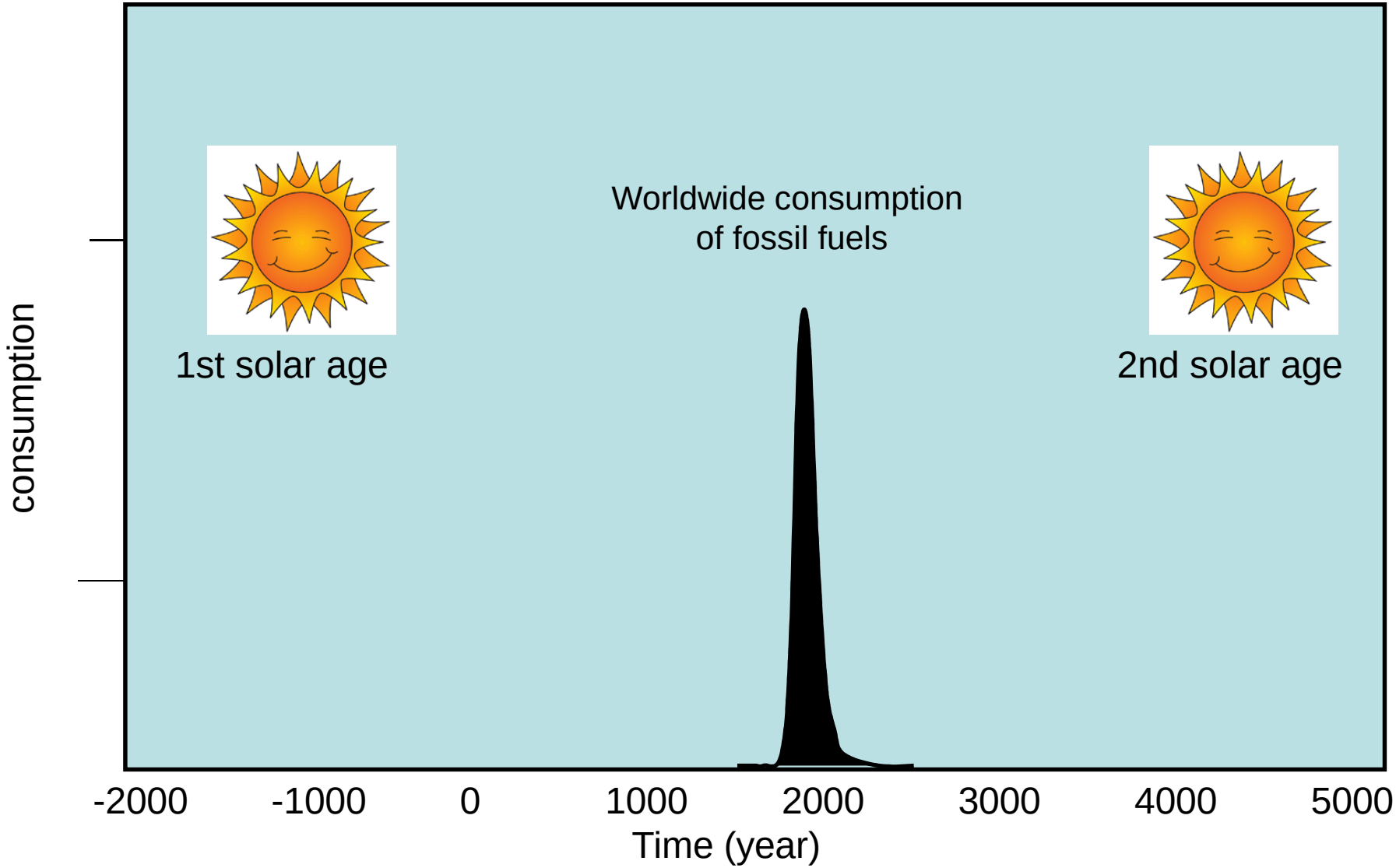
2004	**wind on sea** PJe/km2=GJe/m2	**wind on land** PJe/km2=GJe/m2	**PV** PJe/km2=GJe/m2	**Biomass** PJ/km2=GJ/m2
Netherlands	0.0633	0.042	0.252	0.0072
EU-15	0.0633	0.042	0.30	0.0072
World	0.0633	0.042	0.35	0.0072

Now, the Netherlands: **6x !** **35x !**

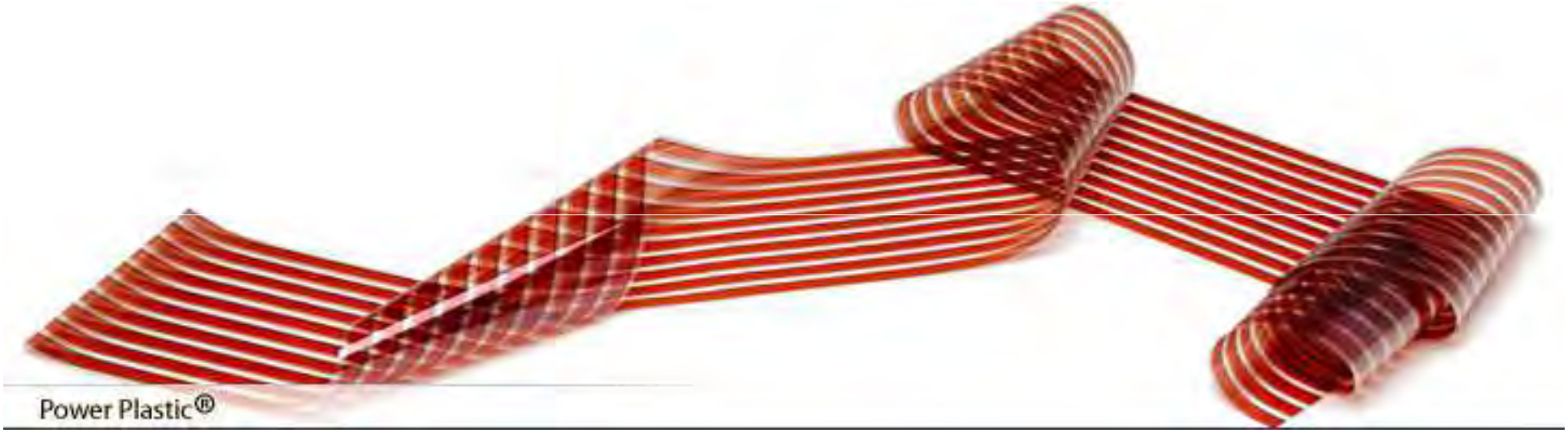
2050	**wind on sea** PJe/km2=GJe/m2	**wind on land** PJe/km2=GJe/m2	**PV** PJe/km2=GJe/m2	**Biomass** PJ/km2=GJ/m2
Netherlands	0.10	0.07	0.63	0.018
EU-15	0.10	0.07	0.75	0.018
World	0.10	0.07	0.88	0.018

Future World: **12x !** **55x !**

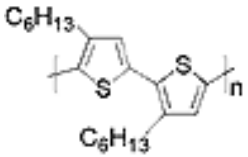
Why solar energy?

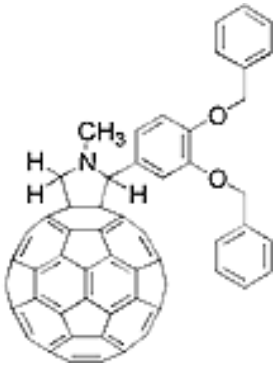


Polymer (plastic) solar cells



Plastic solar cells based on bucky balls





Dutch Polymer (plastic) solar cells

Transparent polymer solar cells

New Energy, a different way of thinking

Polymer solar cells between double layered glass?

Peerplus: smart energy glass

Districts include transportation: Need for Transition

- 50% of the energy consumption
- In harmony with nature!
- Sustainable mobility
- Different way of thinking
- Change of behaviour

HOGESCHOOL ZUYD

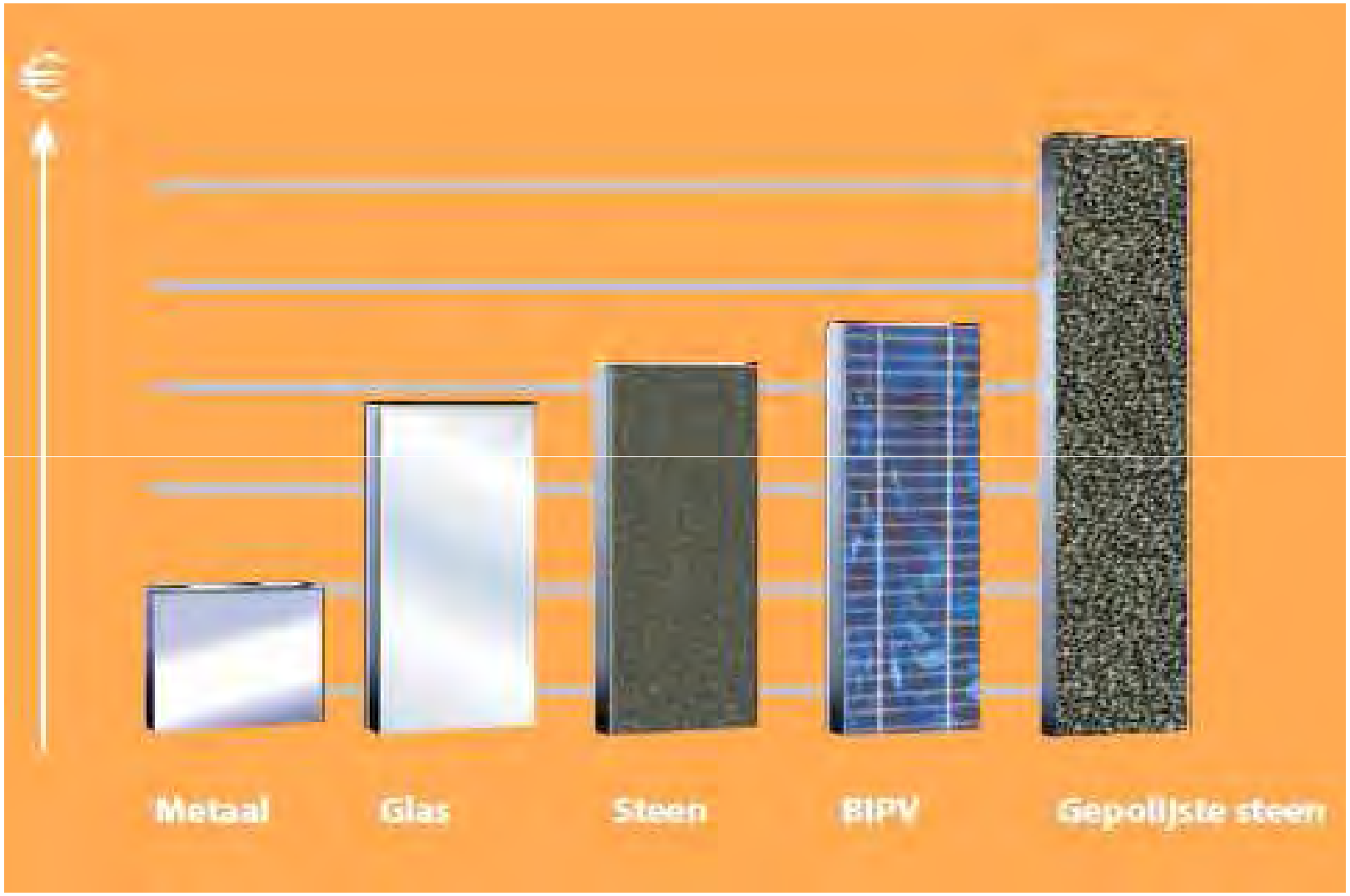
Why is a different way of thinking necessary?

Is solar energy expensive? A new way of thinking!

- Highest building in the Netherlands (Rotterdam)

CIS-tower (Manchester)

Niche-market: facades producing solar electricity!



Conventional method

Why is integration necessary?

The District of Tomorrow: to develop and demonstrate roof integration

The district of tomorrow: The building integrated PV roof is finished!

New Energy, a different way of thinking

The Zuyd University is realizing “The District of Tomorrow”

Goals:

- Demonstration of sustainable houses (zero-energy!)
- Platform for “Open Innovation”
- Educating students
- “Real Life Laboratory”
- International cooperation
- Organizing necessary knowledge
- Optimal integration of available techniques

Show what tomorrow is possible with the techniques of today!

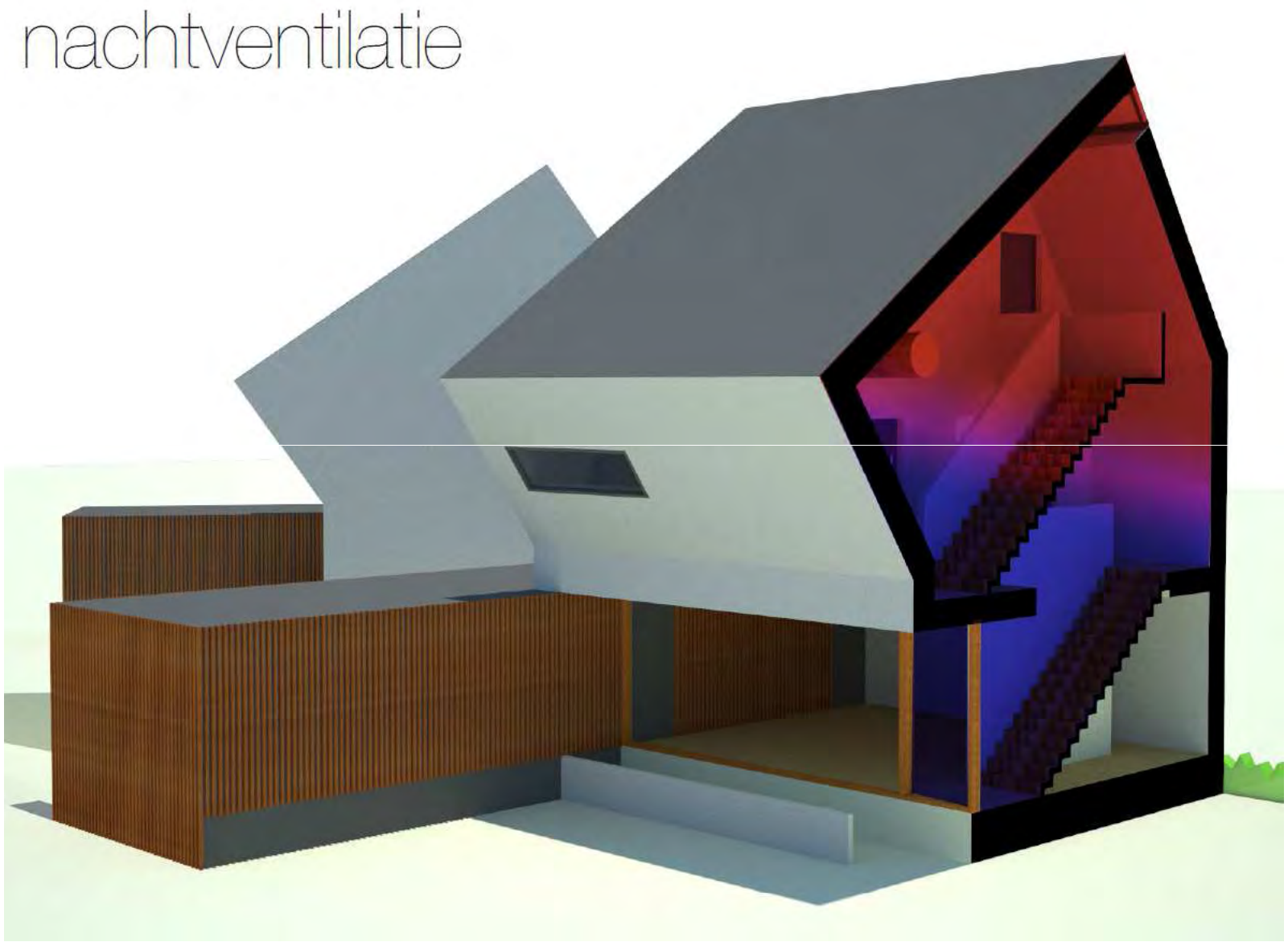
ENERGIEZUINIG BOUWEN OP AVANTIS

The district of tomorrow…

HOGESCHOOL ZUYD

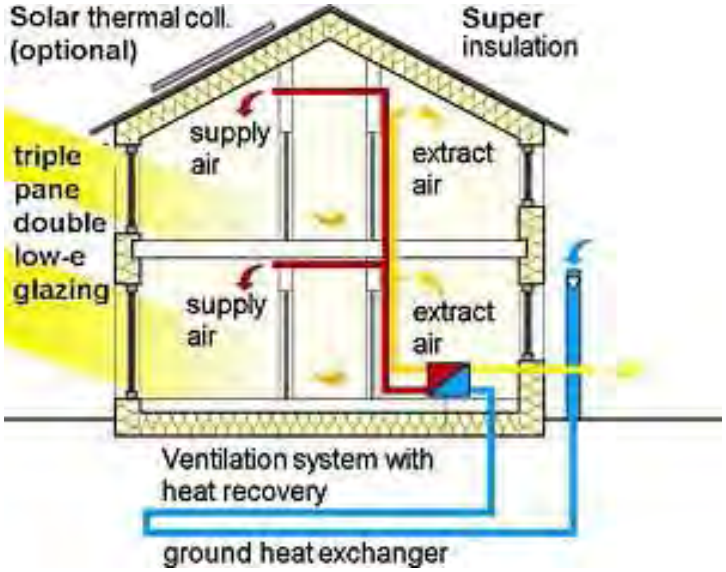
The winners of the design competition of the District of Tomorrow

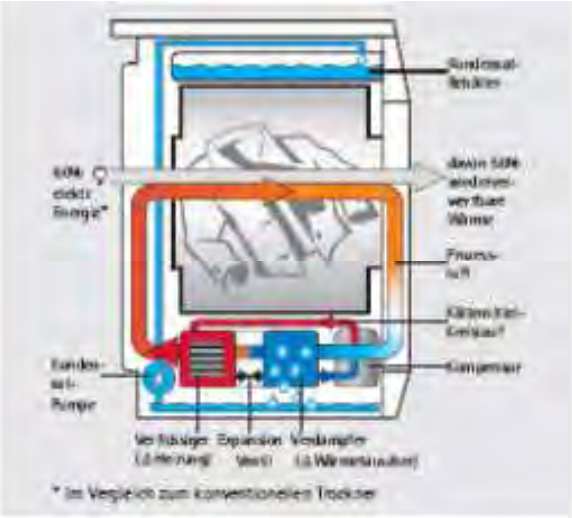
The district of tomorrow: house bended towards the sun



The “district of tomorrow”, technical design

- ‘Passief Haus’ Techniques
  - Optimal insulation
  - Ventilation with heat recovery
  - Cold and heat storage
  - Efficient low temperature heating and cooling
  - Phase change materials





- Efficient equipment
  - 12 V appliances
  - Led-lights and daylight systems
  - Dryers with heatpumps
  - Domotics
- Renewable energy sources
  - Photovoltaics, wind, solar thermal systems

PCM-phase change materials

BASF
The Chemical Company

maxit
clima 26

Different macrocapsules: Dörken, Rubitherm, SGL, Climator and others

Different products with microcapsules: plaster. plasterbords, porous concrete… …..

CELCON

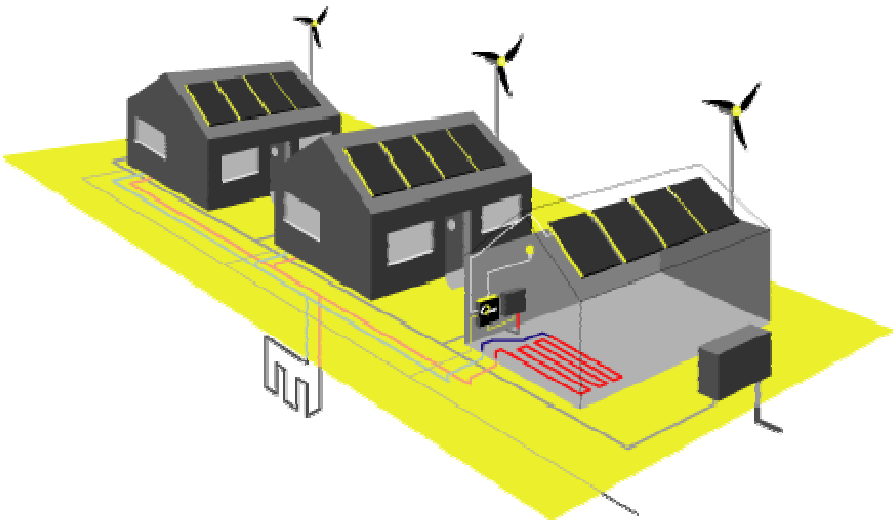
ILKA ZELL
ISOLIERTECHNIK

Fraunhofer Institut Solare Energiesysteme

Other systems: Energain, Rubitherm granules

The district of tomorrow: smart grid and mobility

- Connection to the micro-grid
- Using electric car for shopping etc.
- Using battery for storage



DE WIJK VAN MORGEN

Wijk van Morgen: lange adem

HEERLEN

Avantis, het Europees wetenschaps-en bedrijvenpark op de grens van Heerlen en Aken, gaat plaats bieden aan

samen met de omgeving' middels jaarprogramma's gaat werken aan onder andere zuinigheid en duurzaamheid in de

schaarse middelen' wordt bittere noodzaak... Daarnaast dienen nieuwe economische modellen te

zoals bamboe, dat een drie keer hogere opbrengst heeft," schildert lector R. Rovers van Hogeschool

rkraadse museum
twikkelingen op dit
n Regional Centre
erkrade. De Milieuf
or Internationale Sa
Urgenda en Hoges
nisatie.

Dorp met toekomst

HEERLEN

Avantis, het Europees wetenschaps-en bedrijvenpark op de grens van Heerlen en Aken, gaat plaats bieden aan de 'Wijk van Morgen'. Het presentatiebord van deze proeftuin is deze week als 'opwar-

maar past binnen de filosofie.

Duidelijk is dat de aardbol niet meer lang bestand blijkt om de huidige leefwijze van de wereldbevolking nog heel lang door te laten gaan. Grondstoffen raken op, de houtvoorraad is op den duur onvoldoen-

De wijk die nooit af is

door **Emil Visser**

Vandaag is de fysieke aftrap van 'De Wijk van Morgen', een project van de Hoge-

nieken die net uit de research- en developmentfase rollen. Bovendien hebben we straks prachtige studieobjecten. Die we kunnen blijven aanpassen met de allernieuwste technieken, om te kijken hoe ze werken. Dat is natuurlijk allemaal van groot belang om tot duurzame woningen in de echte woning-

haal je materialen van heel dichtbij en die verwerk je dusdanig in het gebouw dat ze later nog hergebruikt kunnen worden in een nieuwe functie", legt Schroën uit. „In de Verenigde Staten bijvoorbeeld kun je vloerbedekking kopen die na een aantal jaar wordt opgehaald en wordt gebruikt om nieuwe

GASUNIE Wijk van morgen

Tweede prijs voor ontwerp hogeschool

Limburg bereidt zich voor op de nul-ene

Heerlen • Al Gore wil het. Milieuminister Jacqueline Cramer wil het. De Provincie Limburg wil het. En nu werken studenten van de Hogeschool Zuyd aan een project dat er een serieuze bijdrage aan moet leveren. Op weg naar 'De Wijk van Morgen'.

We hebben het natuurlijk over het terugdringen van de CO2-uitstoot. Vaak denken mensen daarbij aan industrie, luchtvaart en autoverkeer, maar ook op het gebied van wonen valt veel te winnen. In diverse Europese landen worden de normen waaraan nieuwbouwhuizen

Wood skeleton

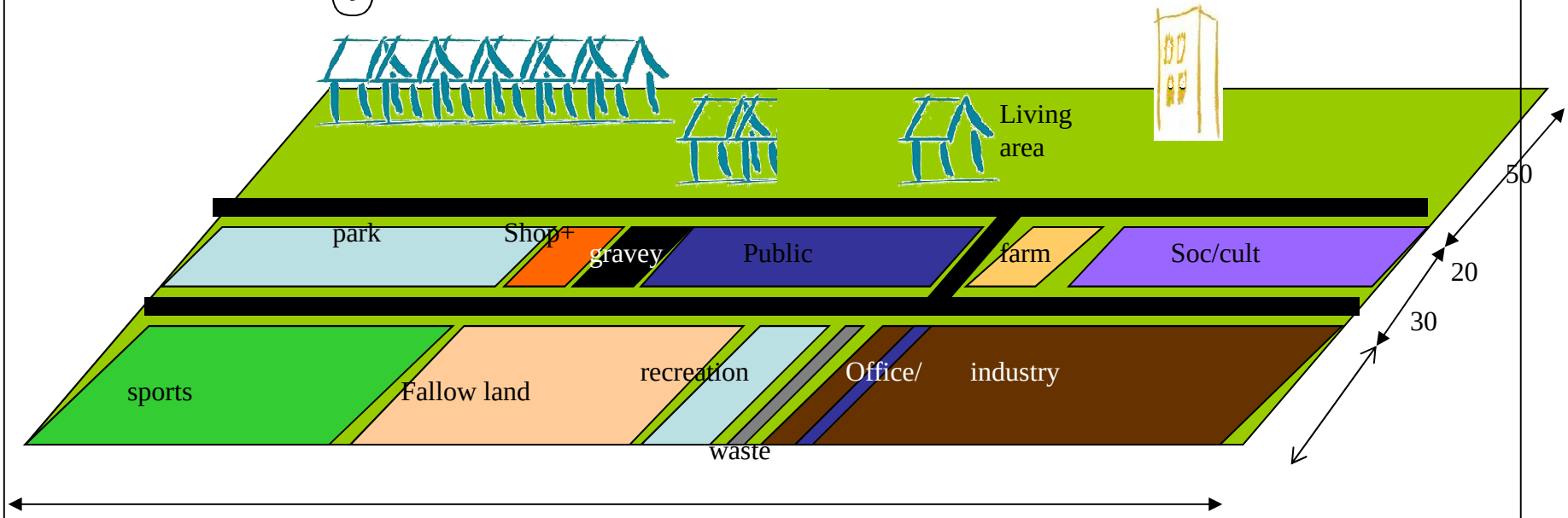
Roof integration!

RiBuilT

THE CONCEPT OF ZERO

Research institute
BuilT environment of Tomorrow

"average NL Urban hectare"



4360 m2 living area
- 9,5 houses (4inarow,two cornerhouses, 1,5 semidetached, 1 villa),
- 4 appartments,
- inclparking, local shop/bank
- primary schools(20m2), etc

~300 m2 socio-cult service
- Incl hospital (~1m2/ha),
- elderly care centres, (~4m2/ha)
- church , museums,(1m2/ha) libraries etc
- monuments (~10m2)
- Cinema, theatre,conf.

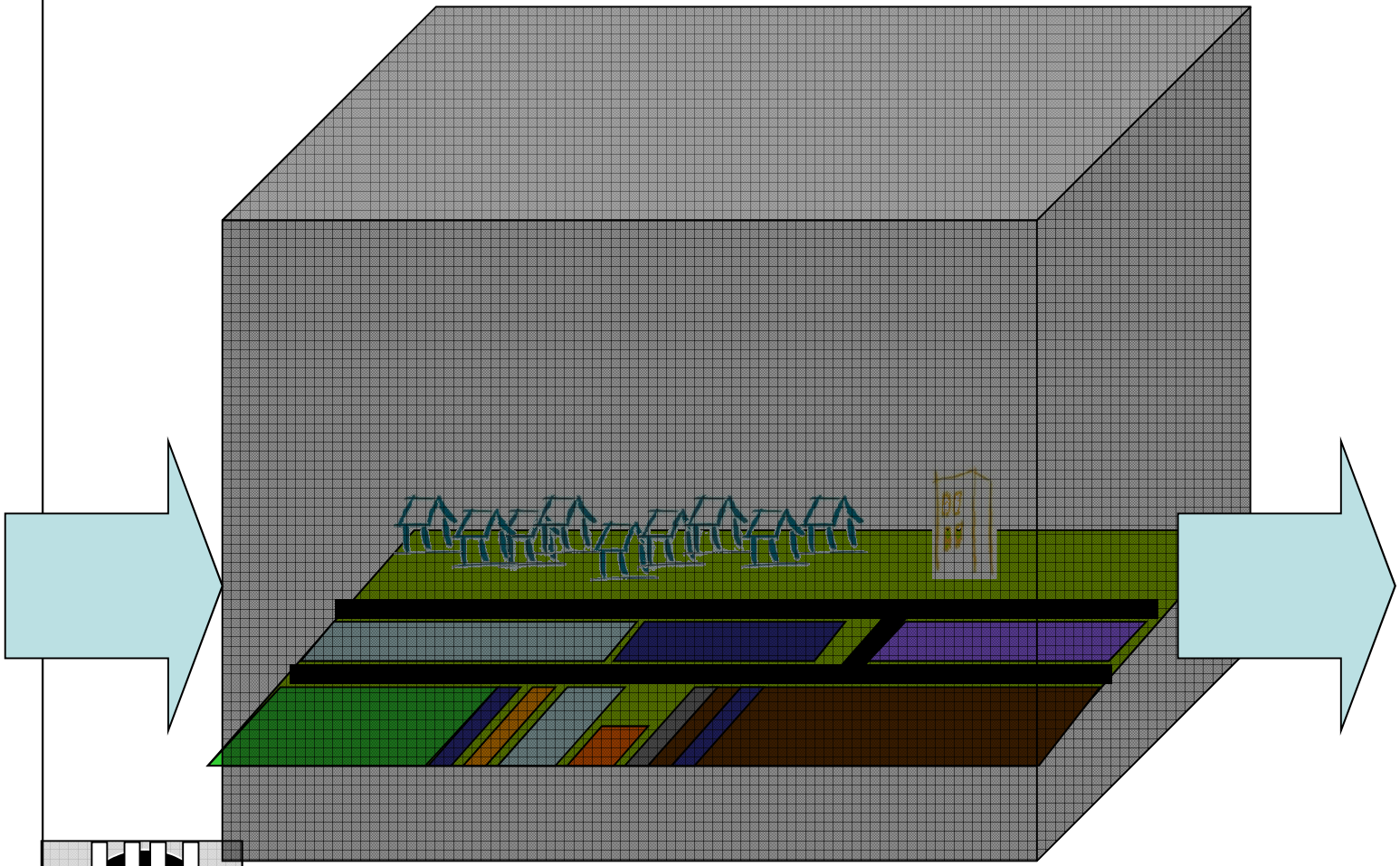
~230 m2 public fac. (adm. Police , energy,. etc)

~1300 m2 industry area
- incl 83 m2 officelevel,
- ~1-industry-office/ha,

~90 m2 shopping + horeca
- ~81 m2 shop (gamma-1m2)
- ~4m2 hotel, (rest:5m2 pub/rest.?)

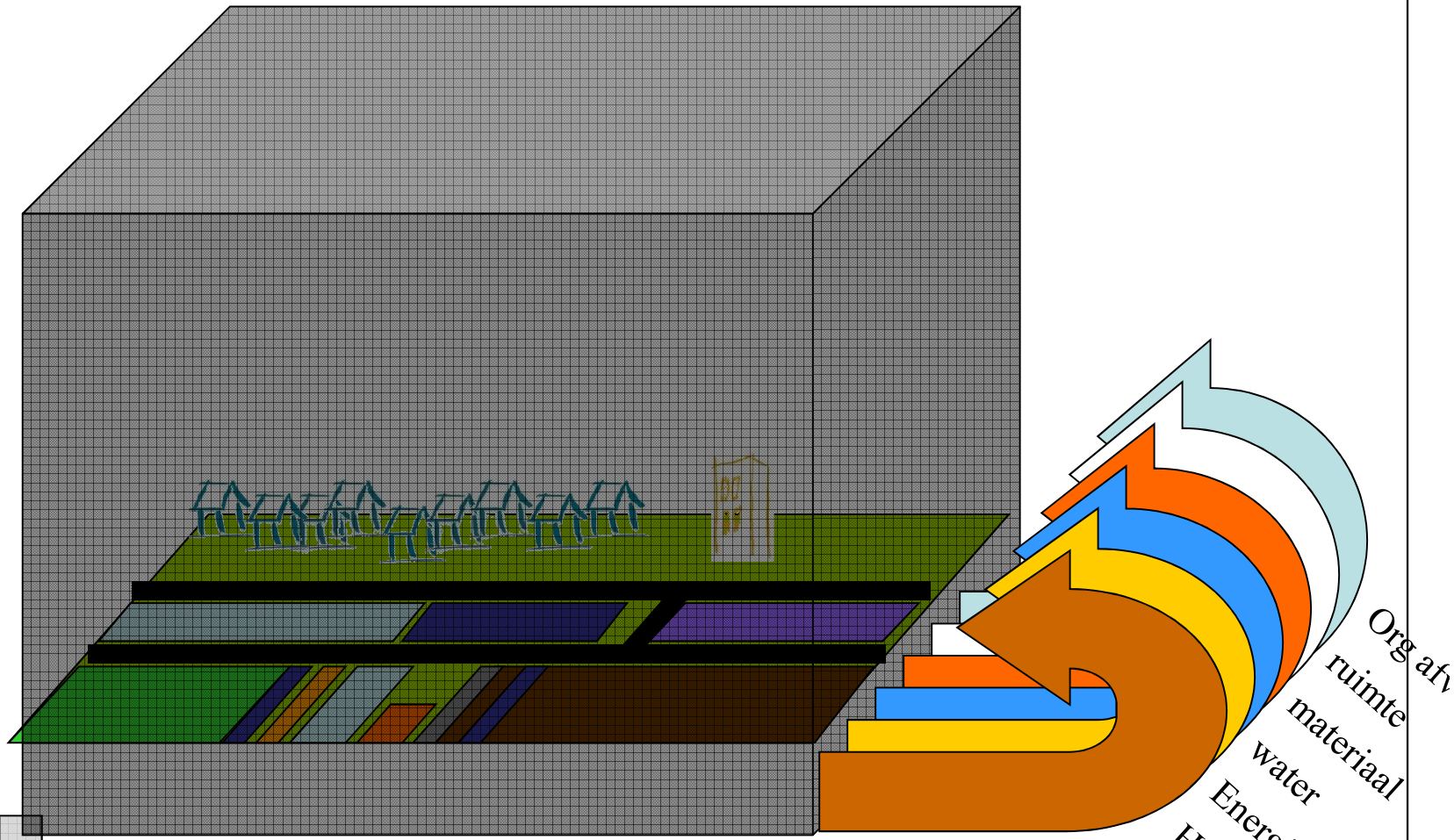
~60 m2 wastedump (incl car wrecks, 10m2)
~80 m2 graveyard (incl cremation centre)
~470 m2 greenpark
~620 m2 sportsfac. (incl indoor) (Golf:123 m2)
~200 m2 recreational area (comm.)
~80 m2 urban foodgardens
~1520 m2 road (250 meter road , 6mtr wide)
~ 630 empty constr area (build/industry)

URBAN HARVEST



UH

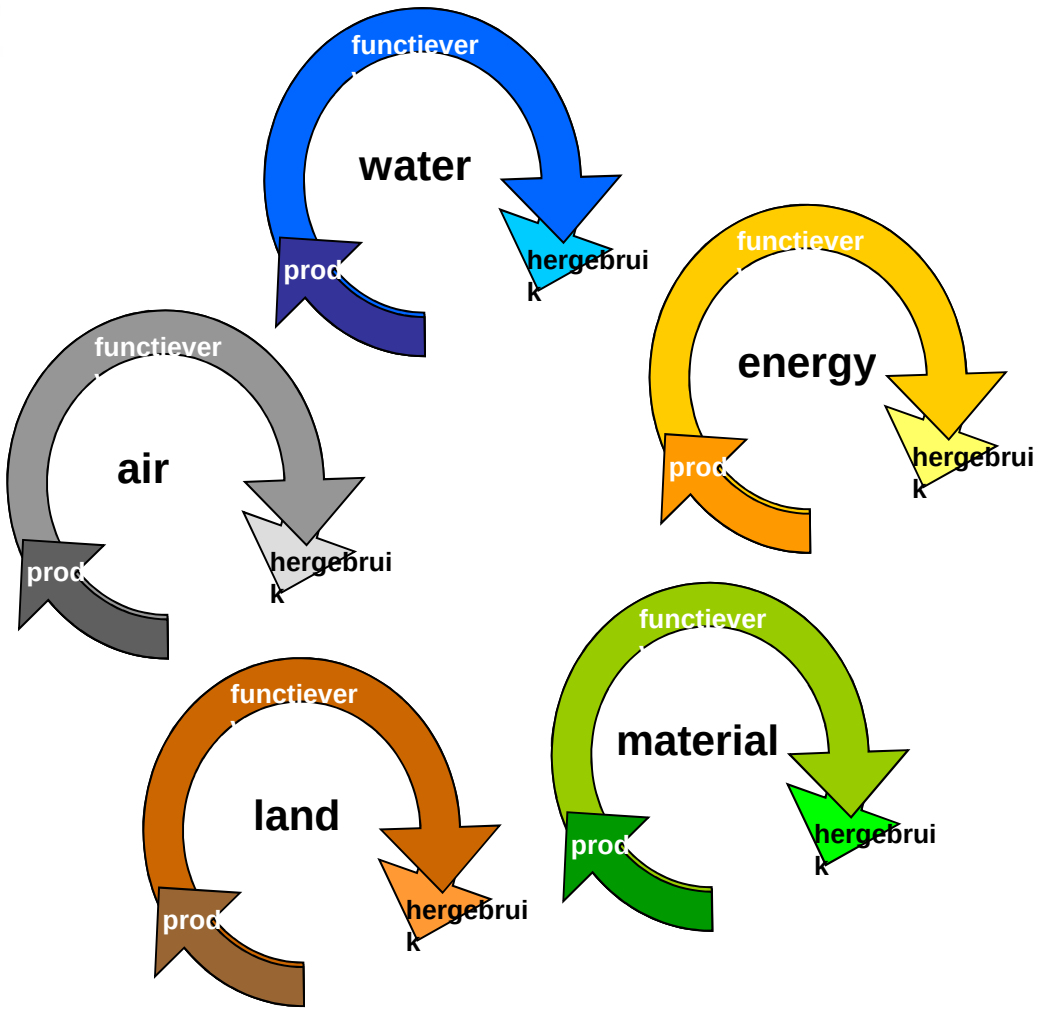
URBAN HARVEST

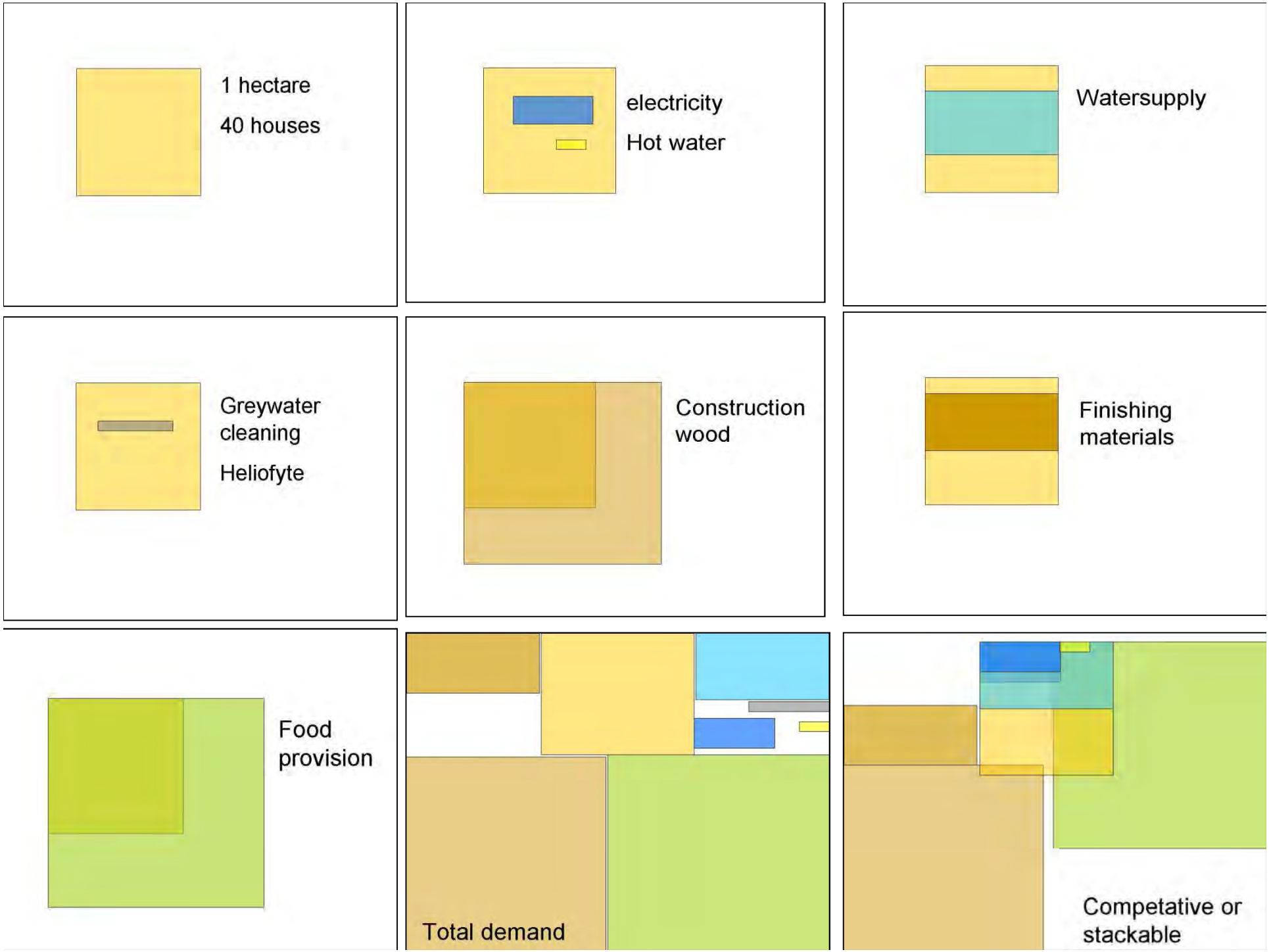


Research Institute Built Environment of Tomorrow

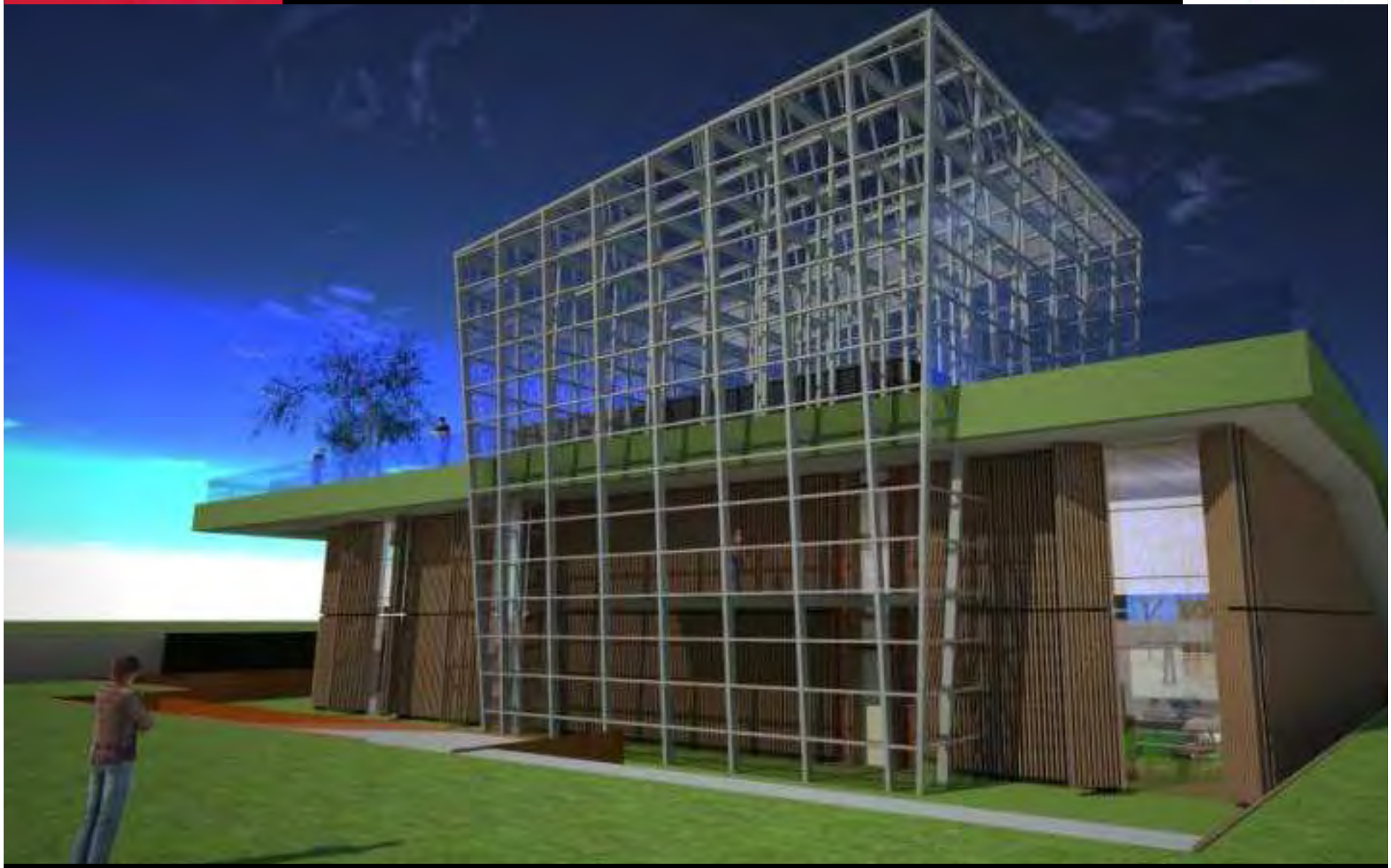
Wrt 5 sources:

- 0 - material
- 0 - energy
- 0 - water
- 0 - air
- 0 - land




1 hectare
40 houses
electricity
Hot water
Watersupply
Greywater cleaning
Heliofyte
Construction wood
Finishing materials
Food provision
Total demand
Competative or stackable

Design of the second expo-building



New Energy, a different way of thinking

DISTRICT OF TOMORROW

Our own sustainable urban development

Impressions of the District of Tomorrow

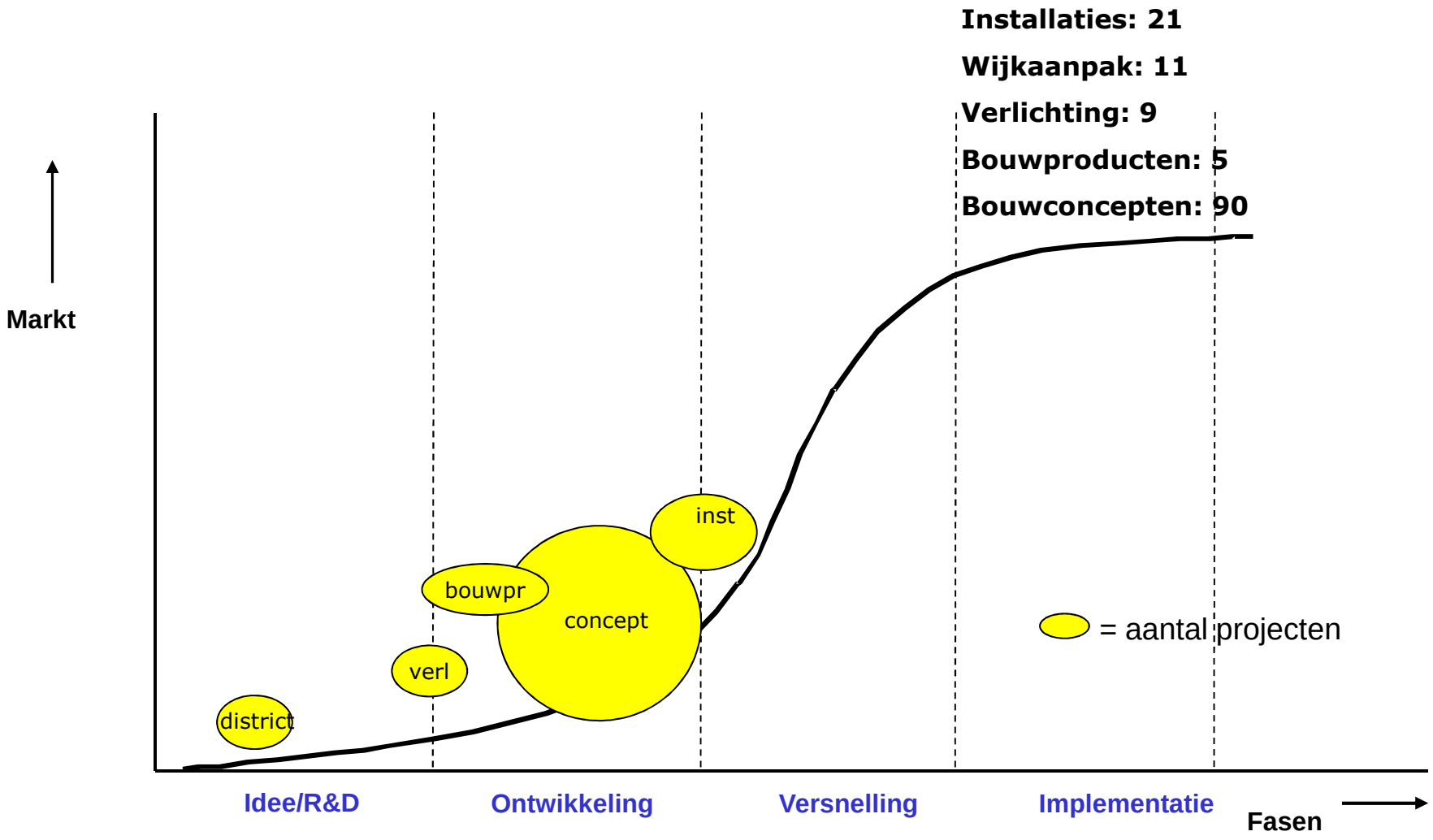
RiBuilT
THE CONCEPT OF ZERO

DE WIJK VAN MORGEN
Impressie: Dreessen Architecten
Toekomstige bestaande bebouwing
GEBOUW B
GEBOUW C

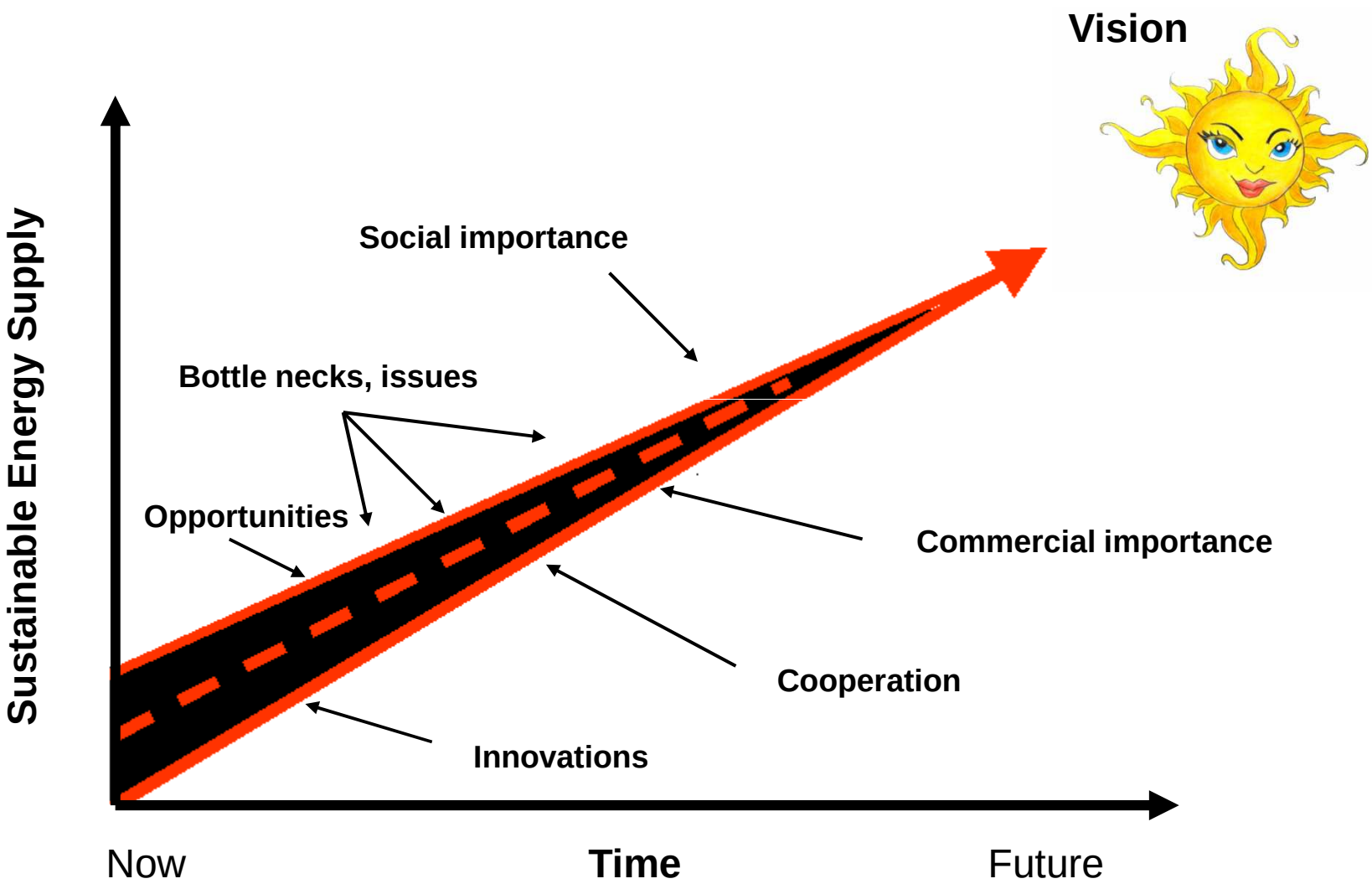
RiBuilT
THE CONCEPT OF ZERO

Price from the minister of Environment, Kramer: the green tourch

The phase of the innovation process on a district level:



Energy transition (roadmap)



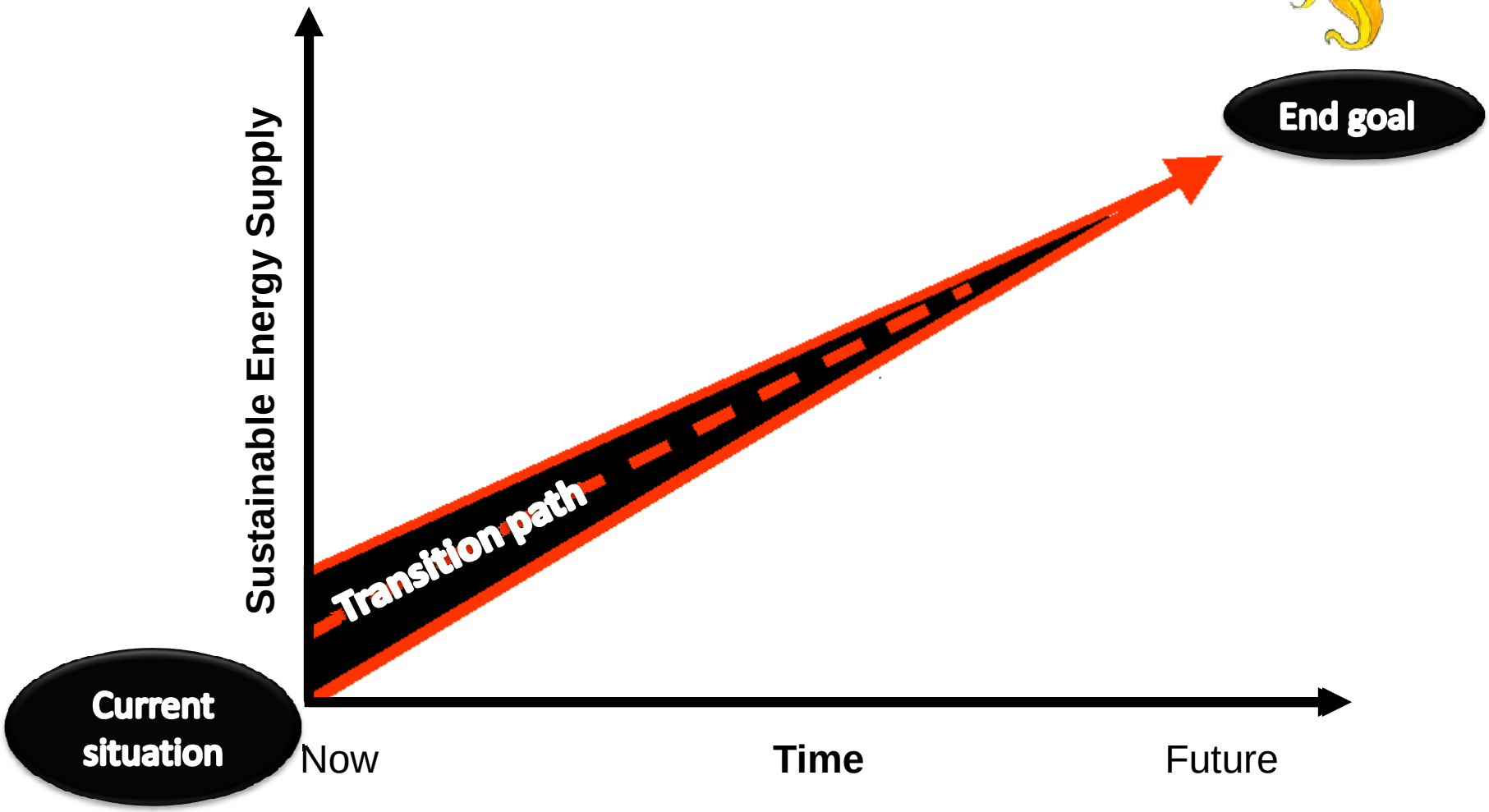
Transition Management:

Vision

(e.g. put a man on the moon)

Energy master planning

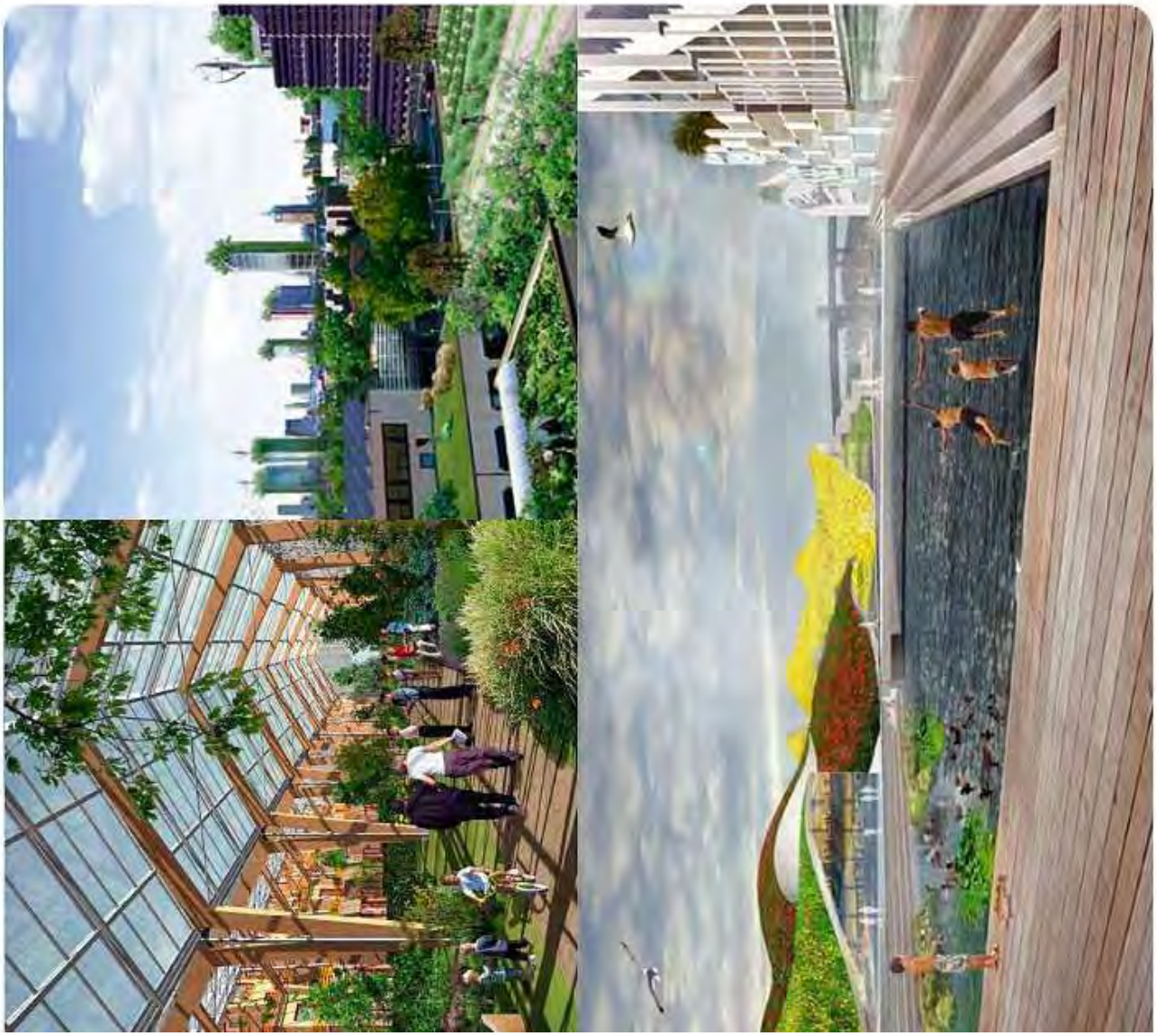
Roadmap for energy transition



RiBuilT

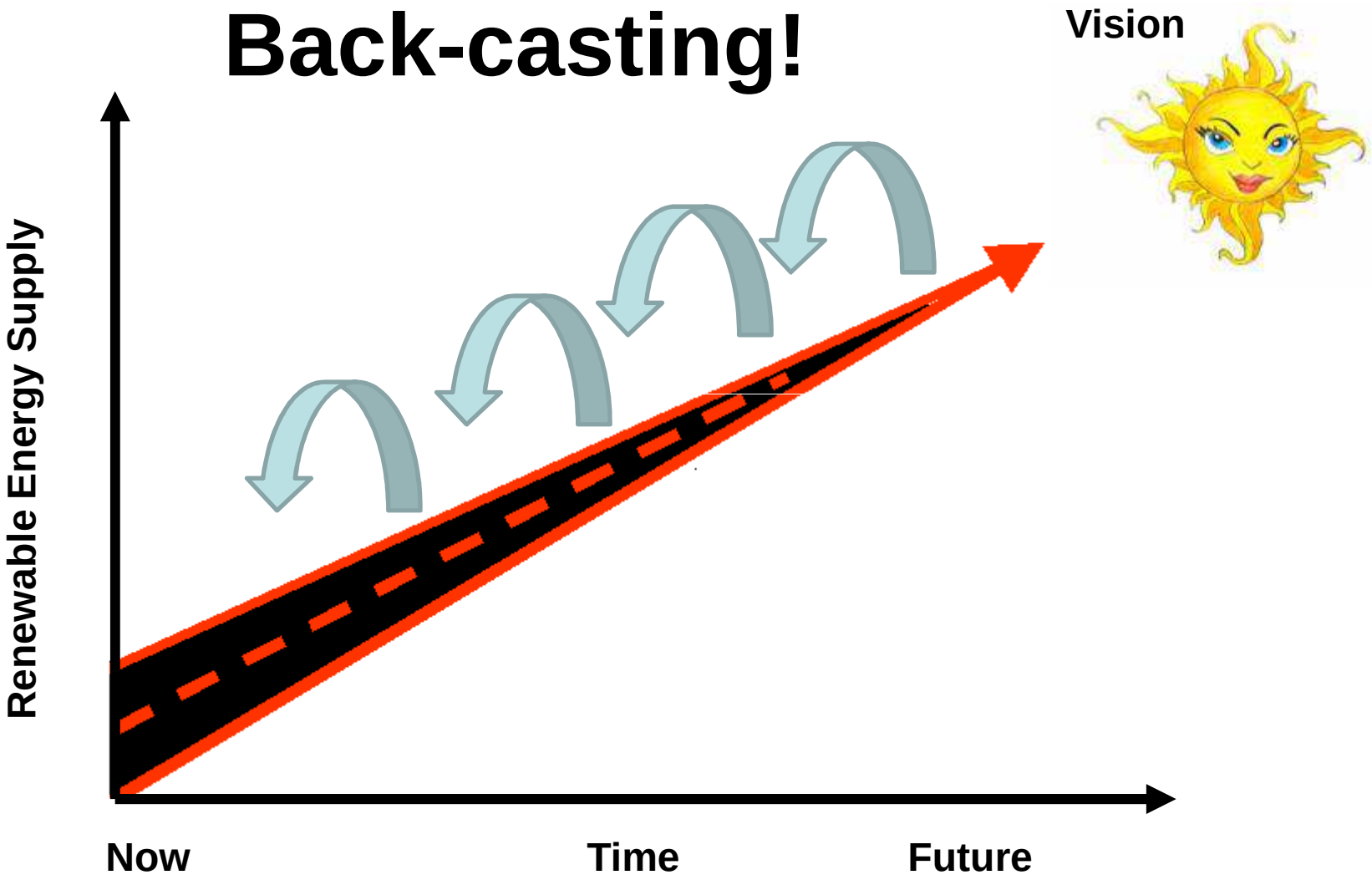
HOGESCHOOL ZUYD

Limburg in 2050



Using vision and goals

Back-casting!



Back-casting!

Every new built house should be zero-energy!

Back-casting!

“You need storage systems”

2050
0-energie Limburg
0-materiaal Limburg
0-water Limburg

2040
Alle steden en dorpen in de provincie zijn energieneutraal
Alle bestaande woningen en kantoren zijn gerenoveerd
Limburg is volledig cradle to cradle
50 0-impactwijken zijn gerealiseerd
Al het afvalwater wordt lokaal gezuiverd in helofytenfilters, gebouwen worden afgekoppeld van de riolering

2030
Zijn alle bedrijventerreinen gerenoveerd en werken CO2-neutraal
Zijn er 25 energieneutrale dorpen/kernen/steden, waaronder Maastricht
Is 40% van de bestaande bouw gerenoveerd tot 0-energie
Is in totaal 1.000 hectare vrijgemaakt voor de productie van biomassa (niet ten koste van voedsel)
Gaat 50% van bouwsloopmaterialen terug in de bouw
Is 30% van de huishoudens aangesloten op decentrale zuivering van regenwater
Is het industrieel watergebruik met 25% teruggebracht

2020
Is de eerste 0-impact wijk gerealiseerd
Is het eerste energieneutrale dorp een feit
Alle nieuwbouw is voortaan 0-energie
Is er 20% energiebesparing gerealiseerd (tov 2005), is 20% van de energievoorziening afkomstig van duurzame energiebronnen en is de uitstoot van CO2 met 20% verminderd
Maken hernieuwbare materialen 50% uit van de bouw
Zijn er 50 Limburgse C2C-producten met een keurmerk op de markt
Is er 10 hectare aan bassins gerealiseerd voor opvang van regenwater in de gebouwde omgeving
Is het huishoudelijk watergebruik met 25% verminderd

2015
Hebben alle wijken een transitieplan
Is in totaal 5% van de bestaande woningen en kantoren gerenoveerd tot 0-energie gebouwen
Maken hernieuwbare materialen 25% uit van de nieuwbouw en renovatie
Is het eerste 100% C2C bedrijventerrein Limburg een feit
Is het eerste verzamelkantoor voor flexibel werken actief
Is de eerste waterneutrale wijk gerealiseerd
Is de eerste 0-impact straat opgeleverd

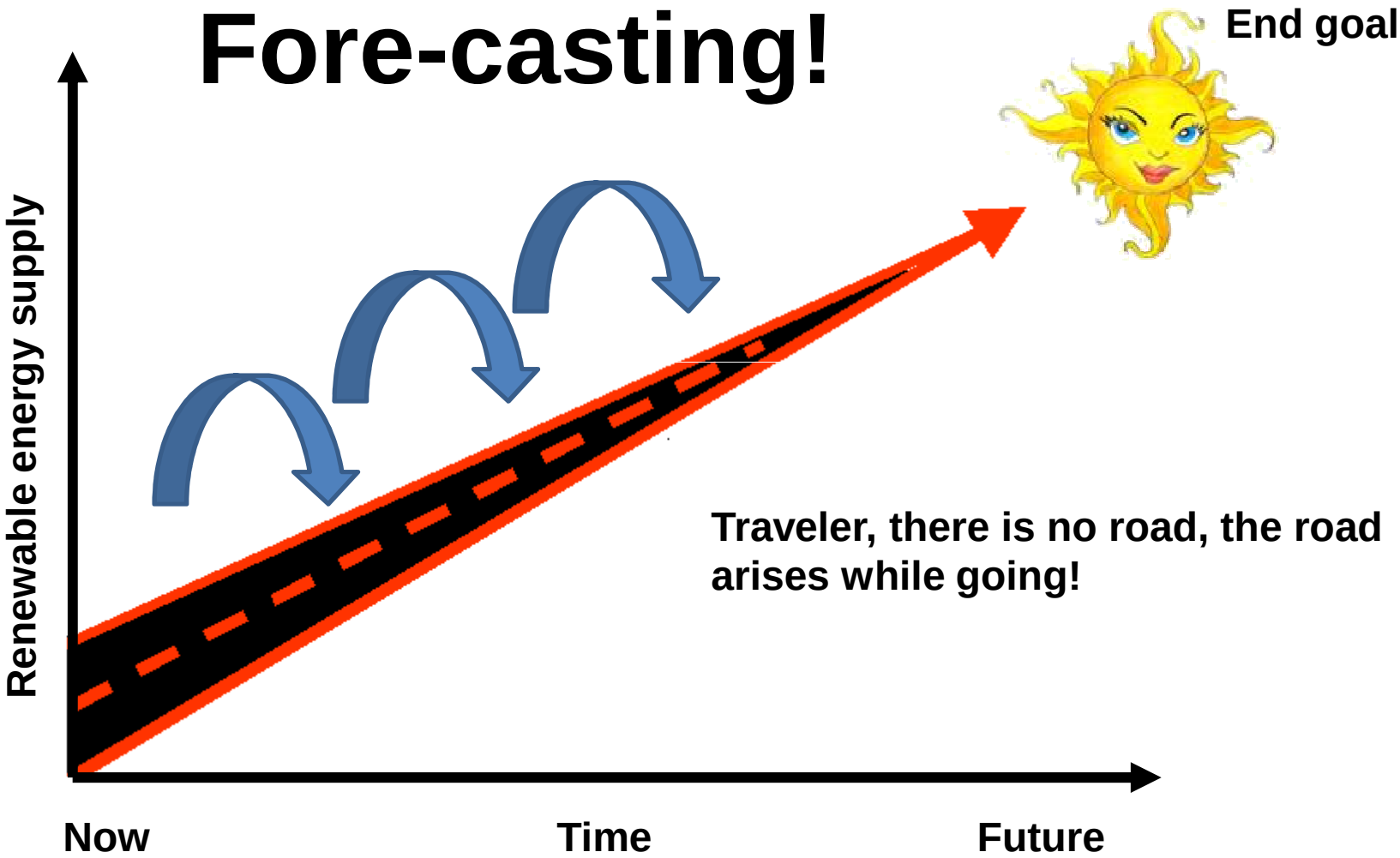
2013
Wordt de eerste 0-impact woning gerealiseerd
Wordt de eerste 0-energiestraat feestelijk gevierd
Start het eerste landbouwbedrijf gespecialiseerd in biobased materials
Opent een centrale kringbouwwinkel voor restmaterialen uit sloop zijn deuren
Is er in Limburg 5 hectare helofytenfilters gerealiseerd,

2012
Is de roadmap voor een duurzaam Limburg in 2050 uitgewerkt
Zijn er 3 transitie-demonstratieprojecten gestart
Zijn de twee Duurzame Energie Centrales bij Venlo en Maastricht actief
Zijn de eerste 0-energiewoningen in bestaande seriebouw gerealiseerd
Is er een proefveld opgezet voor de productie van hernieuwbare materialen
Bestaat de eerste nieuwbouwwoning uit geheel secundaire bouwproducten

2011
Transitiecoordinatie en centrum ‘up and running’
Is 5% energie bespaard (tov 2005); is 5% van de energiemix afkomstig van duurzame bronnen
en is de CO2-uitstoot met 6% gereduceerd (tov 1990).

2010
In 2011 is in Limburg C2C een geaccepteerd ontwerpprincipe voor
Duurzame ontwikkeling voor overheden en bedrijfsleven (gerealiseerd)
Limburg is in 2011 koploper als het gaat om C2C regios in NL (gerealiseerd)
In de periode 2007-2011 moet in minstens 10 concrete (voorbeeld)projecten het C2C principe zijn toegepast bij
koplopers, majeure ontwikkelingen en beeldbepalende ontwikkelingen (gerealiseerd)

Using lessons learned!



Collecting learning experiences by interviewing the frontrunners

International Co-operation in the framework of IEA:

Annex 51 - Energy Efficient Communities

Lead: France
(EiFER)

Subtask A:
State-of-the-Art

Lead: Sweden
(Prof. Moshfegh)

Subtask B:
Case studies
(community areas)

Lead: The Netherlands
(Prof. Kimman)

Subtask C:
Case studies
(towns/cities)

Subtask D:
- Guidebook
- C-ECA
- Dissemination

Lead: Germany
(H. Erhorn)

Operating Agent: R. Jank

Participants:

Canada
Finland
France
Denmark
Germany
Japan
The Netherlands
Sweden
USA
Austria

AUSTRIA
CANADA
DENMARK
FRANCE
GERMANY
SWEDEN
THE NETHERLANDS

City of St. Johan
City of Pr. George
Aarhus
Nantes
Ludwigsburg
Stockholm
Tilburg

RiBuilT THE CONCEPT OF ZERO

ZUYD

Collecting learning experiences frontrunners

CASE STUDIES

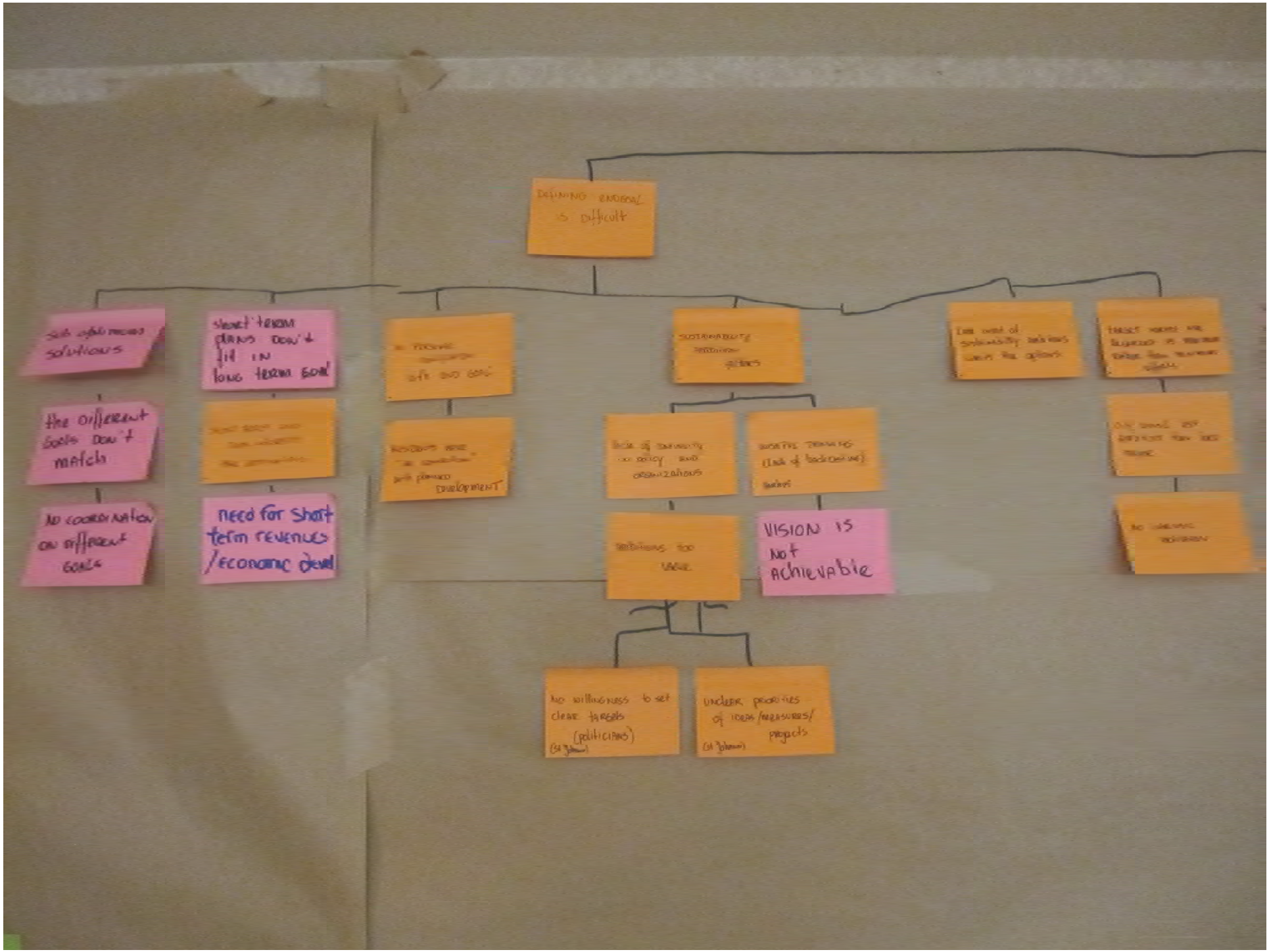
Country	Austria	Canada	France	Germany	Nether lands	Sweden	Denmark
city	St. Johann	Prince George	Nantes	Ludwigs burg	Tilburg	Stockholm	Aarhus
Popu lation	10.714	70.981	580.000	87.000	205.000	850.000 (city) 2 milj (area)	311.000
HDD	4.184	4.727	2.342	2.563	2.289	2.856	3.180

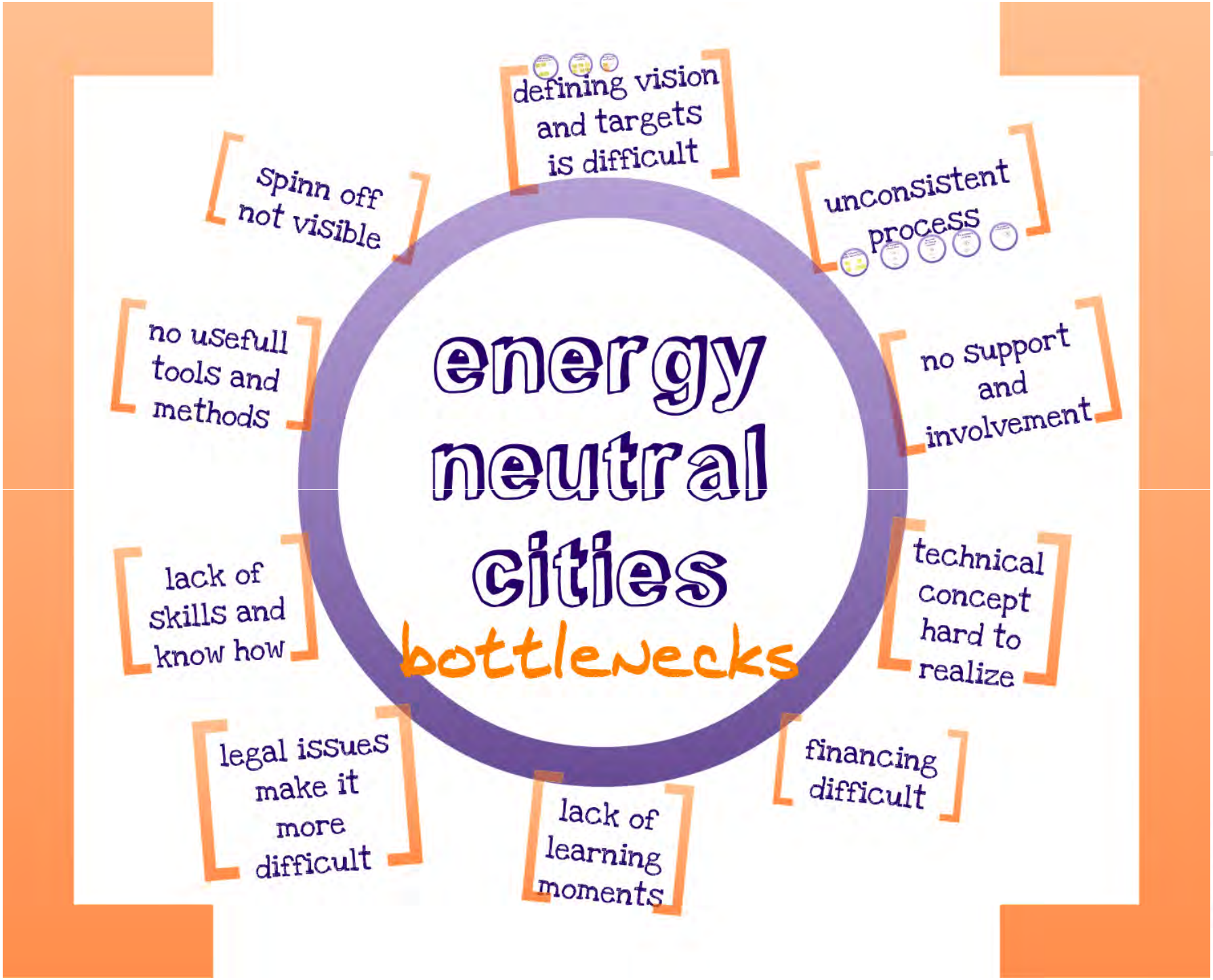
Netherlands: results from research on 15 frontrunner municipalities (EOS LT TRANSEP DGO)

Transition Management:

Issue/ bottle neck analysis

NOT RESPONSIBLE FOR
LOST OR STOLEN ARTICLES.
NON RESPONSABLE POUR
OBJETS PERDUS OU VOLÉS


DEFINING ENDGOAL is difficult
Sub optimum solutions
the different goals don't match
No coordination on different goals
Short term plans don't fit in long term goal
need for short term revenues /economic growth
SUSTAINABILITY
VISION IS Not Achievable
No willingness to set clear targets (politicians)
Unclear priorities of ideas/measures/ projects


energy neutral cities
bottlenecks
defining vision and targets is difficult
unconsistent process
no support and involvement
technical concept hard to realize
financing difficult
lack of learning moments
legal issues make it more difficult
lack of skills and know how
no usefull tools and methods
spinn off not visible

- End goal
- Process and organization
- Support and involvement
- Technological concepts
- Financing
- Monitoring
- Legal issues
- Skills and know how
- Tools and methods

END GOALS

- 100% energy autonomous in ? (St. Johann)
- 80% reduction GHG in 2050 (Pr. George)
- 50% reduction GHG in 2025 (Nantes)
- Energy neutral in ? (Ludwigsburg)
- 100% reduction GHG in 2045 (Tilburg)
- Fossil free by 2050 (Stockholm)
- CO_2 neutral in 2030 (Aarhus)

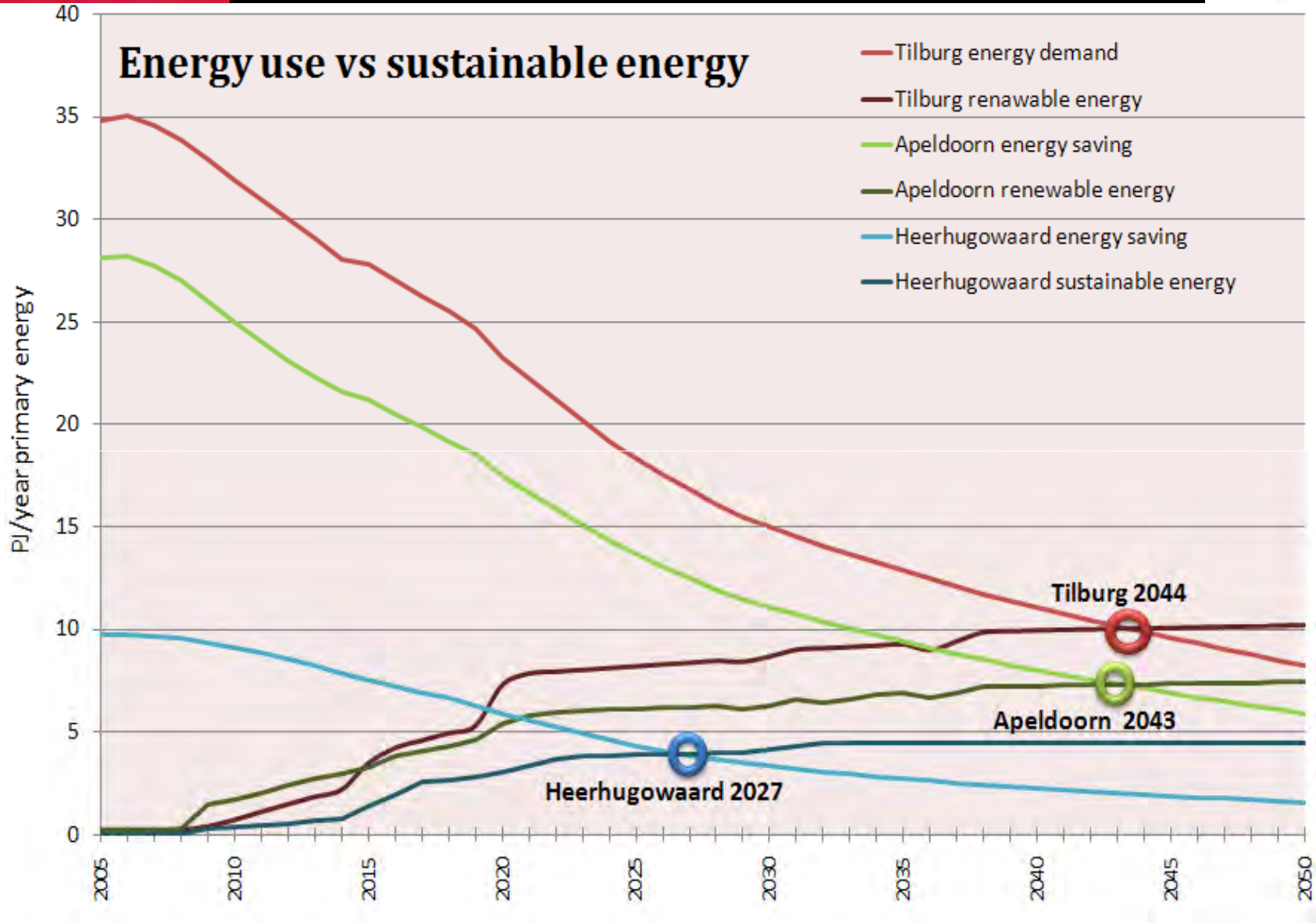
Definition Energy Neutral/ zero energy

- Carbon neutral (+)
  - Considers only the greenhouse gas CO_2
  - Climate forests and Carbon capture & storage are allowed

- Climate neutral (++)
  - Does not influence the climate, because it does not emit any of the greenhouse gases CO_2, CH_4 (methane), N_2O (laughing gas) and certain fluor compounds

- Energy neutral / (net) zero energy (+++)
  - In an energy neutral municipality not more energy is used by end users than is supplied by sustainable energy sources
  - Focus on the development of a sustainable energy supply system
  - Climate forests and Carbon capture & storage do not tribute to energy neutrality

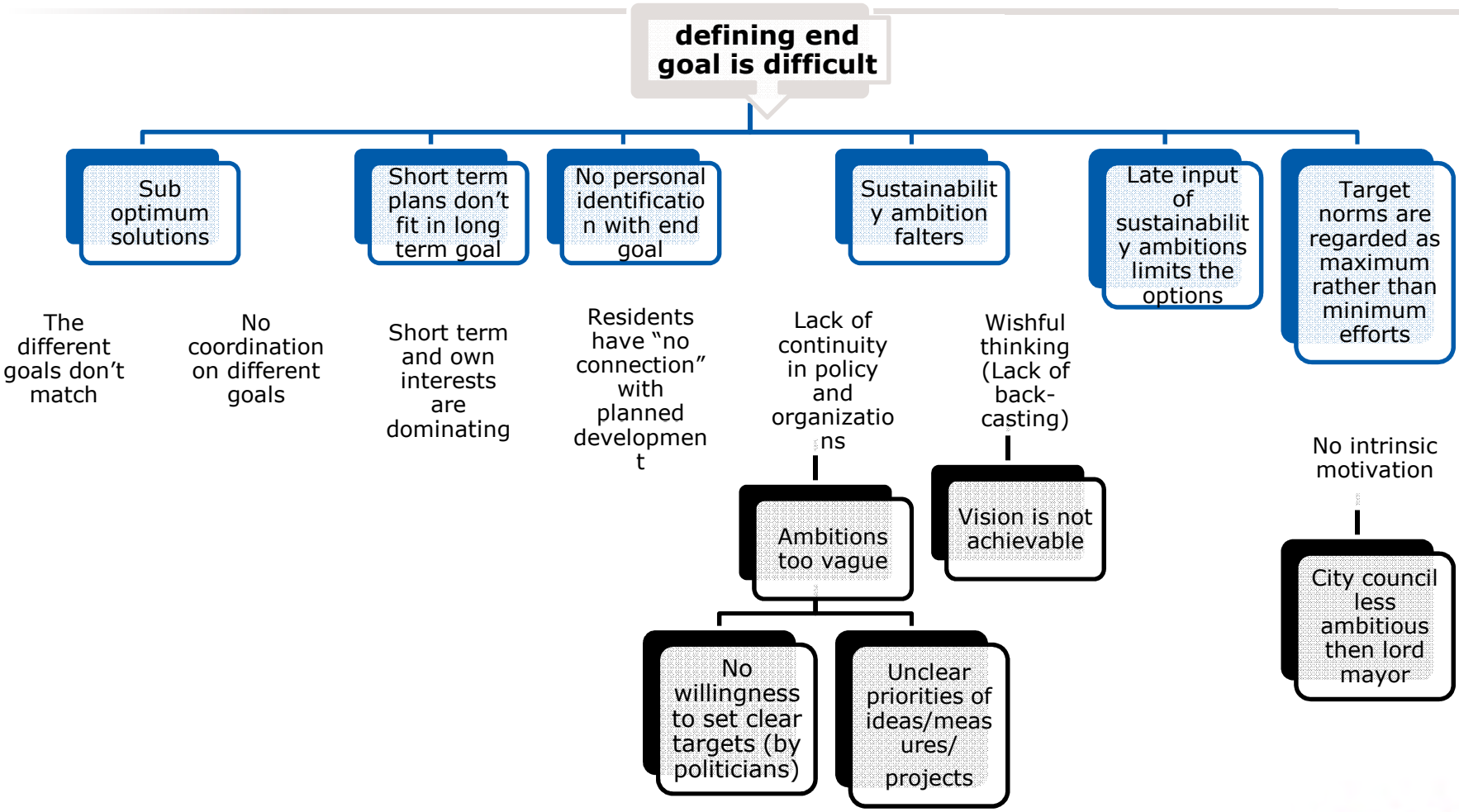
Energy Neutral in 2030?



Source: Builddesk,Vera Rovers, carbon neutral cities pilot-program, VROM 2008

City of the sun (Heerhugowaard)

Solar energy: experiences


defining end goal is difficult
Sub optimum solutions
Short term plans don't fit in long term goal
No personal identificatio n with end goal
Sustainabilit y ambition falters
Late input of sustainabilit y ambitions limits the options
Target norms are regarded as maximum rather than minimum efforts
The different goals don't match
No coordination on different goals
Short term and own interests are dominating
Residents have "no connection" with planned developmen t
Lack of continuity in policy and organizatio ns
Wishful thinking (Lack of back-casting)
No intrinsic motivation
Ambitions too vague
Vision is not achievable
City council less ambitious then lord mayor
No willingness to set clear targets (by politicians)
Unclear priorities of ideas/meas ures/ projects

Barriers sustainable urban development

- Short time focus
- Split incentive
  - Realization and exploitation separated
- Distrust
- Ambitions not enough anchored
- No bonus for energy neutrality, no punishment for energy inefficiency
- Integral approach is no standard

→ **Transition** needed in organisation, thinking and doing

- End goal
- Process and organization
- Support and involvement
- Technological concepts
- Financing
- Monitoring
- Legal issues
- Skills and know how
- Tools and methods

Proces is not consistent

- No problem owner process
  - Unclear who are the decision makers
  - Who is responsible for the whole process?
  - Proces are many different decision makers
  - No "issue owner" for realizing energy infrastructure on city scale
- No integration within organization
  - hard to transform organization
    - coordination different decisionmakers hard
  - hard to harmonize different sections
    - organization and working method very segmented per sector
    - no coordination between different projects within municipality
- to little connection between planning, execution and control
  - too much separate motives to different stakeholders during the whole process
- no common vocabulary
  - people can't understand each other
  - different definitions for the same words
  - various possible definitions
  - Different worlds politicians ↕ engenieers
- No need to change process
  - No whole "picture" of process
  - lack of process knowledge
  - to little attention for proces

bridge gap

competition → all departements

willing be able

Ever

Process is not consistent

No problem owner process

- Unclear who are the decision makers
  - Not clear who is responsible for process
  - There are many different decision makers
- No "issue owner" for realizing energy infrastructure on city scale

No integration within organization

- Hard to transform organization
  - Coordination between different decision makers is hard
- Hard to harmonize different departments
  - Organization and working method very segmented per sector
  - No coordination between different projects within municipality

No continues process

- To little connection between planning/ execution and control
  - Too much transfer moments to different stakeholders during the whole process

No common vocabulary

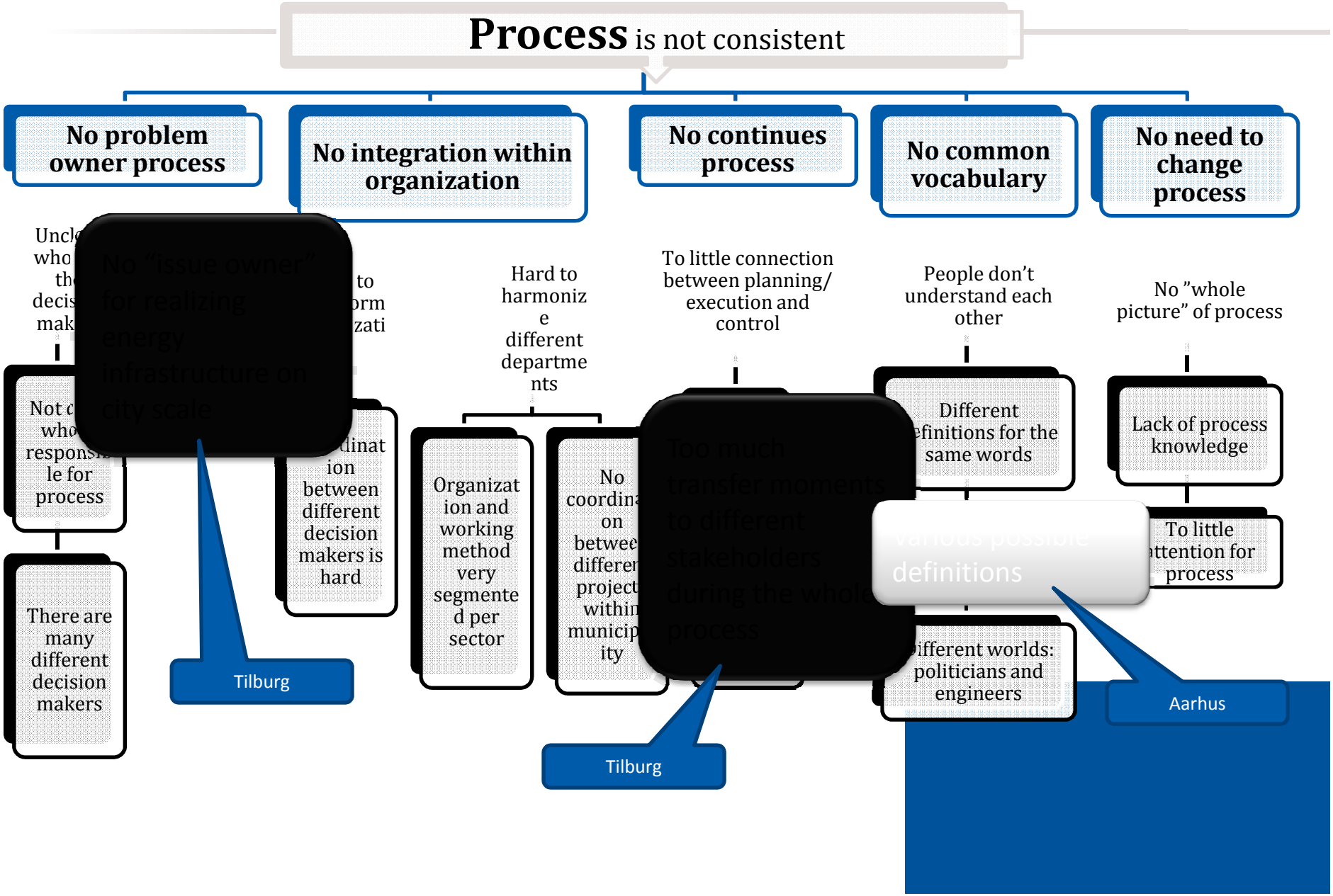
- People don't understand each other
  - Different definitions for the same words
  - Various possible definitions
  - Different worlds: politicians and engineers

No need to change process

- No "whole picture" of process
  - Lack of process knowledge
  - To little attention for process

RiBuilT THE CONCEPT OF ZERO

ZUYD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[redacted]
Not c who responsi le for process
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to orm zati
tlinat ion between different decision makers is hard
Tilburg
Hard to harmoniz e different departme nts
Organizat ion and working method very segmente d per sector
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[redacted]
Tilburg
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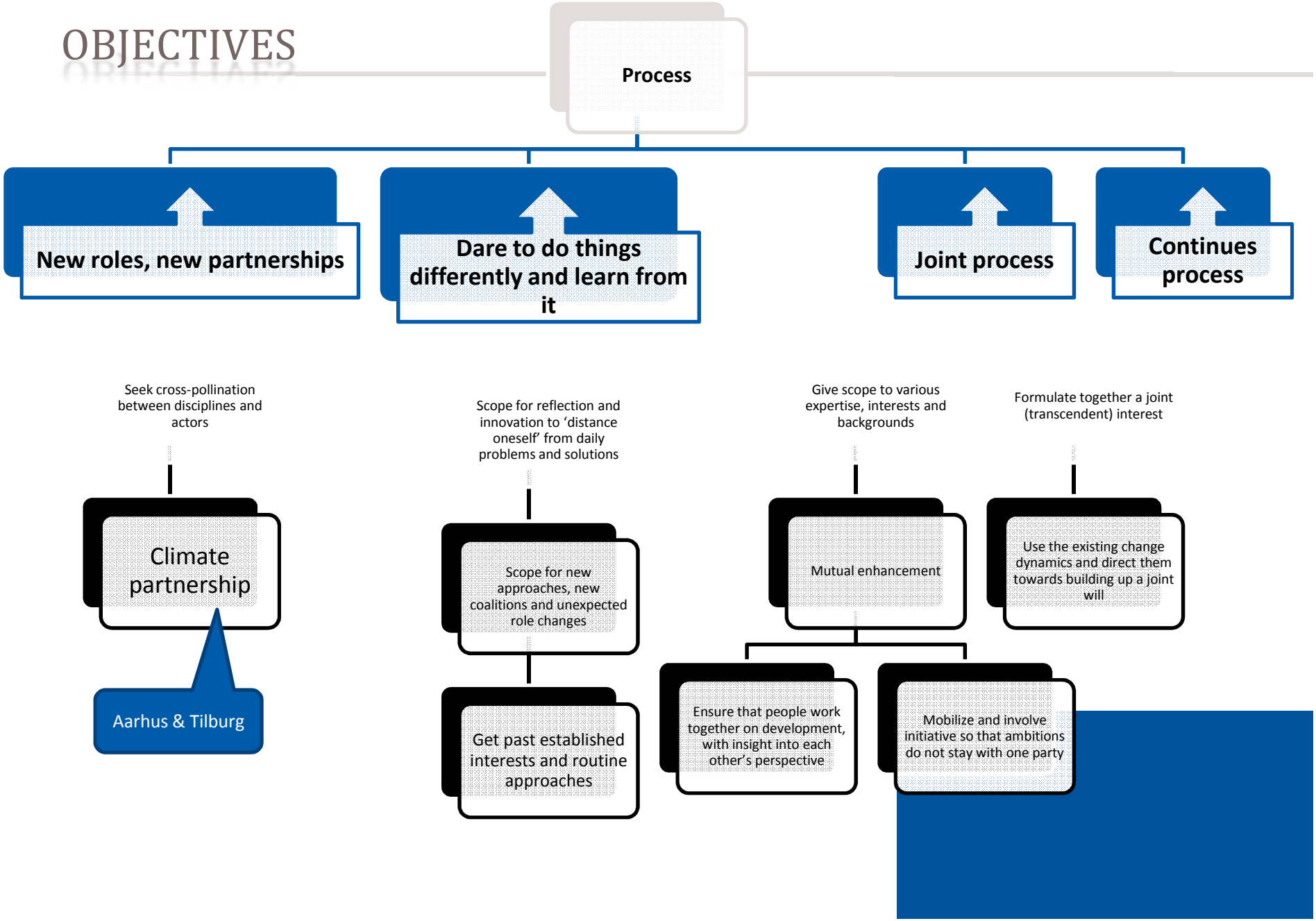
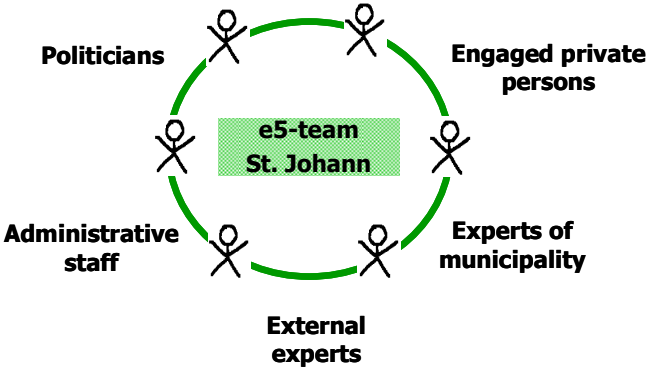
Aarhus

OBJECTIVES

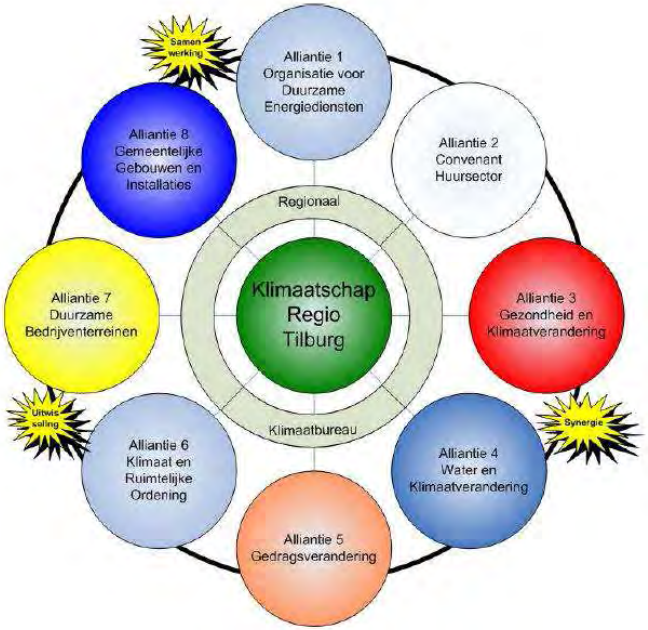

Process
New roles, new partnerships
Dare to do things differently and learn from it
Joint process
Continues process
Seek cross-pollination between disciplines and actors
Climate partnership
Aarhus & Tilburg
Scope for reflection and innovation to 'distance oneself' from daily problems and solutions
Scope for new approaches, new coalitions and unexpected role changes
Get past established interests and routine approaches
Give scope to various expertise, interests and backgrounds
Mutual enhancement
Ensure that people work together on development, with insight into each other's perspective
Mobilize and involve initiative so that ambitions do not stay with one party
Formulate together a joint (transcendent) interest
Use the existing change dynamics and direct them towards building up a joint will

PROCESS - NEW PARTNERSHIPS

- New partnerships between municipality with citizens, companies and other stakeholders:



- E5/eea team (st Johann)
- Effectively engaged residents & DDES (pr. George)
- Energy team (Nantes)
- Climate partnership (Aarhus & Tilburg)
- Plan of action - Public–private cooperation (Stockholm)
- Broad participation process with experts, local stakeholders and citizens (Ludwigsburg)



CONTINUES AND INTEGRAL PROCESS AND ORGANIZATION

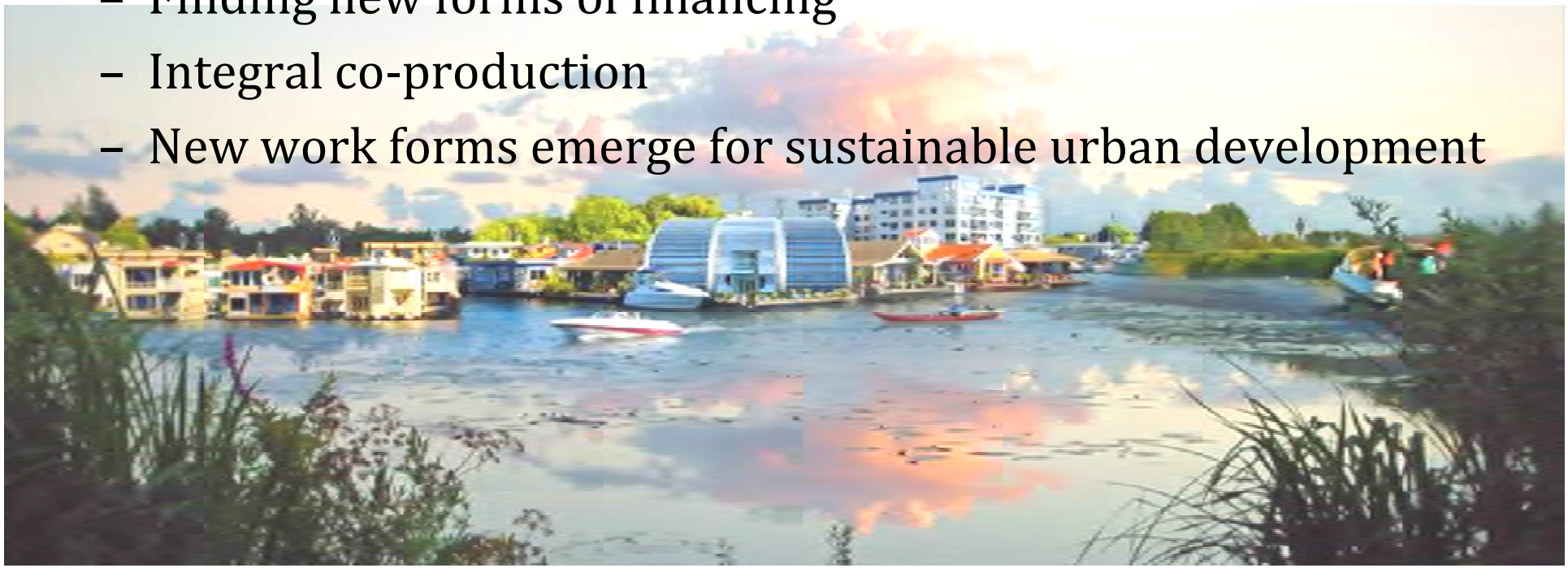
- Standardized process organization & Continuous process (St. Johann)
- myPG: city wide integrated planning process (Pr. George)
- Office for Regional Planning (Stockholm)
- Management circle with 60 indicators for sustainability (Ludwigsburg)

Analysis of the Interviews: results

Obstacles – fragmentation within municipality	Solutions – fragmentation within municipality
-No coordination between different projects within municipality -Organisation and working method very segmented per sector -Sustainability ambitions are not widely supported within the municipal organisation -Sustainability aspects are considered relatively unimportant -Sustainability is regarded as an additional degree of difficulty -The right competences are lacking for integrated cooperation	-Build on a network of intrinsically motivated people, right across all sector boundaries. -One person with final responsibility for the development at both official and political level, but also widely supported by the various departments. -Get people from sectors physically working together on themes or areas -Don't judge on the results achieved by your own department but on what the department contributes to joint objectives. -Jointly formulate and act on the necessity for innovation and sustainability-oriented change -Integrated plans (such as mobility plans via environmental impact linked to health effects) -Test policy plans against sustainability ambitions by multi-sector team -Improve the required competences; appoint a process leader who has insight into different expertises but who can work on a broader and more strategic basis.

Solutions of front-runners:

- Long-term values leading
  - Regular monitoring short-term actions to long-term goals
  - Anchoring long-term values in policy documents
- Innovative process approach
  - Key players working together instead of next to each other
  - Looking at lifetime costs not only investment costs
  - Finding new forms of financing
  - Integral co-production
  - New work forms emerge for sustainable urban development



In 20 steps to energy neutral districts

A. Ambition	1. Personal ambitions and effort 2. Desribe ambition in policy documents
B. Design of the Roadmap/ Transition management	3. Make a physical view in terms of space and area Visualise the energy neutral district in future 4. Backcasting and forecasting based on best practices 5. Organise a strong team to coordinate the roadmap
C. Bundeling economic results/ Businessmodel/ Spin offs	6. Develop business plans 7. Ask for contracts based on a price and quality for the whole period of exploitation 8. Get strong committment by showing spin-offs
D Scenarios/ decision model	9. Think in terms of out of the box solutions. Scan the financial consequences of the different scenarios
E. Suitable Energy concept	10. Determine the energy demand and reduction 11. Analyse the energy potentials of the district 12. Choose the right energy system
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H. Involve Users	19. Involve users in the exploitation /achieve quick wins 20. Stimulate low energy consumption

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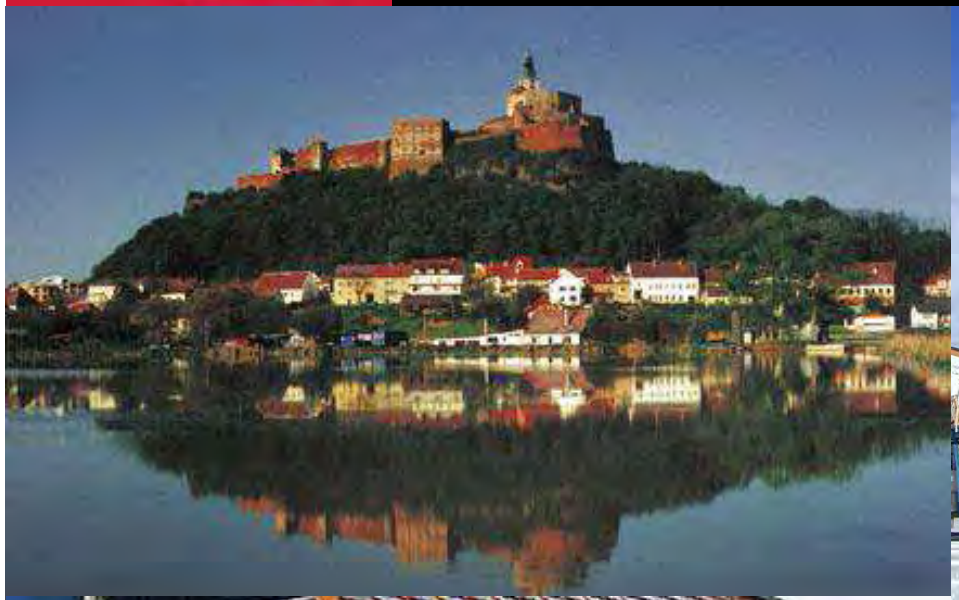
HOGESCHOOL ZUYD

Güssing (Austria): first energy neutral city in the world!



EUROPÄISCHES ZENTRUM
FÜR ERNEUERBARE ENERGIE
GÜSSING GMBH

A roadmap to energy neutral districts

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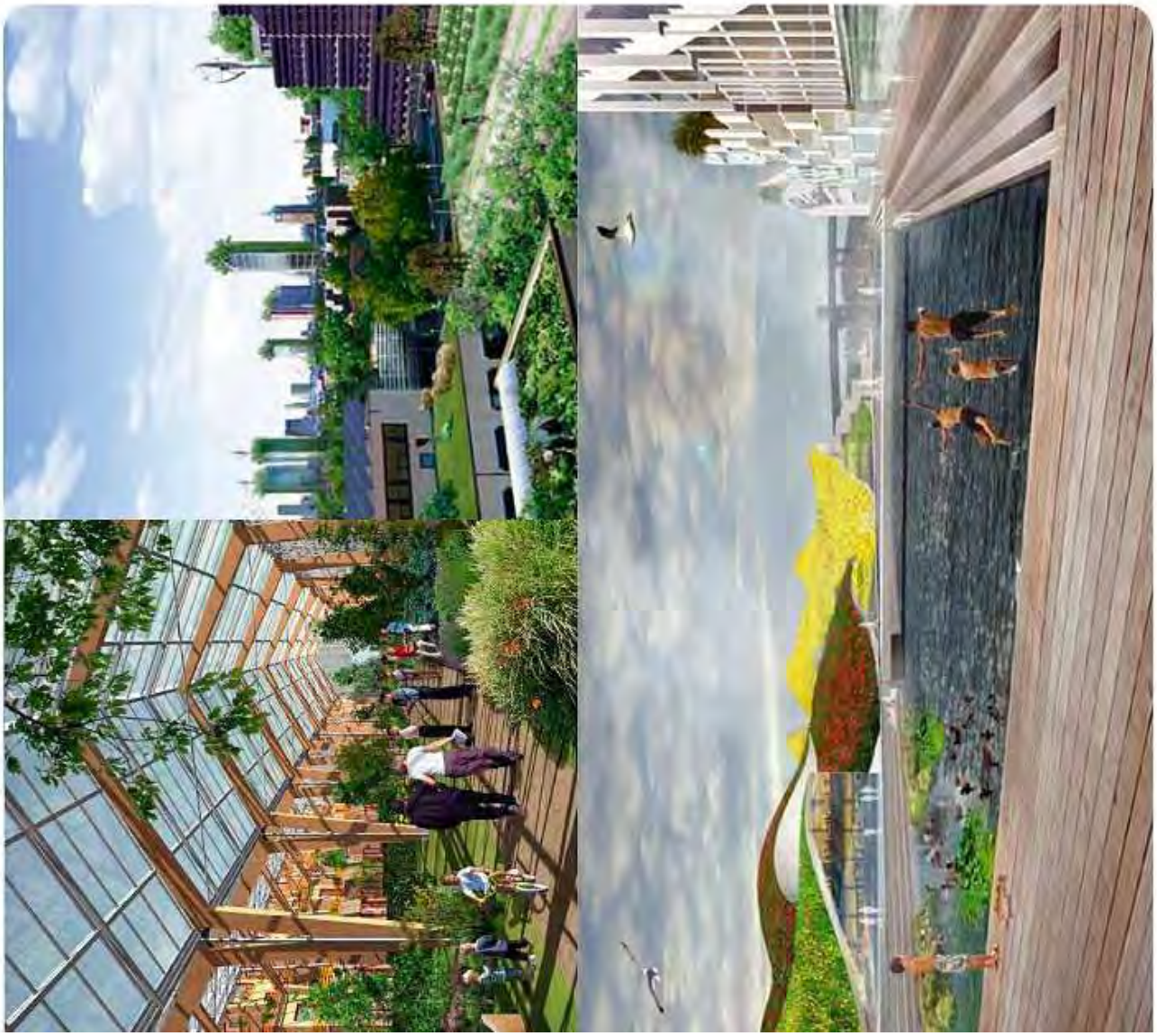
RiBuilT

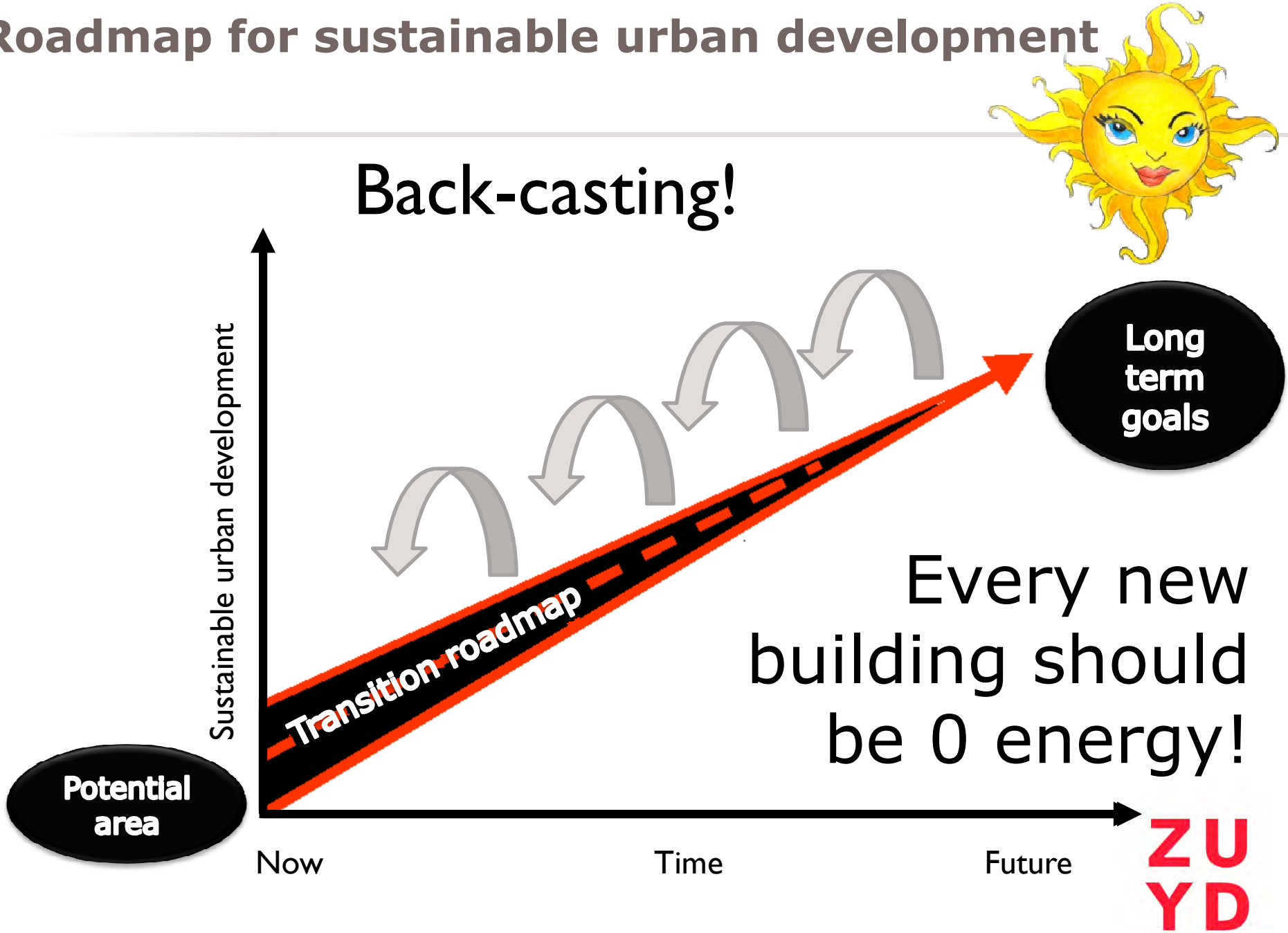
HOGESCHOOL ZUYD

Limburg in 2050



Super Sustainable City - Goteburg

Roadmap for sustainable urban development



De Wijk van Morgen
Transition project
Transition forum

In 20 steps to energy neutral districts

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Teknologiasta liiketoimintaa

Peltosaari, Riihimäki

Jyri Nieminen, VTT

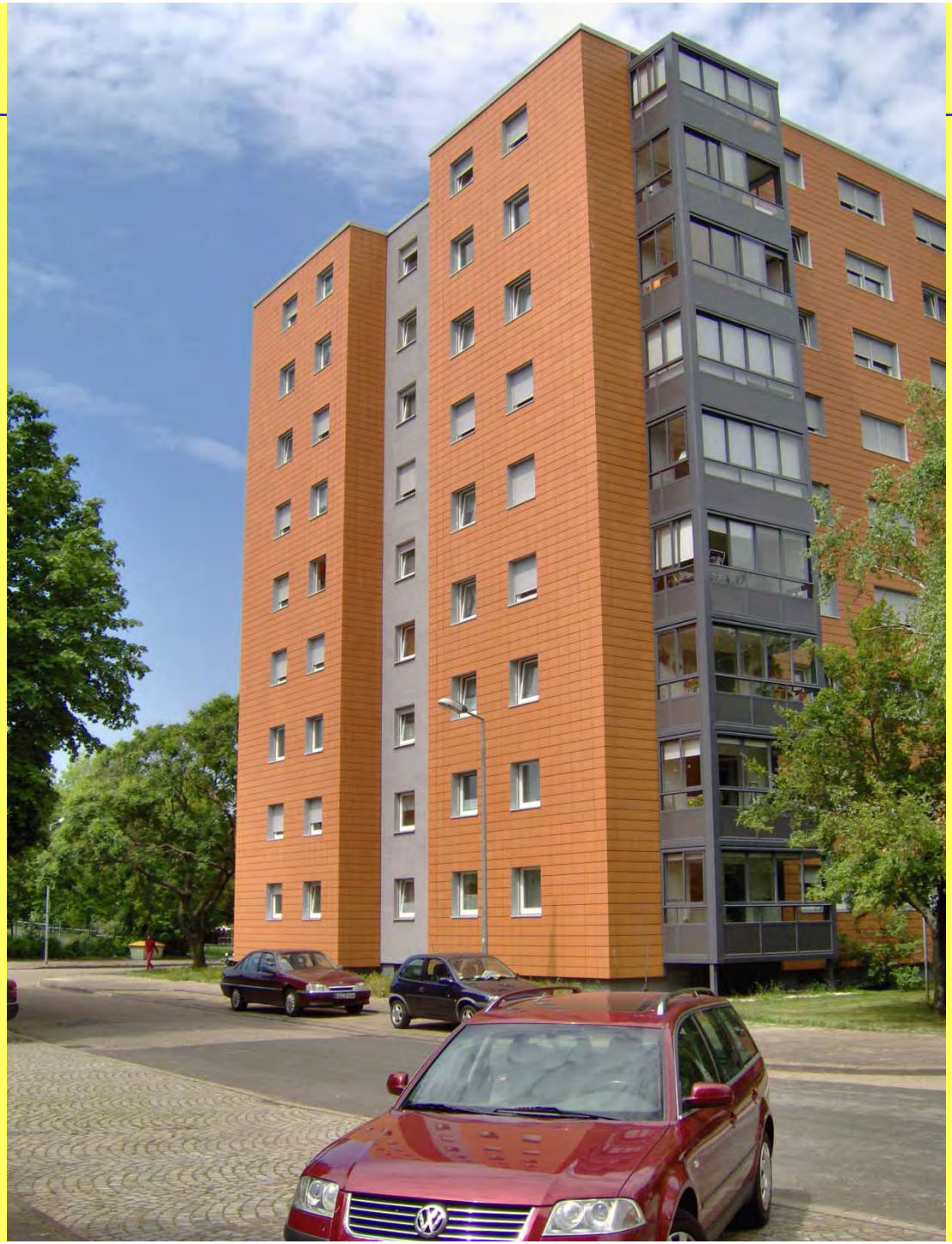
Value increase by renewal

- Price recovery
  - Value increase for the whole Peltosaari 77 M€
- Building rights: direct income for the building / apartment owners 20 M€
- Total, eco-efficient and high quality renewal including new services' structure, work places, shops etc.
  - Value increase ~100 M€ or even more
  - *The target has to be high!*
- Reduction of energy costs:
  1,5 - 2,0 M€/year
- Costs of renewal 80 – 90 M€.

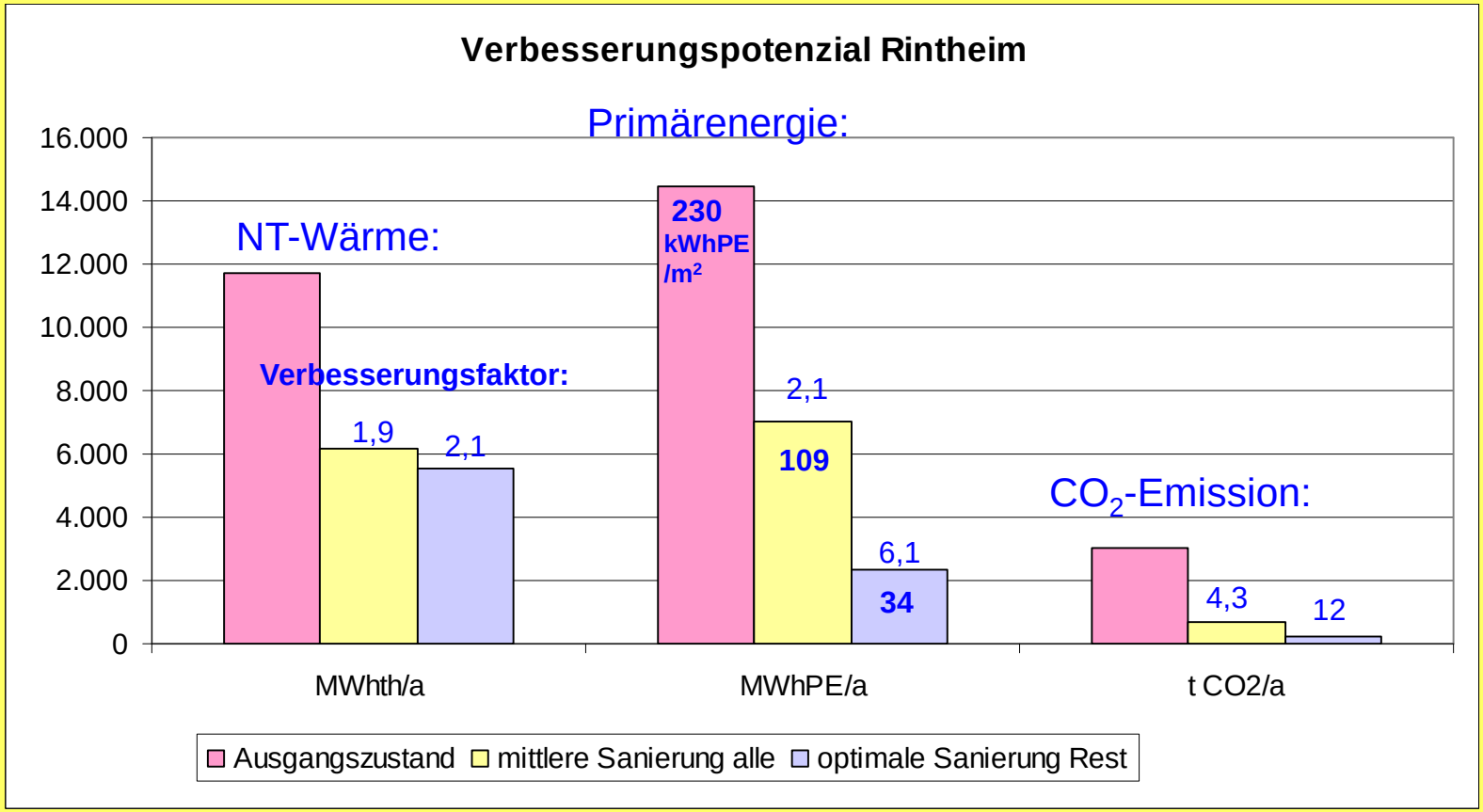
IEA, Annex 51:

Quartierskonzept Rintheim,
Karlsruhe, Germany
R.Jank
Volkswohnung,
Housing Company

→ a bottom-up approach



(sehr grobe Abschätzung!)



Fernwärme-PE-Faktor: ~ 0,5 kWhPE/kWhth

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FINANCING

- Life time extension to 50 years
- Increase rent fitting into existing average living expense
- Property valuation system based on energy label
- Rent harmonization to 70% of maximum rent

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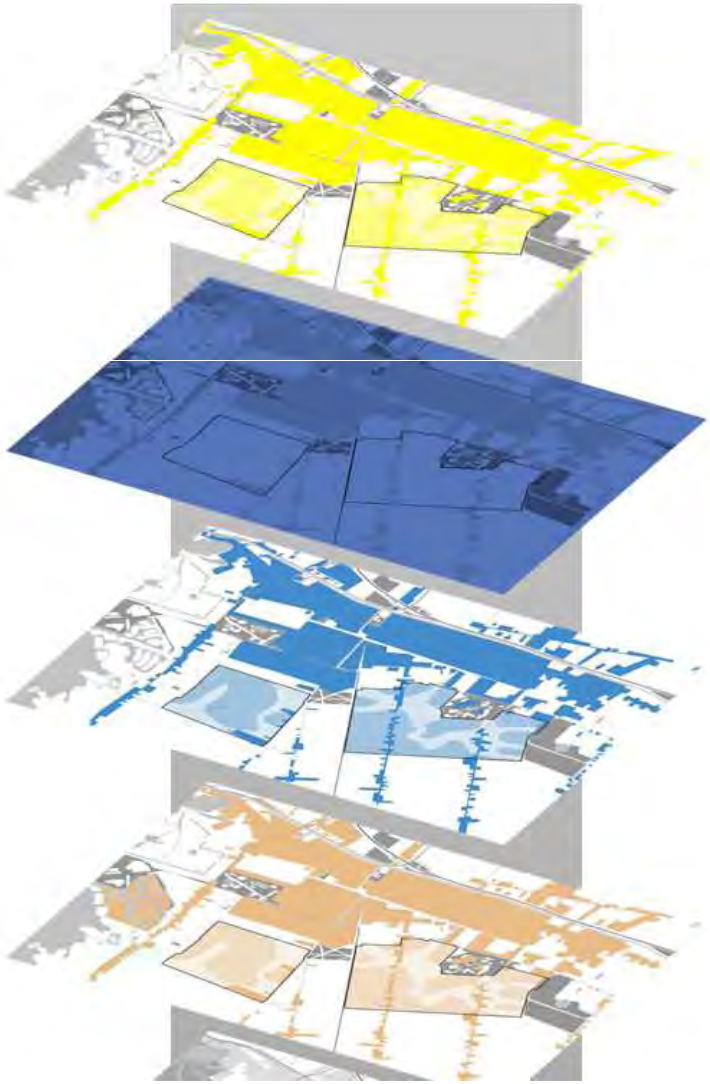
Potential stack energy mapping

De groene compagnie (Hoogezand Sappermeer)

Energievraag 3000 hh:
10,6 GWh_e
26,5 GWh_{th}

Energiepotenties

	DGC (700ha)	Toegepast
Zon 9640 MWh_{pr}/ha	6750 GWh_{pr}	PV op daken 12 GWh_e Zonne-collectoren op daken 25 GWh_{th}
Wind, 100m 228 MWh_e/ha	160 GWh_e	Wind, grote turbines 160 GWh_e
Wind, 30m 56 MWh_e/ha	5 MWh_e/turby	Wind, turby's 39 GWh_e (theoretisch max.)
Afval, huishoudens 1,7 $MWh_{(e + th)}$/ha	1,2 $GWh_{(e + th)}$	Afval, verbranding 1,2 $GWh_{(e + th)}$



Restwarmte

Kappa
2x 35 GWH_{th}
Jansen Wijhe
15 GWH_{th}

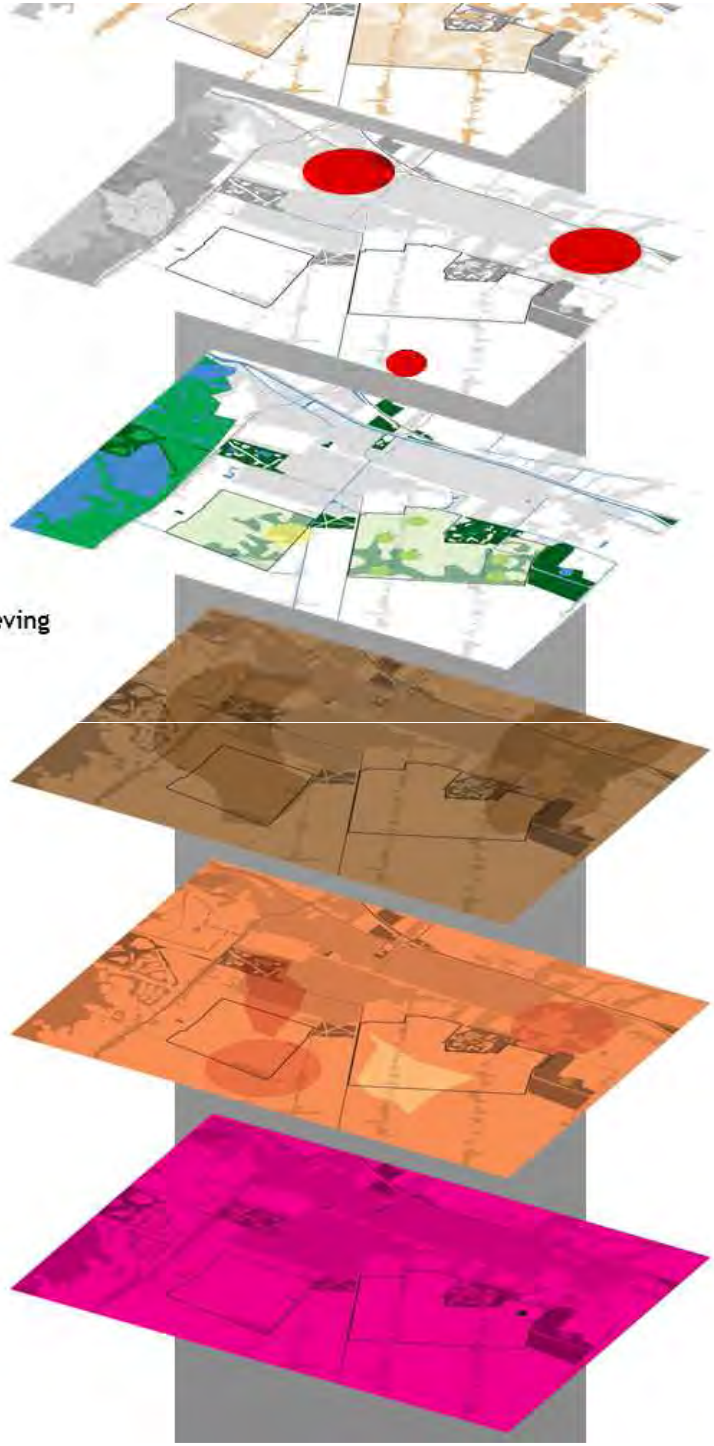
Biomassa
Natuuronderhoud
4,7 MWh_{pr}/ha
Bosonderhoud
18,9 MWh_{pr}/ha

Onderhoud DGC
3,1 GWh_{pr}
Mest
3,0 GWh_{pr}
Onderhoud omgeving
20 GWh_{pr}

Bodem tot -50m
verticale WW

Aquifers
w/k opslag

Geothermie, -3000m
105 °C



Restwarmte
Kappa
70 GWh_{th}
Jansen Wijhe
15 GWh_{th}

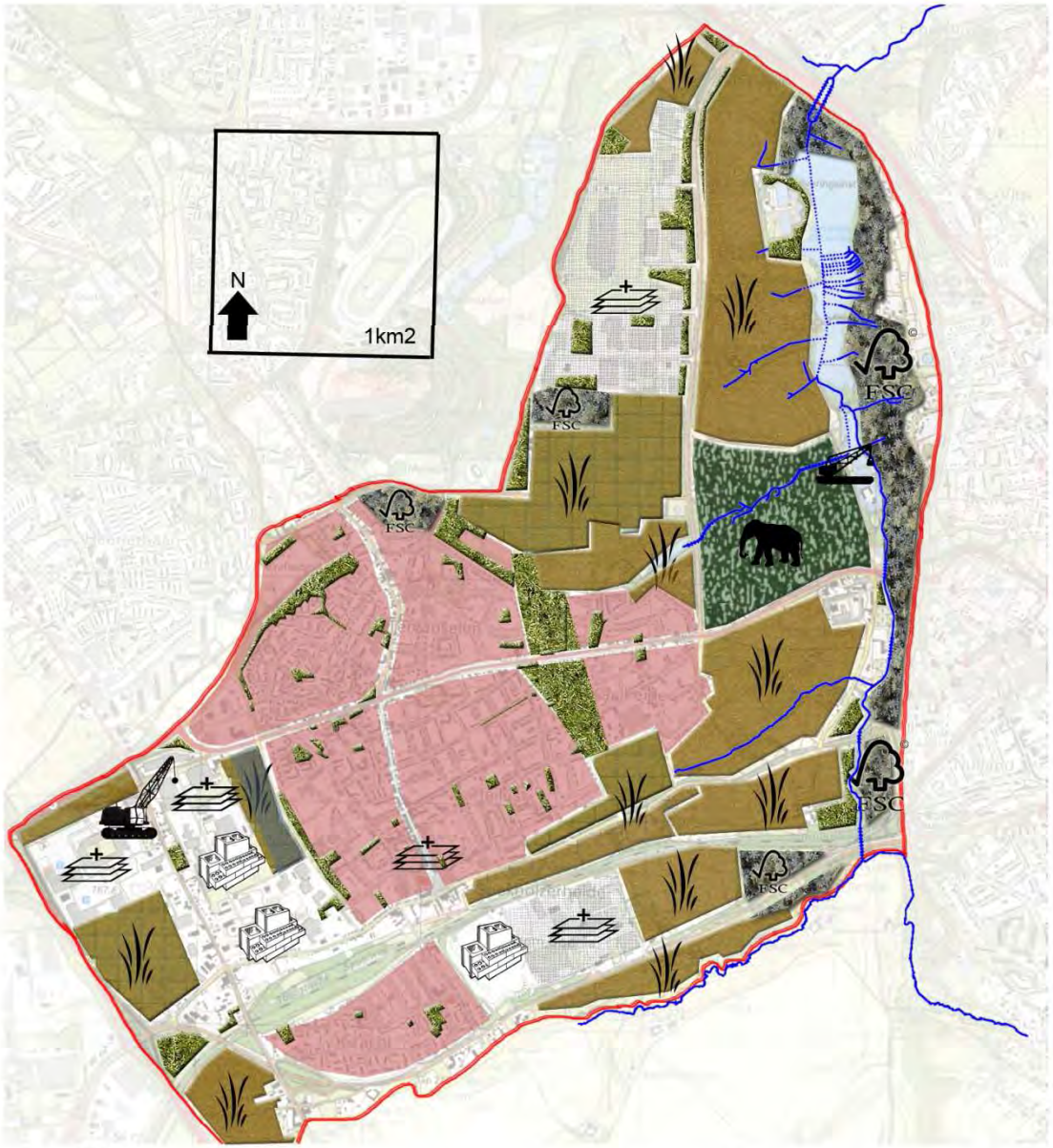
Biomassa
Onderhoud DGC
3,1 GWh_{pr}
Kippenmestvergassing
1,7 GWh_{pr}
Onderhoud omgeving (straal 10km)
20 GWh_{pr}

Bodemgeschiktheid WW
Zeer geschikt
Geschikt

Aquifergeschiktheid
Zeer geschikt
Niet geschikt
Onbekend
Restrictiegebeiden

Geothermie
Gasboorpunt

TU Delft
Wageningen University



General terrain section, hights in meters above AOD

Existing District of Tomorrow, Kerkrade West

Residential area;
50% reduction of infrastructure surface (one-way streets, central parking).
Total amount released mineral waste; 153,000 tons (brick pavement, granule, mixed sand).
Released land (ca 17HA = 170,000m2) useful for production of (building)material and food, water storage, wastewater treatment (constructed wetlands).
Usage of 50% of the gardens for production of buildingmaterials and food; ca 75,000m2

'Construction farms' in stead of existing agricultural land and greenzones'; ca 217HA (=2,170,000m2)

Existing forest/greenzones; transition towards FSC production forest

'construction farms' on land released by multiple space use and exclusion of non-sustainable production units

Non-used terrain (ca 90HA) and grass strips (ca 10HA) useful for production of materials; total ca. 100HA (=1,000,000m2)

Industrial zone; reduction of space use and transition towards sustainable production; 45HA (=450,000m2) released land for production of buildingmaterials.

Multiple space use on commercial buildings; sports grounds, greenhouses, etc.

Existing zoo; transition towards zero-materials Zoo

Regular demolishing of office buildings; released land; 0,38 HA/y (=3800m2/y) useful for pduction of materials

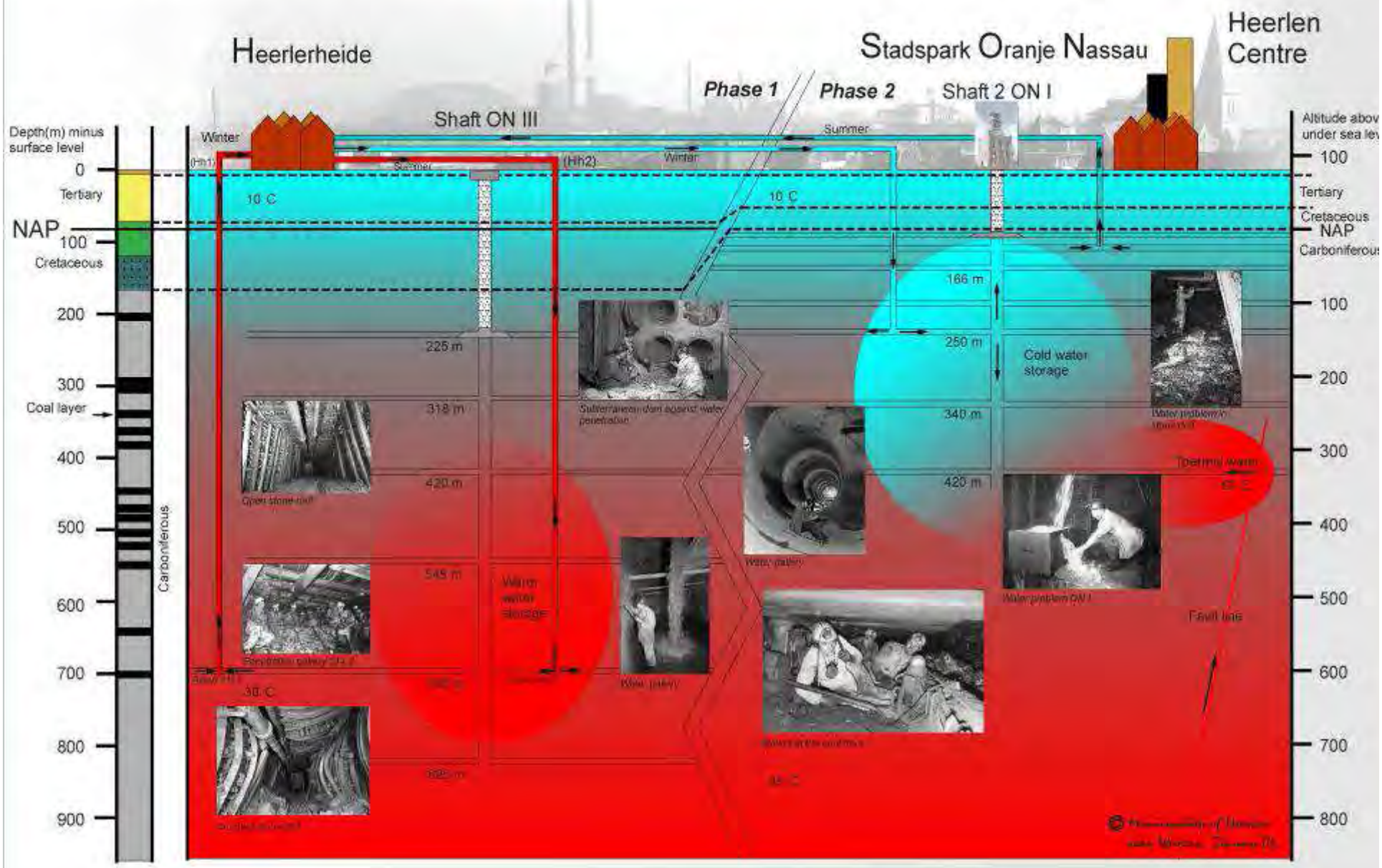
Sustainable extraction of supply of loam/clay in Anselderbeek; ca 220 tons/y

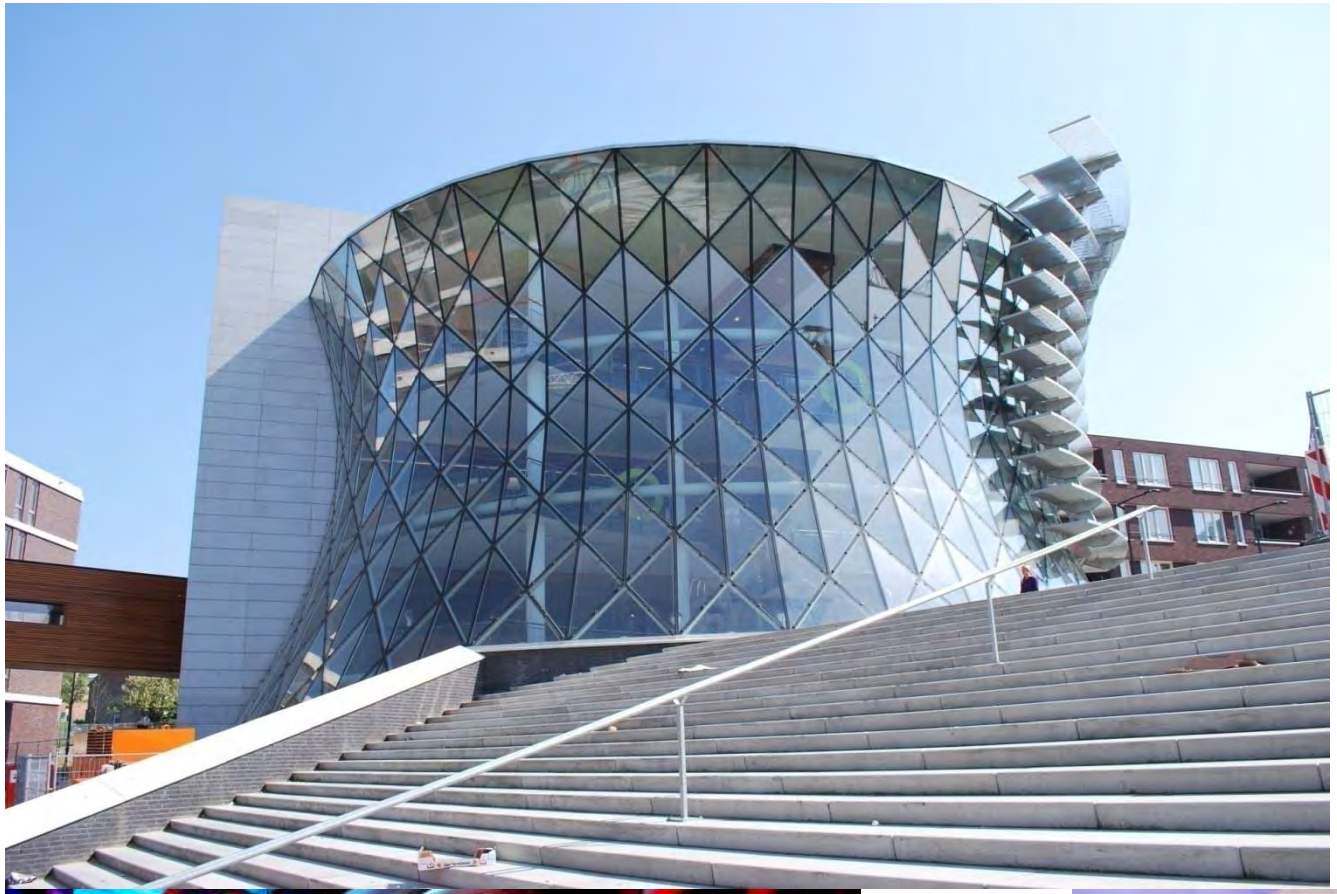
Existing companies that recycle or produce mineral building material; transition towards sustainable production/recycling

Optimization map; materials

ZU
YD

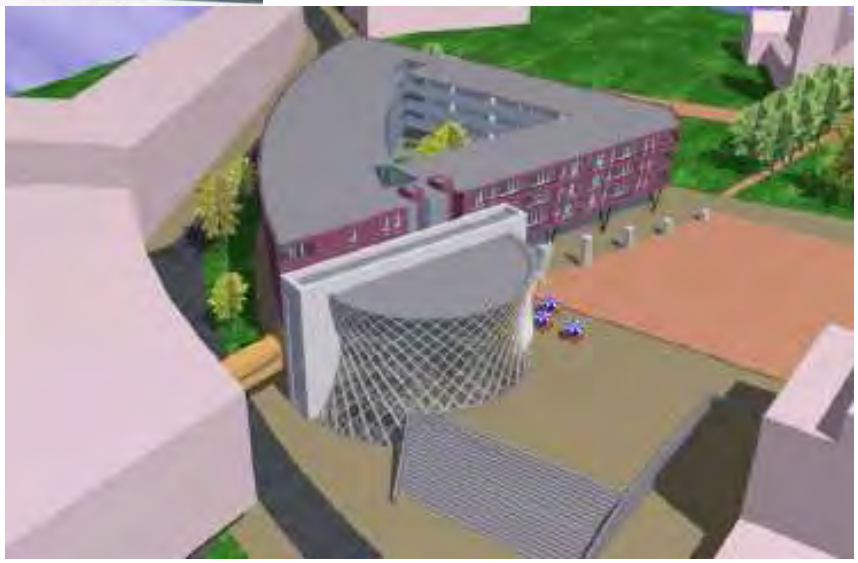
Heerlen the Netherlands, *warm* and *cold* water from abandoned coalmines





REMINING
LOWEX

Heerlerheide Centre



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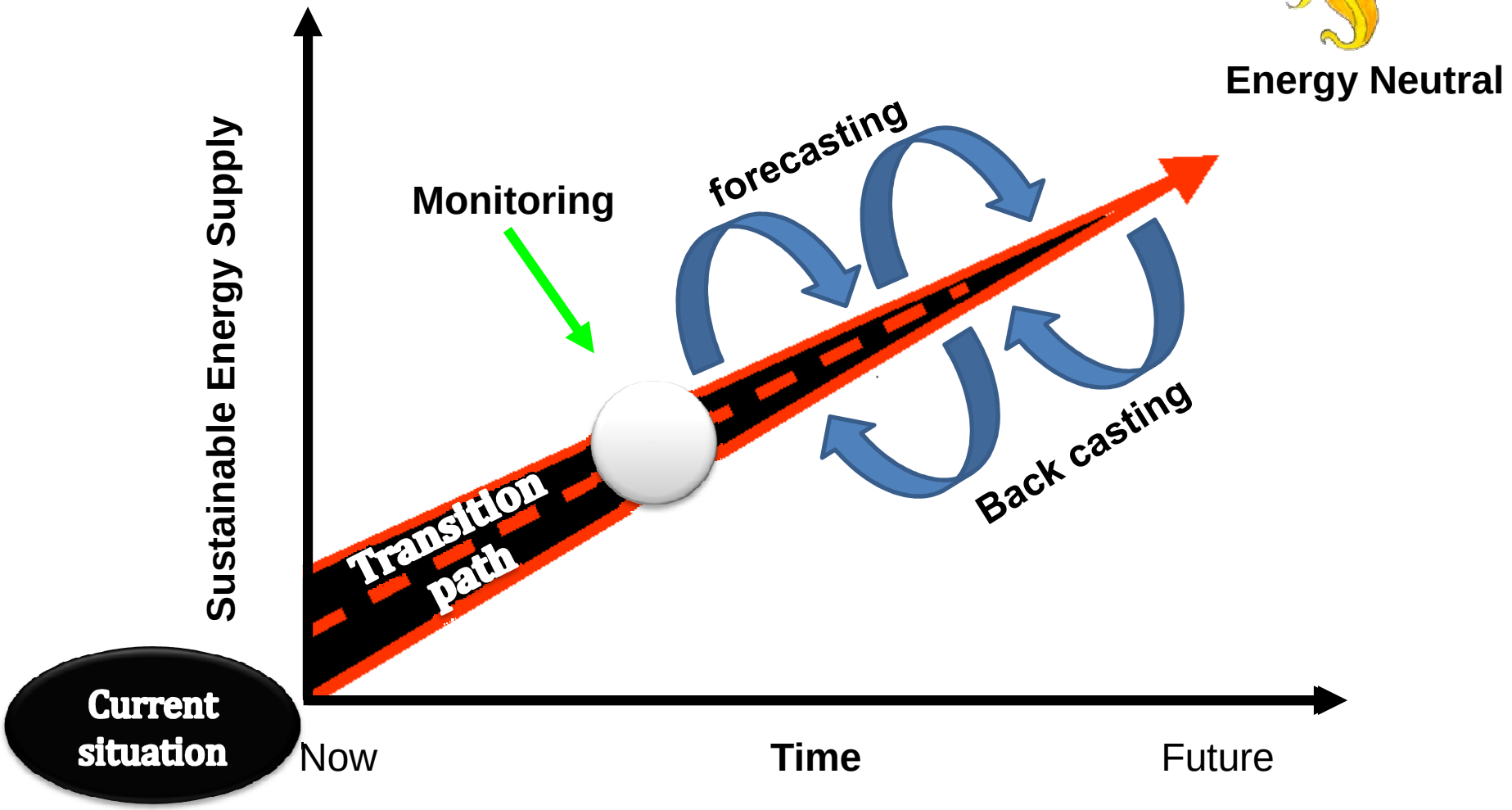
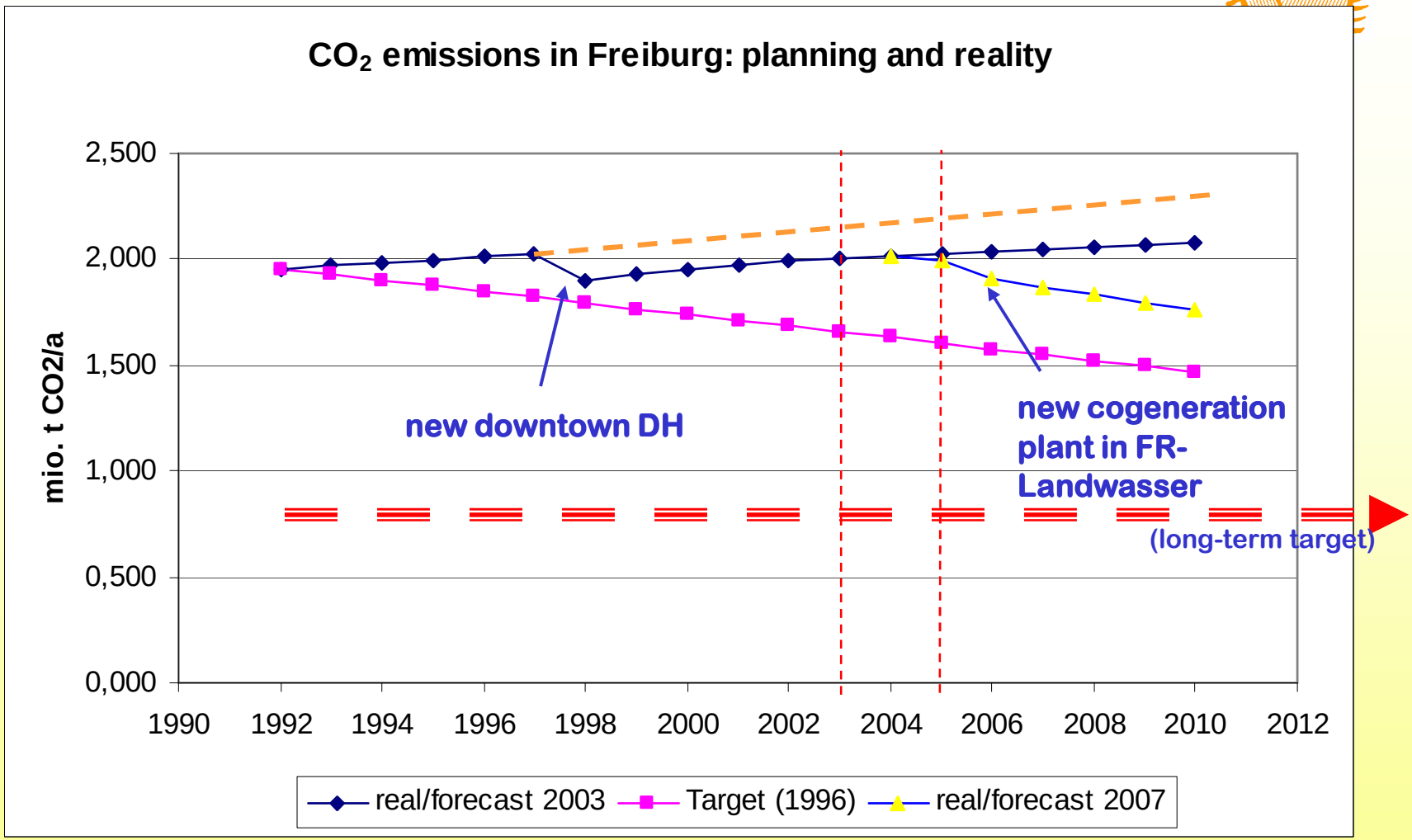
The importance of monitoring!

Defining the roadmap to energy neutral



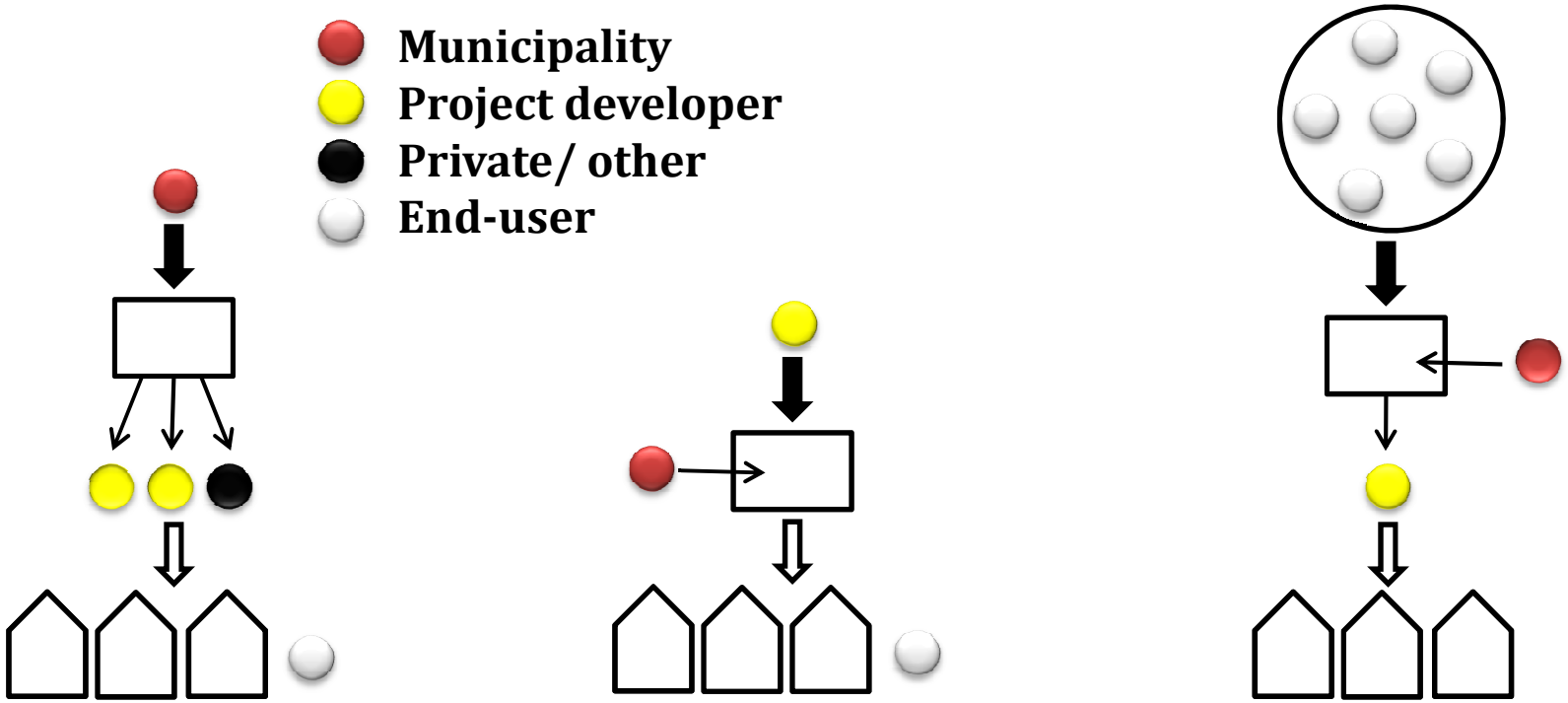
Freiburg, the
„Solar Capital“
of Germany


CO2 emissions in Freiburg: planning and reality
mio. t CO2/a
2,500
2,000
1,500
1,000
0,500
0,000
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
new downtown DH
new cogeneration plant in FR-Landwasser
(long-term target)
real/forecast 2003
Target (1996)
real/forecast 2007

„Solar neighborhood“, Schlierberg/Freiburg

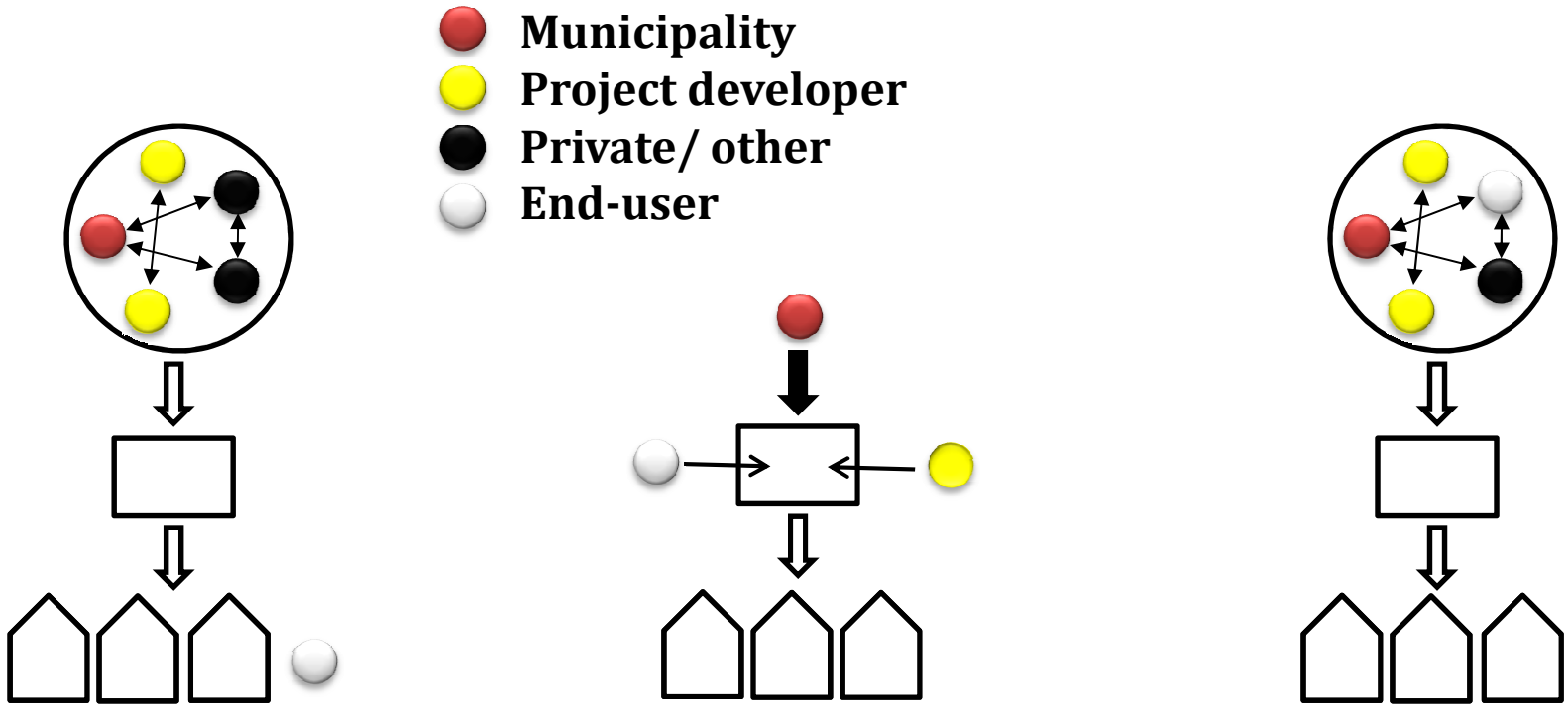
→ 50 „Plus-energy“ single-family buildings

Energy master planning



Municipality takes action	Private sector takes action	End users takes action
[-] No public support [-] Plans do not fit requirements end users [+] Strong coordination on long-term goals	[-] Plans do not fit requirements end users [-] Focus on investment instead of life time costs	[+] Fit to wishes of users [-] Risk of chaotic steering in the realization phase

Energy master planning

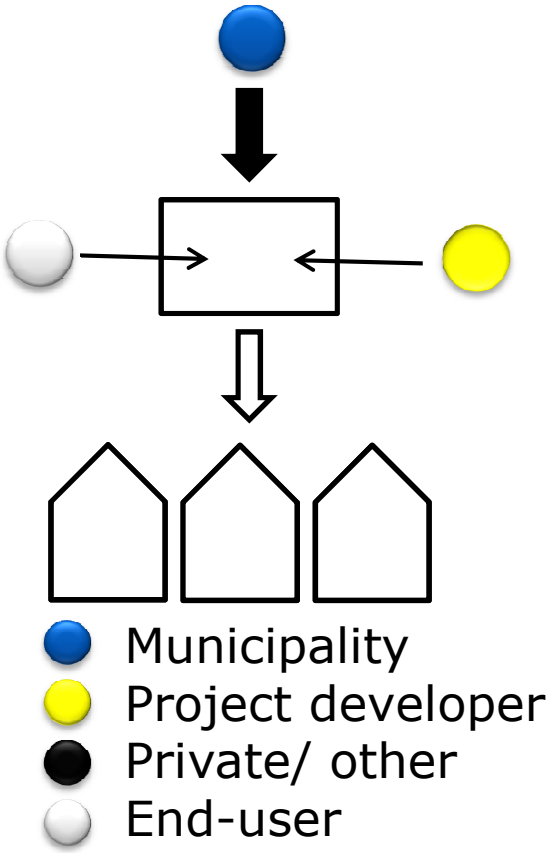


Public private partnership	Participation model	Transition model
[-] Bad fit for the requirements of end users [+] Good communication and tuning	[+] Bigger commitment of end users [-] Avoiding risks by private sector	[+] Bigger commitment , integral approach, less influence of boundary conditions [-] Big transformation necessary for existing organizations

ST. JOHANN & LUDWIGSBURG: PARTICIPATION MODEL

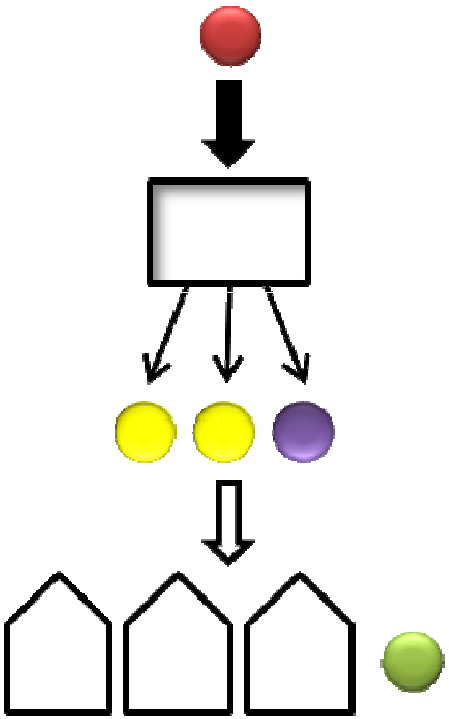
- St Johan:
  - Initiative: member of city administration
  - & private persons
  - & municipal politicians
  - Steering group: municipal policy & administration & private persons

- Ludwigsburg:
  - Strong participation of citizens and stakeholders



AARHUS & TILBURG: TRANSITION

Government driven



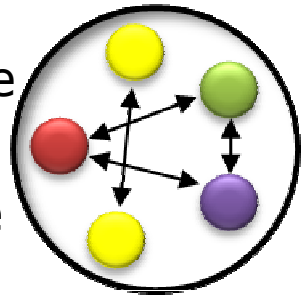
Municipality initiator, executive and organisor

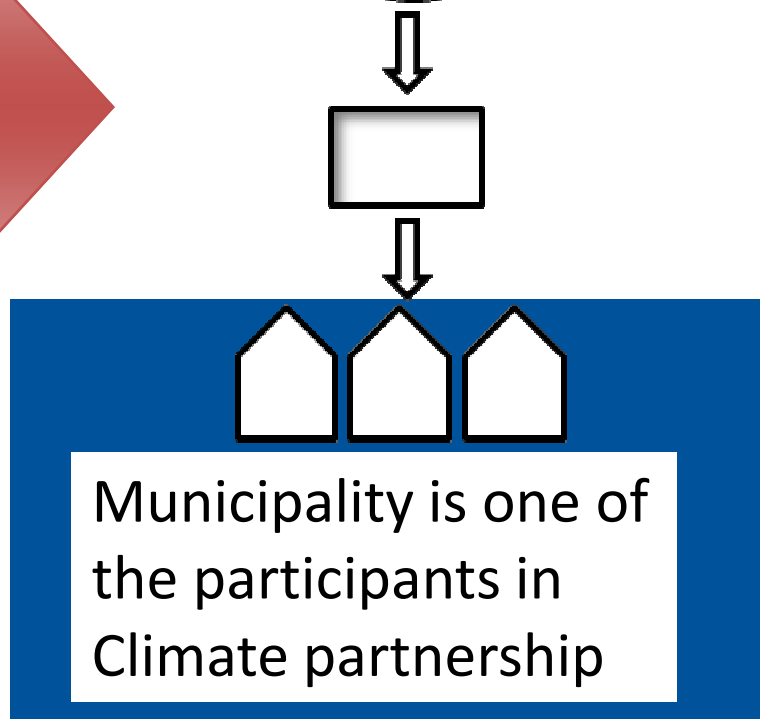
initiator ➔ facilitator

Frontrunners model

Facilitate

Promote





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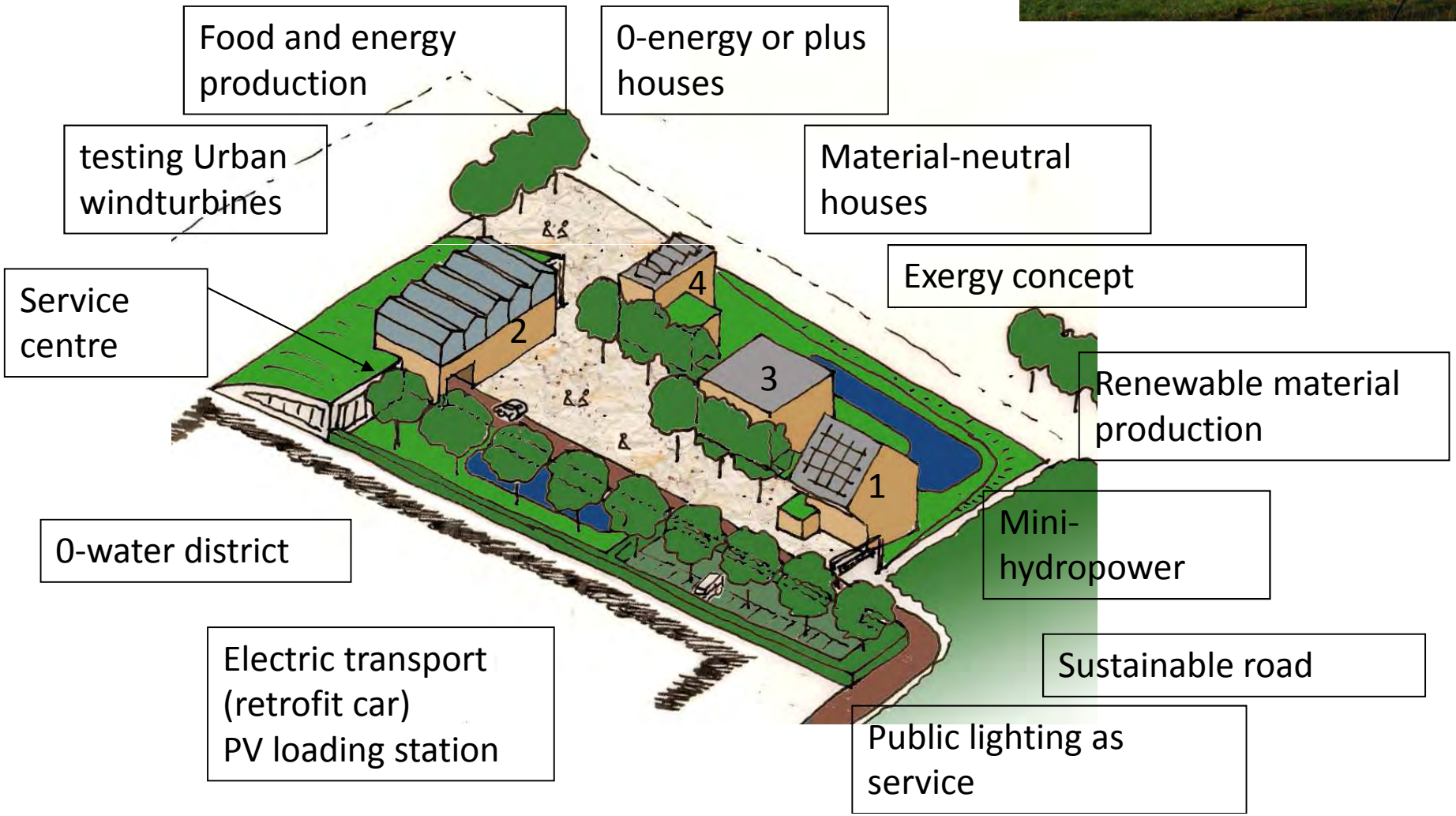
Asking for contracts: no specifications but asking for solutions!

Transition:
The action

The District of Tomorrow

Besides houses, many other elements are developed, designed, constructed and researched



RIBUILT & SUSTAINABLE URBAN DEVELOPMENT

District of tomorrow

- Demonstration
- Education

Eos lt transep dgo

- Transition in energy and process to sustainable urban development

IEA Annex 51

- Energy efficient cities

Kerkrade West

- Research
- Demonstration
- Education

Sustainable monuments

- Research

ZUYD

Roosendaal, the Netherlands

Renovation of 40 year old buildings

134 passiefhaus buildings in Roosendaal

FILLING IN THE TRANSITION PATH STEP BY STEP:

ONE STEP: RENOVATION 153 HOUSES KAALHEIDE KERKRADE WEST

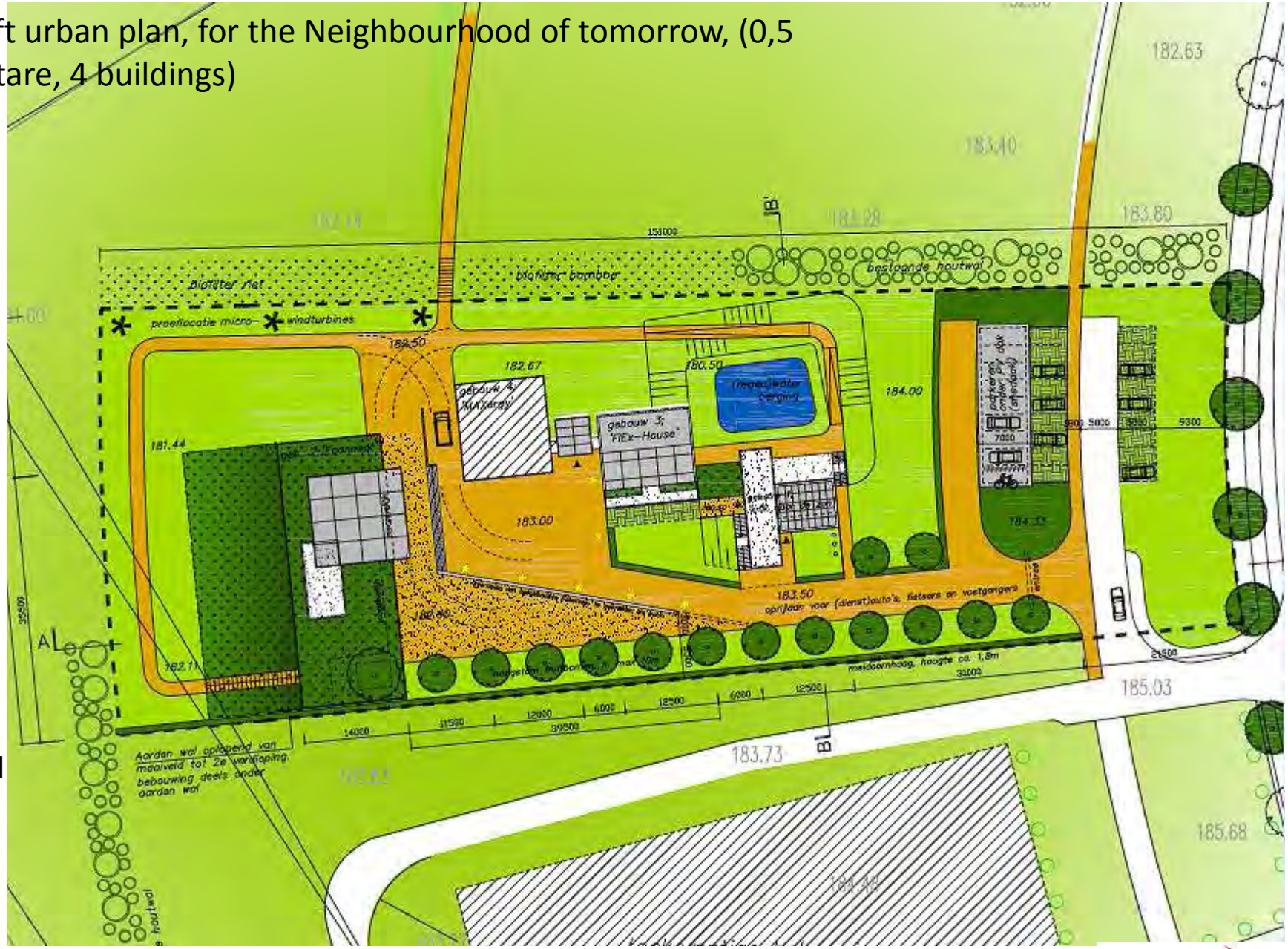
project indicators planning

		project 1: Knik	project 2 Eco/nnect	project 3 exergie house	project 4 0-materials
		under construction	in detail phase	in design	planned
		energy	**energy**	**energy**	**energy**
demand	vraag	passive	EPC= 0,3	min-exergie	exergie 2.0
supply	levering	100%RE (0-energie)	Energieplus	e-plus	e-plus-e-auto
		Materials	**Materials**	**Materials**	**Materials**
demand	vraag		< 750kg/m2	< 750 kg/m2	exergie 2.0: min-m2
supply	levering	25% renewable	50% renewable	75% renewable	~100% renewable
		Water	**Water**	**Water**	**Water**
demand	vraag			min "watergie"	
supply	levering		25% renewable	50% renewable	100% renewable
		Landuse	**Landuse**	**Landuse**	**Landuse**
demand	vraag				
supply	levering		plus 1	>0	exergie 2.0: minimal

UNIVERSITY ZUYD

RiBuilT THE CONCEPT OF ZERO

Draft urban plan, for the Neighbourhood of tomorrow, (0,5 hectare, 4 buildings)



UNIVERSITY ZUYD

RiBuilT THE CONCEPT OF ZERO

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STEP BY STEP IMPLEMENTATION

Quick Wins

- Realize short term projects (4-5 years) which contribute to the long term end goal
  - Long term interest of government
  - Success for politicians
    - Short time running period
  - Commitment from companies
    - Short term interest of private sector
  - Commitment of users

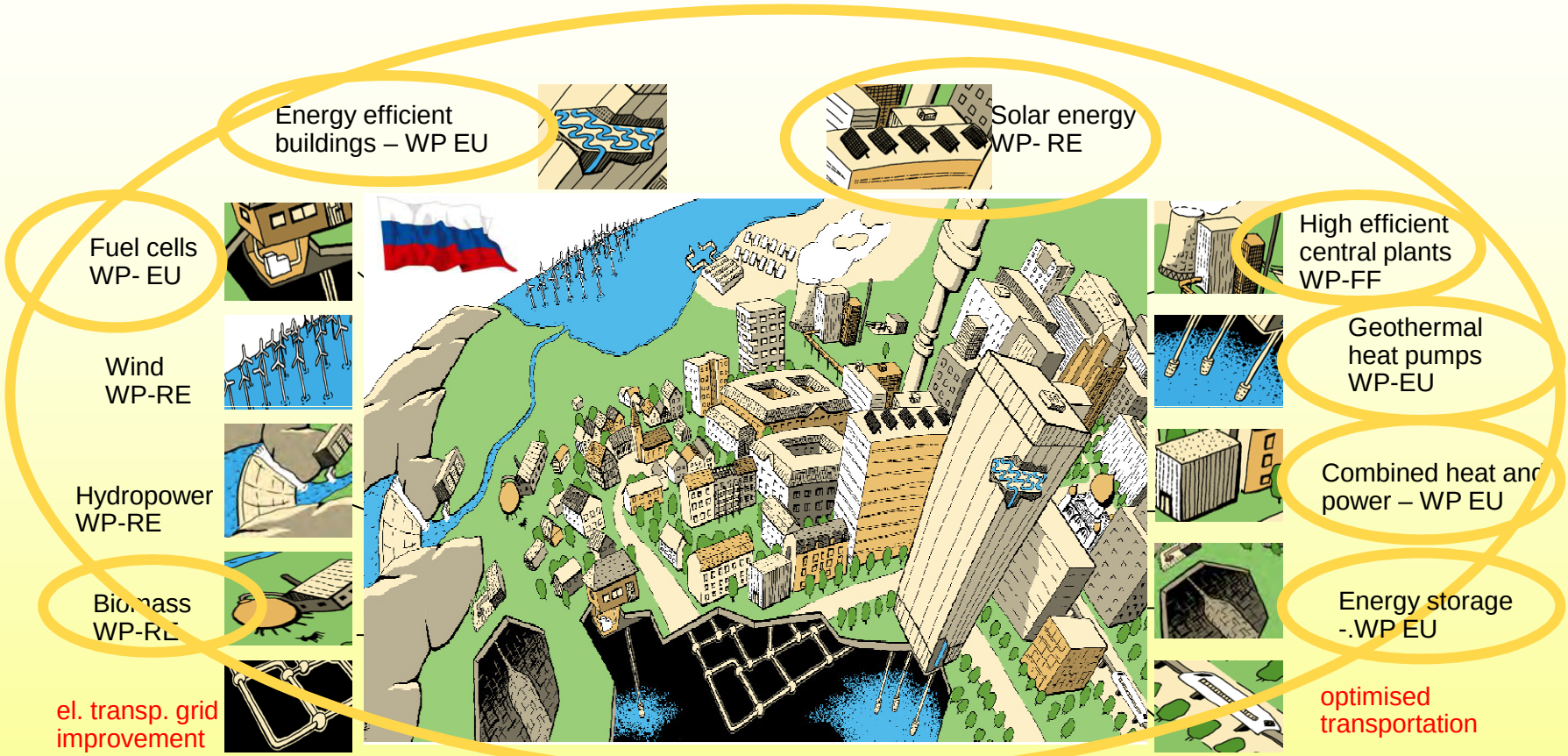
HOGESCHOOL ZUYD

The district of tomorrow: the users of tomorrow

The road towards energy neutral cities

„Sustainable city“ …

Existing efforts: LaR-EP, Solar Cities, G40, PolyCities, Concerto, etc.



Economic efficiency by integrated system optimization

Source: EnBW, Karlsruhe