

HOGESCHOOL ● ● ● ZUYD



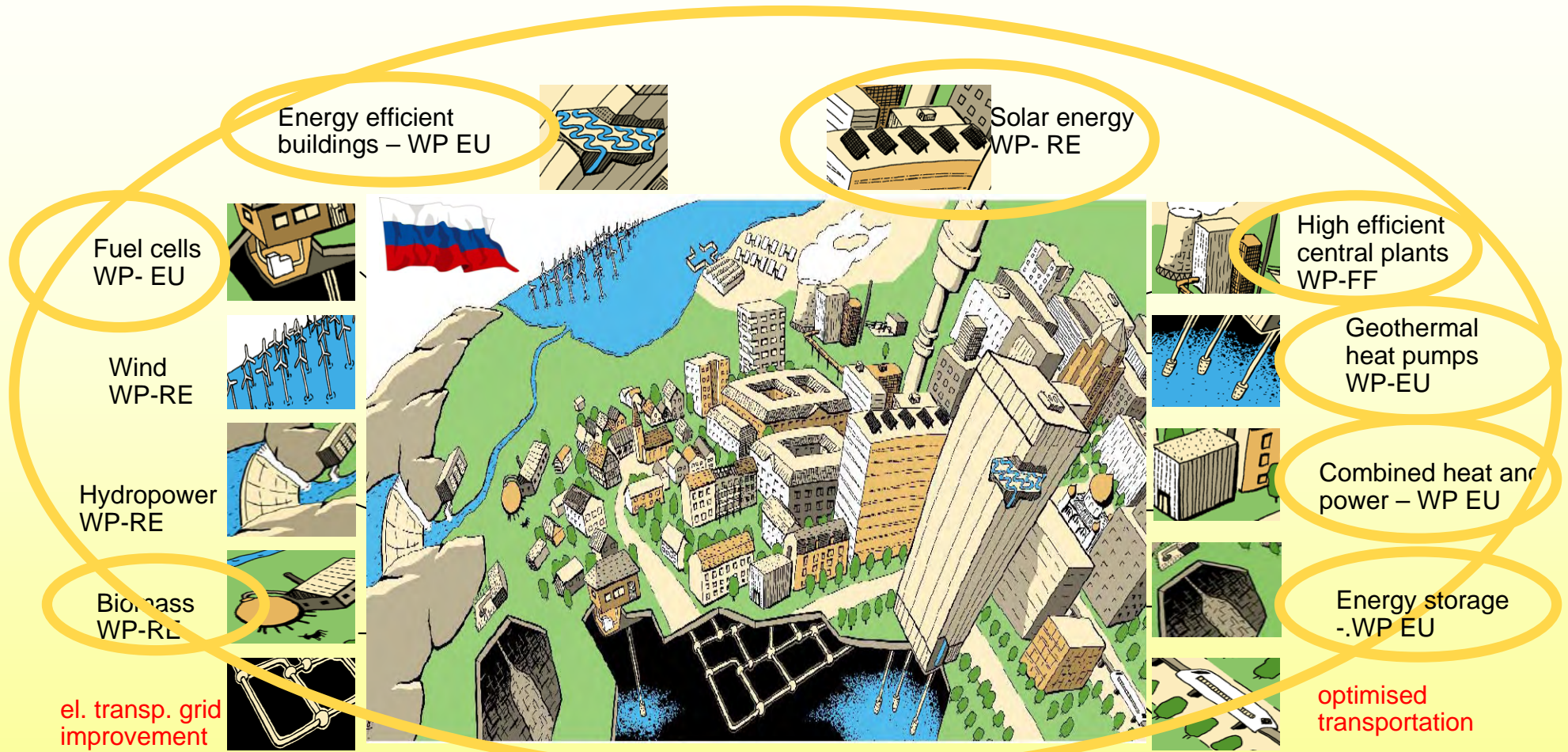
A roadmap to energy neutral cities: 10 key-issues for successful implementation

Dr. Jacques T.N. Kimman
Professor in New Energy at the Zuyd University
Programme manager Energy Strategy and Transition at AgentschapNL,
Agency of the Ministry of Economic Affairs in the Netherlands

IEA, Annex 51, „Sustainable city“ ...



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



 **Economic efficiency by integrated system optimization**

Source: EnBW, Karlsruhe



Glacier in Switzerland



New Energy, a necessity



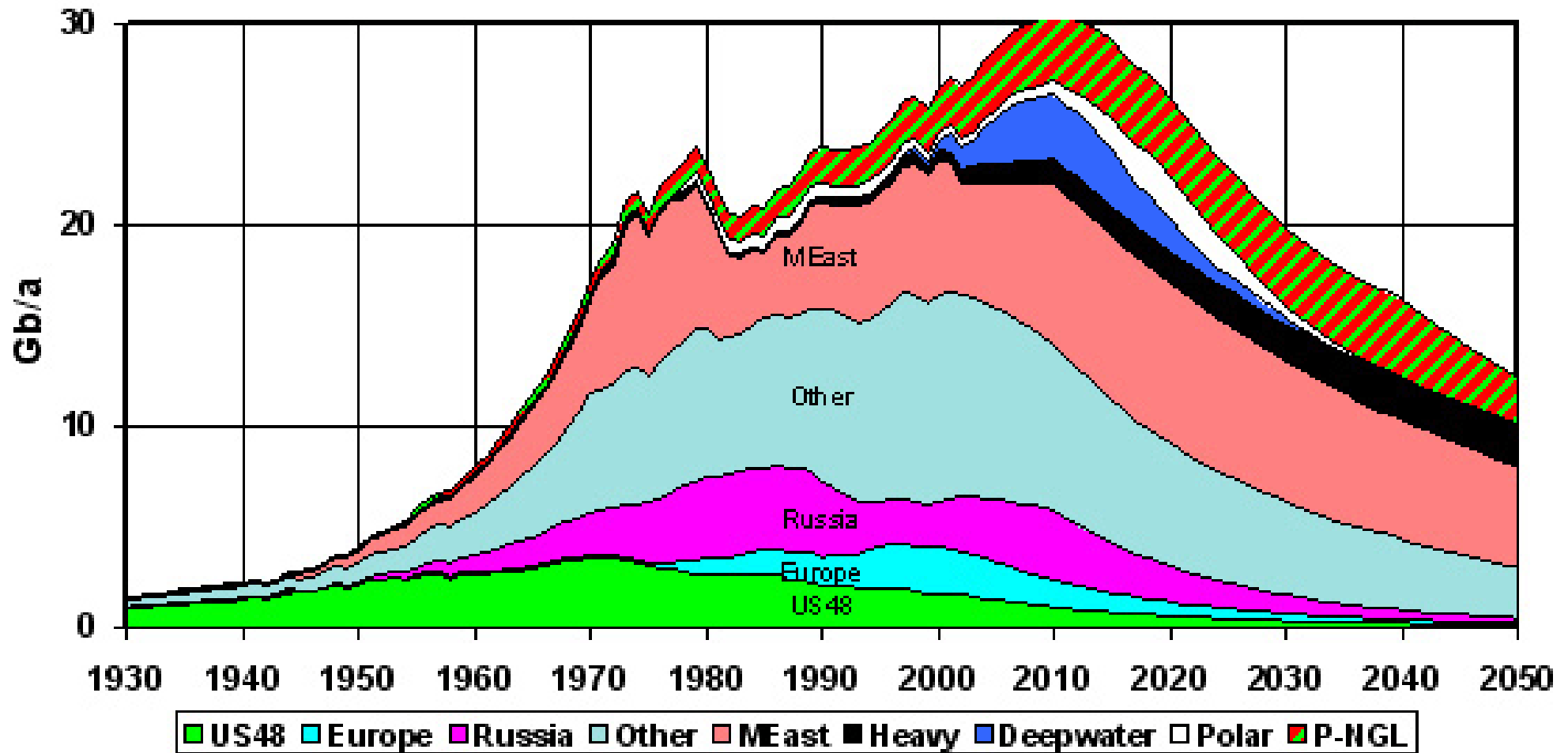
Is there a problem?





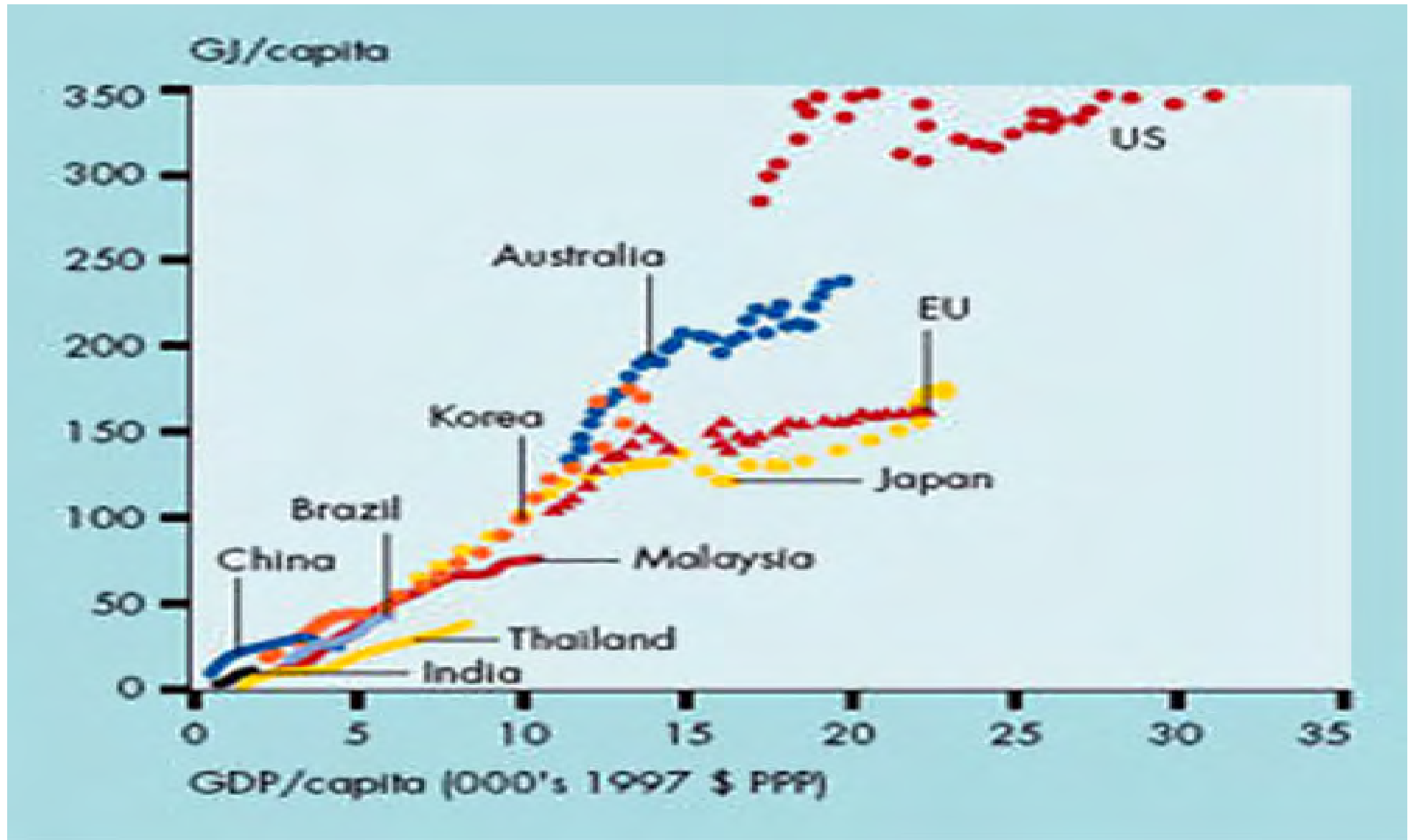
Are the oil prices going to increase?

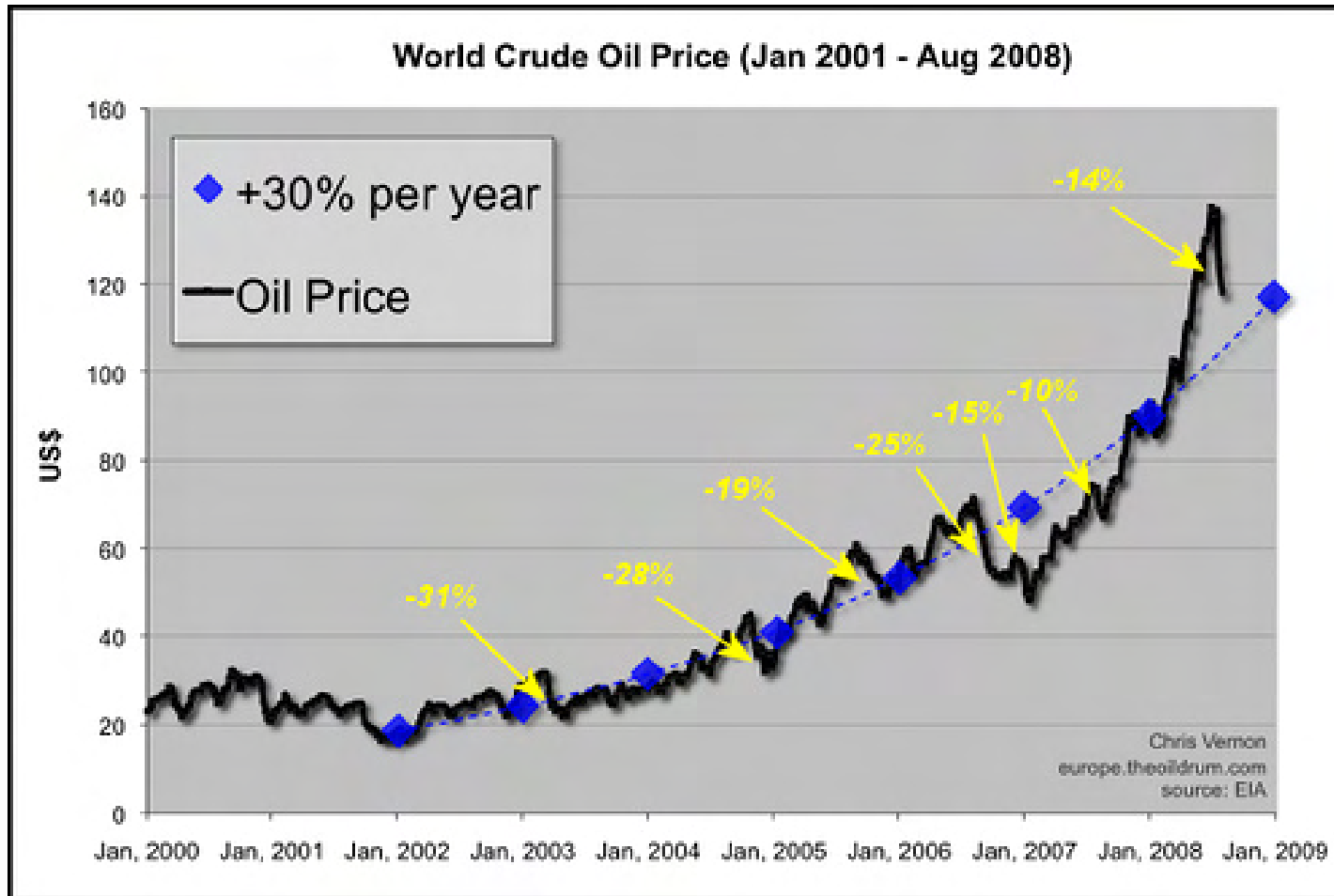
Regular Oil & Natural Gas Liquids
2003 Base Case Scenario





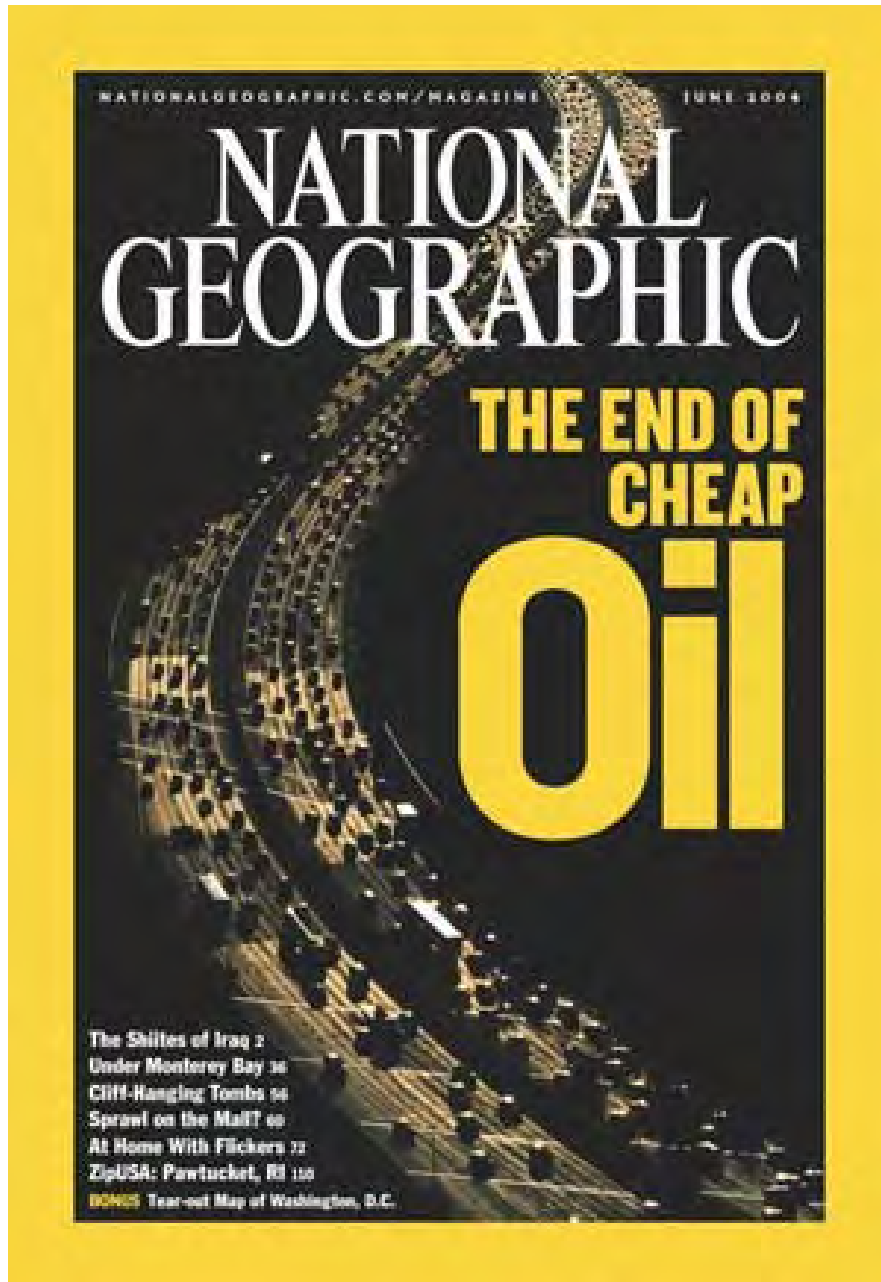
What about the energy demand?







Oil prices?





Districts include transportation: Need for Transition



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

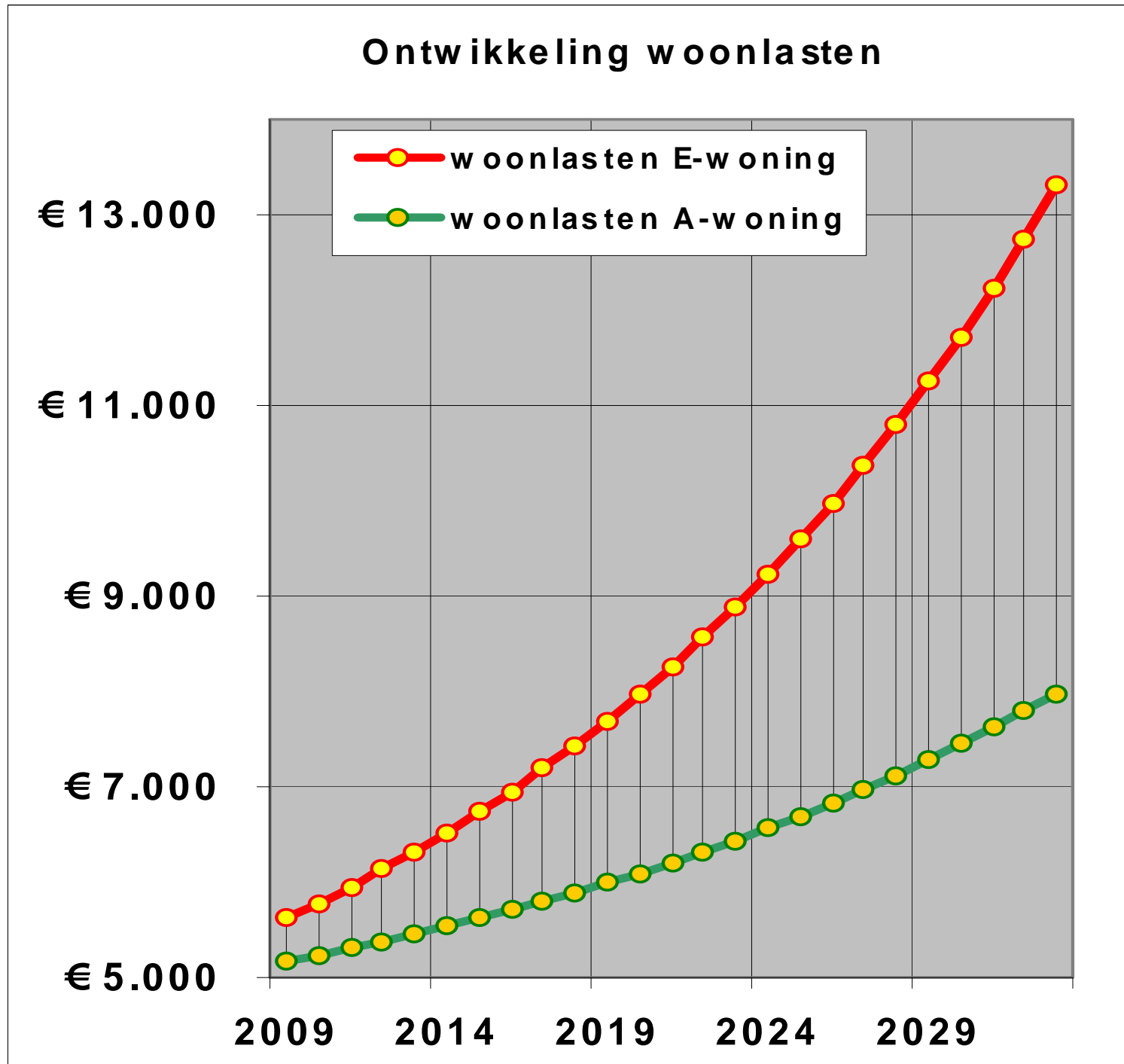


Why is a different way of thinking necessary?



New Energy, a different way of thinking

1.7





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

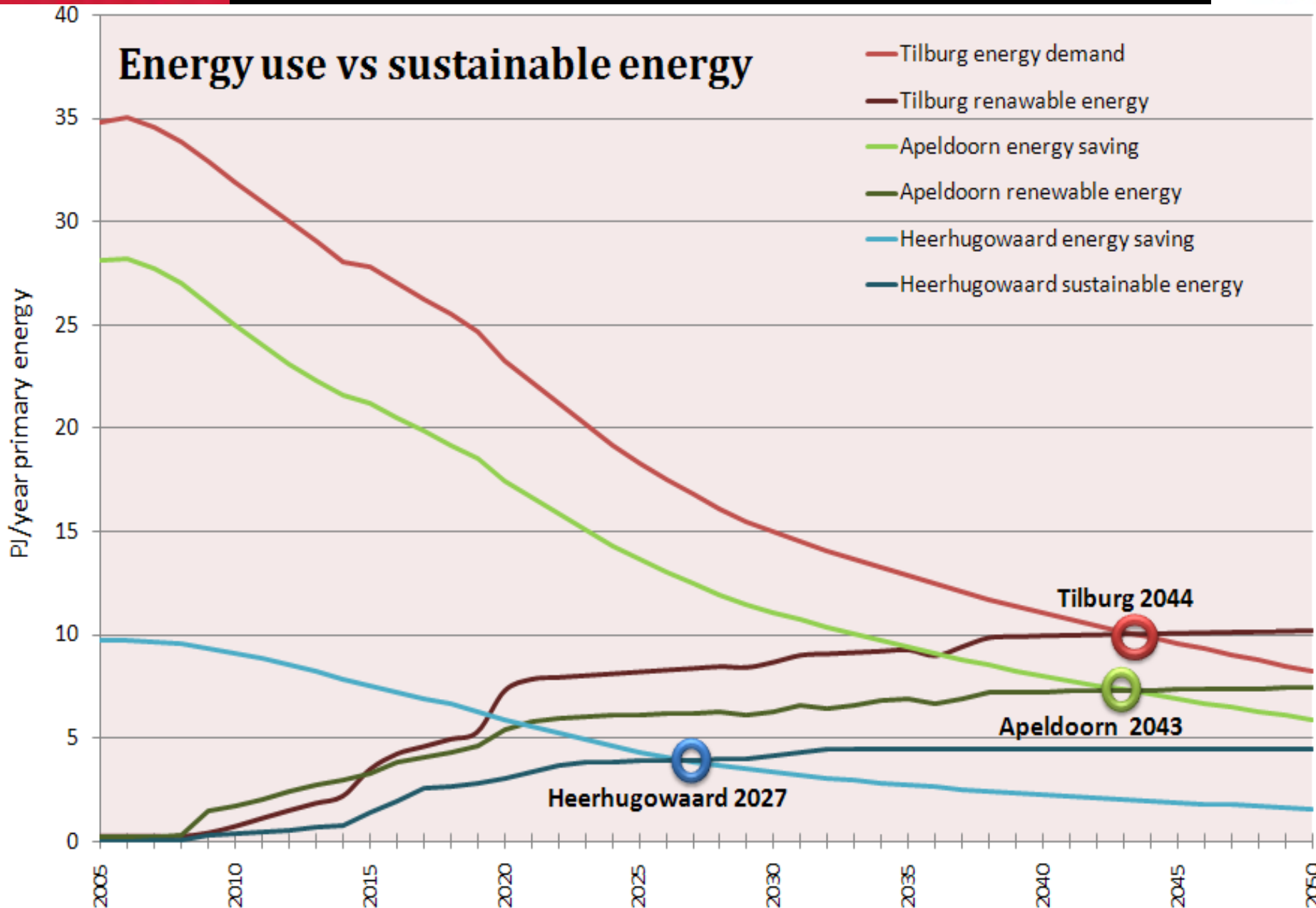


**EUROPÄISCHES ZENTRUM
FÜR ERNEUERBARE ENERGIE
GÜSSING GMBH**

A roadmap to energy neutral districts



Energy Neutral in 2030?





City of the Sun (Heerhugowaard)

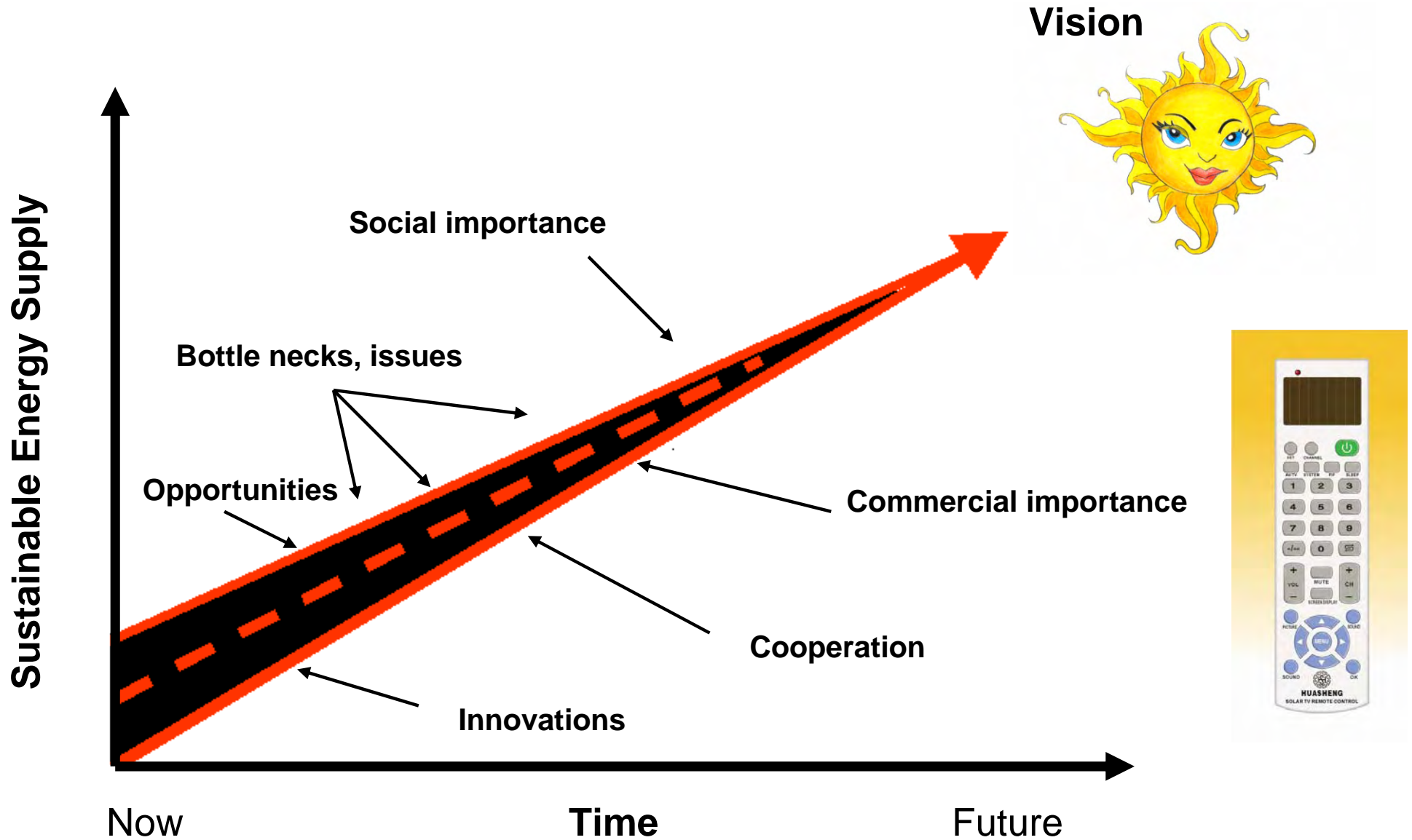


The road to energy neutral cities





Energy transition (roadmap)





Transition Management: Issue/ bottle neck analysis



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

SHORT TERM AND OWN INTERESTS ARE DOMINATING

need for short term revenues / economic devel

NO PERSONAL IDENTIFICATION WITH END GOAL

RESIDENTS HAVE "NO CONNECTION" WITH PLANNED DEVELOPMENT

SUSTAINABILITY AMBITION FALLS

lack of continuity in policy AND ORGANIZATIONS

Ambitions too VAGUE

NO WILLINGNESS TO SET CLEAR TARGETS (politicians) (st john)

WISHFUL THINKING (Lack of backcasting) Ambitious

VISION IS NOT ACHIEVABLE

unclear priorities of ideas/measures/projects (st john)

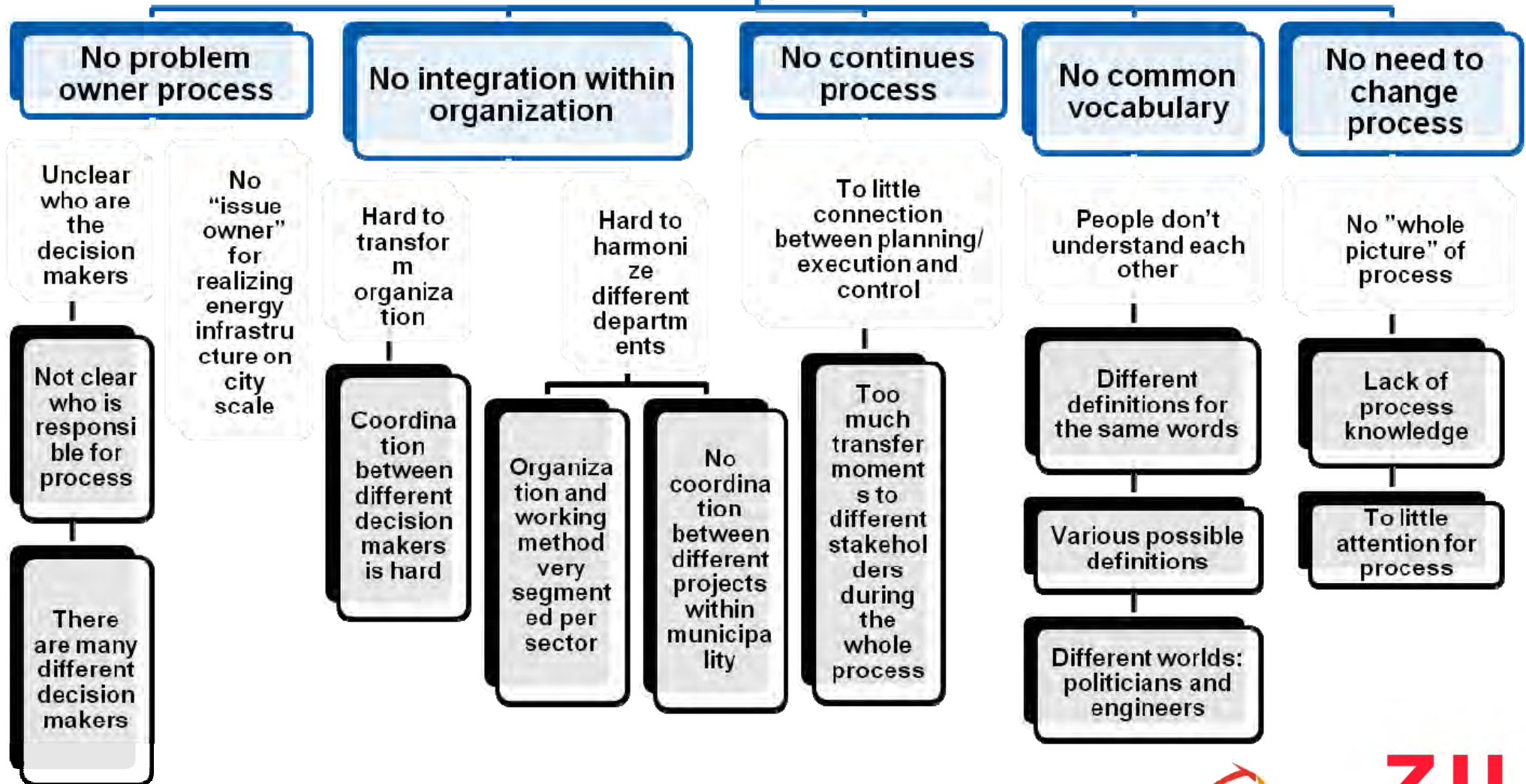
Late input of sustainability ambitions Limits the options

target norms are perceived as maximum rather than minimum efforts

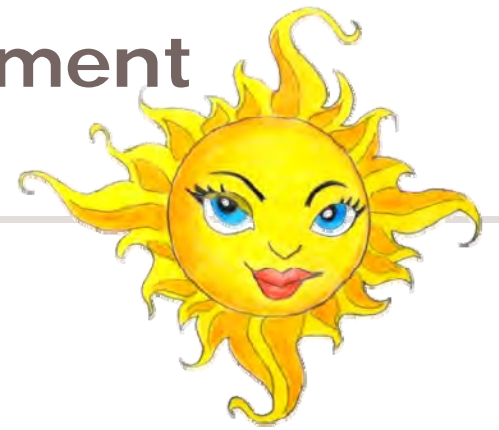
city commit less ambitious than best mayor

no intrinsic motivation

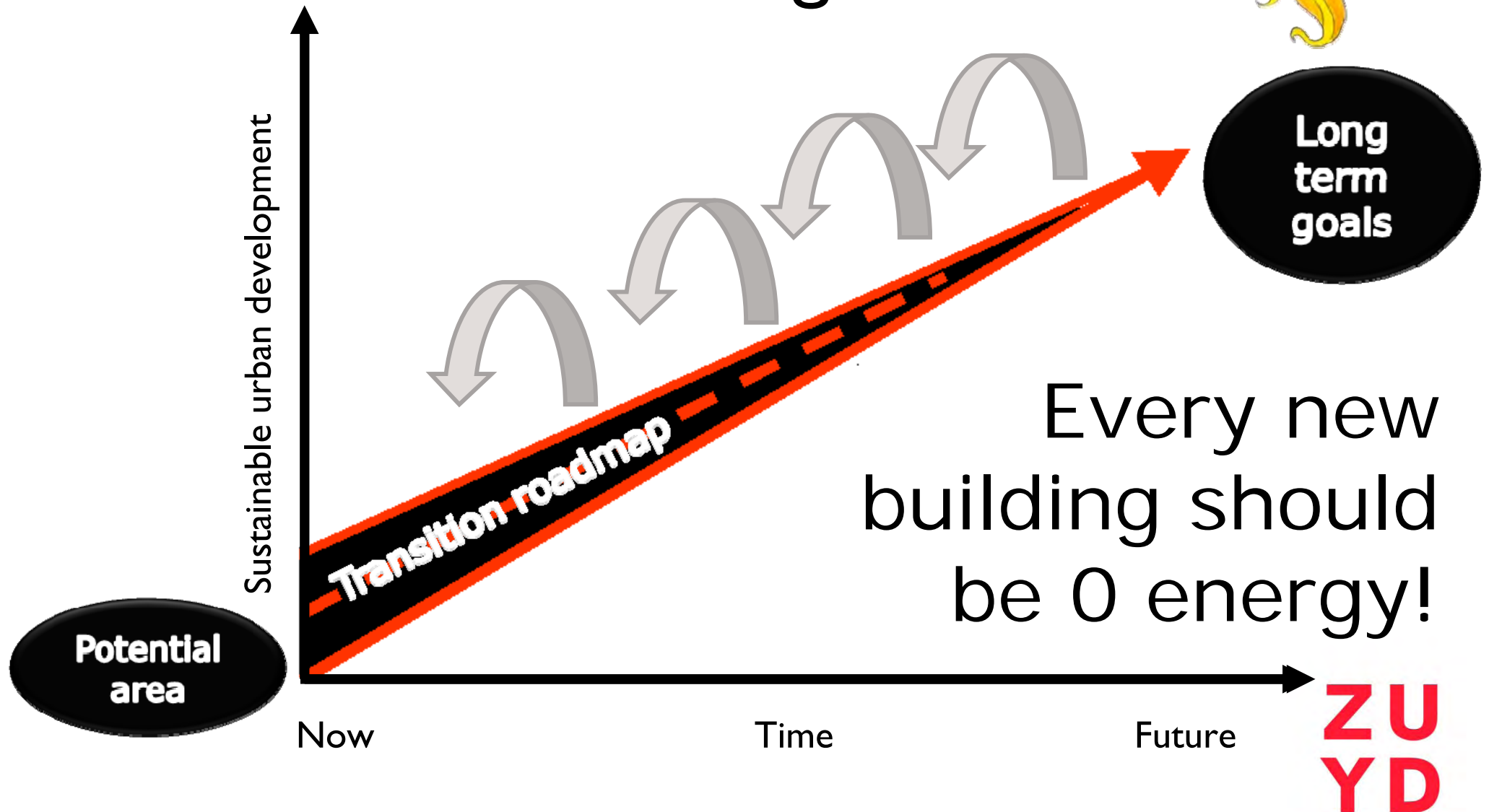
Process is not consistent



Roadmap for sustainable urban development

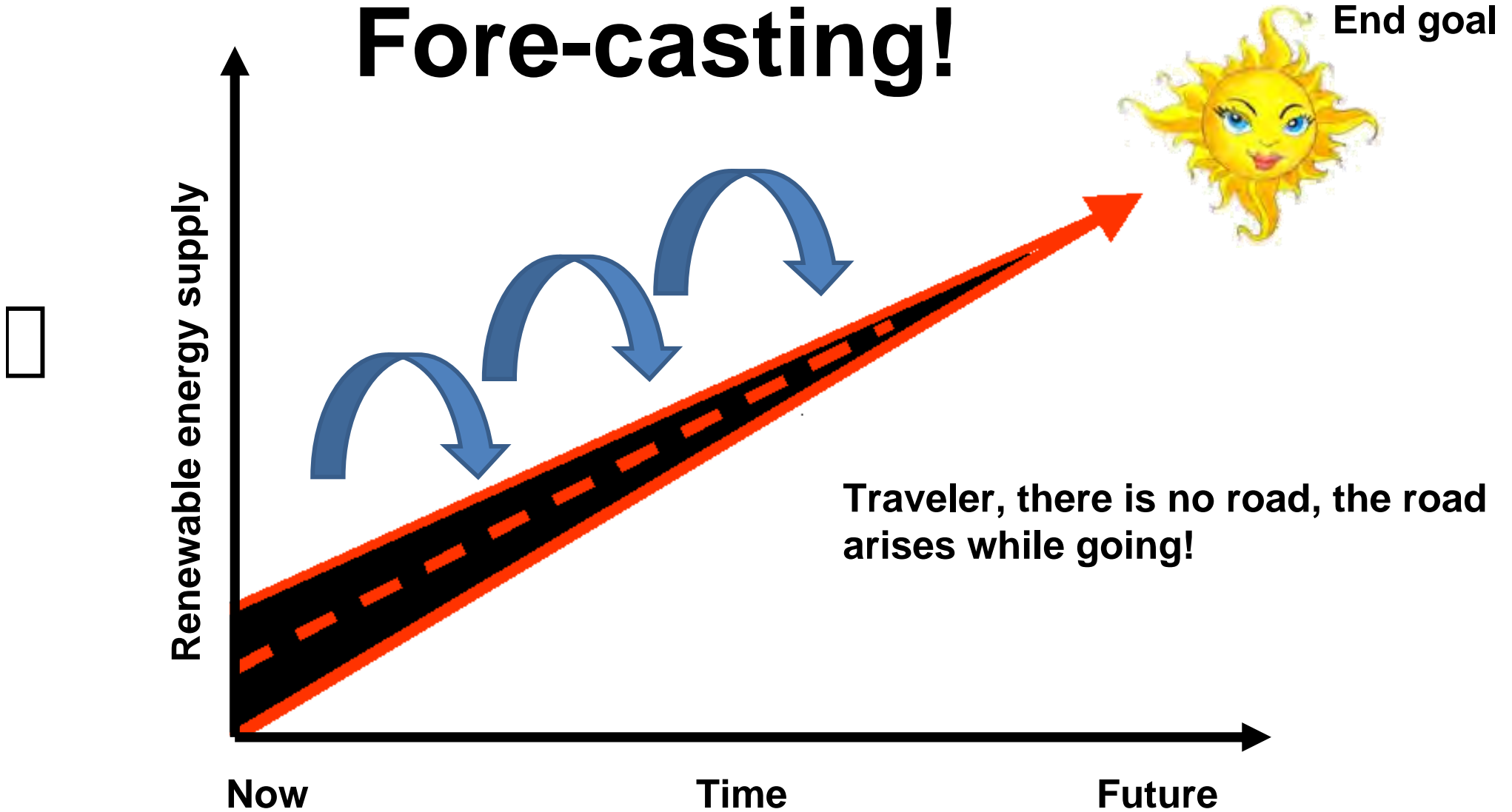


Back-casting!





Fore-casting!





Collecting learning experiences frontrunners



Image: Cees van Roeden



AUSTRIA
CANADA
DENMARK
FRANCE
GERMANY
SWEDEN
THE NETHERLANDS

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



WHICH **KEY-ISSUES** FOR SUSTAINABLE
URBAN DEVELOPMENT ARE IMPORTANT TO
LEARN ABOUT FOR **DECISION MAKERS?**



Vision and targets



Process and organization



Support and involvement



Skills and know how



Technological concepts



Monitoring



Tools and methods



Financing



Legal issues



Spin – off effects

BOTTLENECKS ENERGY EFFICIENT CITIES



Unrealistic goals and targets

- Ambitions are too vague
- Wishful thinking
- No personal identification with end goal
- Different ambitions and goals within a municipality don't match



No continuous process

- Short-term focus
- Ambitions insufficiently anchored in policy
- No problem owner for the process as a whole
- Lack of coordination between projects within the municipality
- Learning experiences are not shared
- National policy not continuous



No integral approach

- Difficult to harmonize different departments
- No common vocabulary
- Organization and working method are very segmented in each sector
- Split incentives
- Realization and operation separated

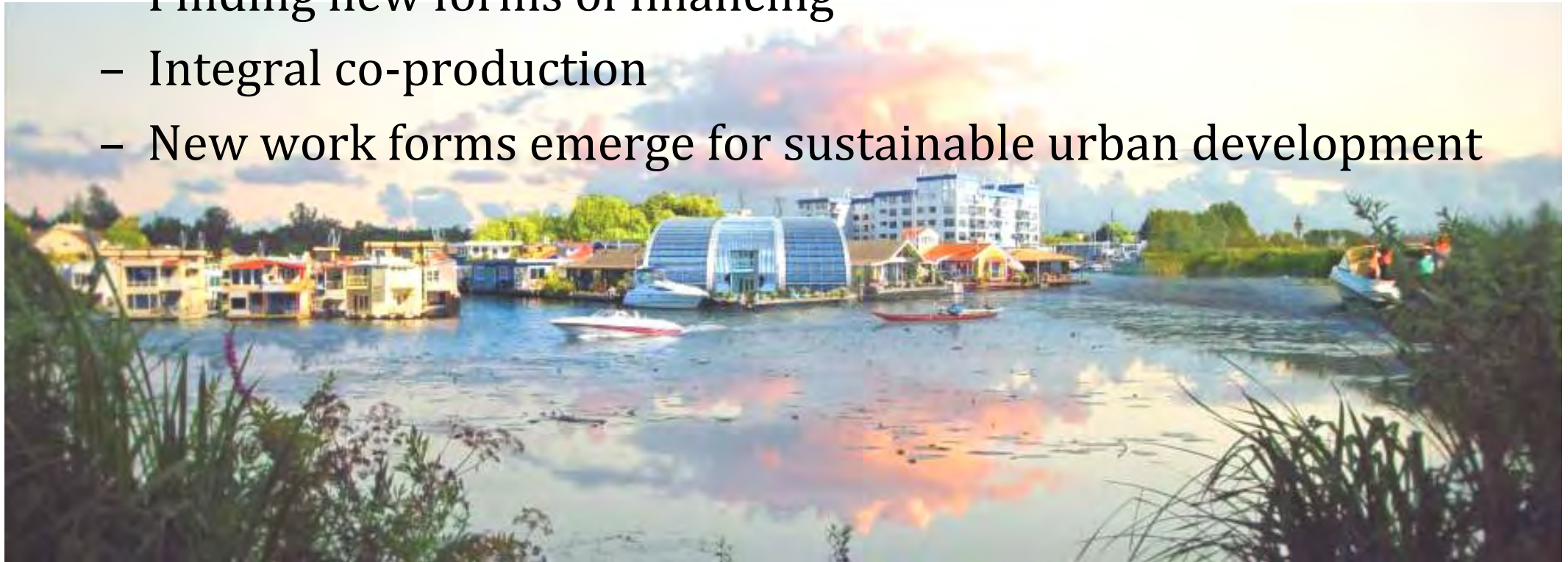


Ambitions not widely supported

- Lack of trust
- No common goal and vision
- Ambitions not broadly supported within the departments of the municipality
- No intrinsic motivation
- Users of the area don't accept the development
- Poor communication to end-users

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



20 RECOMMENDATIONS TO ACHIEVE A ENERGY EFFICIENT CITY



A. Smart Control

- 1. Utilize personal ambition and effort
- 2. Appoint a process coordinator
- 3. Put together a strong project team



B. Inspiring vision and targets

- 4. Visualize the future energy efficient city
- 5. Set ambitious targets
- 6. Lay down targets in policy documents



C. Create new coalitions

- 7. Create new forms of cooperation
- 8. Involve end-users in the decision making process
- 9. Share knowledge



D. Clear analysis

- 10. Produce an analysis of the area
- 11. Determine the energy demand after implementation of energy saving measures
- 12. Produce an analysis of the energy potentials
- 13. Choose a suitable energy system



E. Realistic plan

- 14. Draw up an integral business plan
- 15. Take the operational phase into account
- 16. Build powerful financial coalitions



F. Decisive implementation, execution and operation

- 17. Utilize the innovation skills of companies
- 18. Assure the quality of the energy system
- 19. Monitor progress and results
- 20. Encourage energy efficient user behavior



A. Smart Control

- 1. Utilize personal ambition and effort
- 2. Appoint a process coordinator
- 3. Put together a strong project team



B. Inspiring vision and targets

- 4. Visualize the future energy efficient city
- 5. Set ambitious targets
- 6. Lay down targets in policy documents

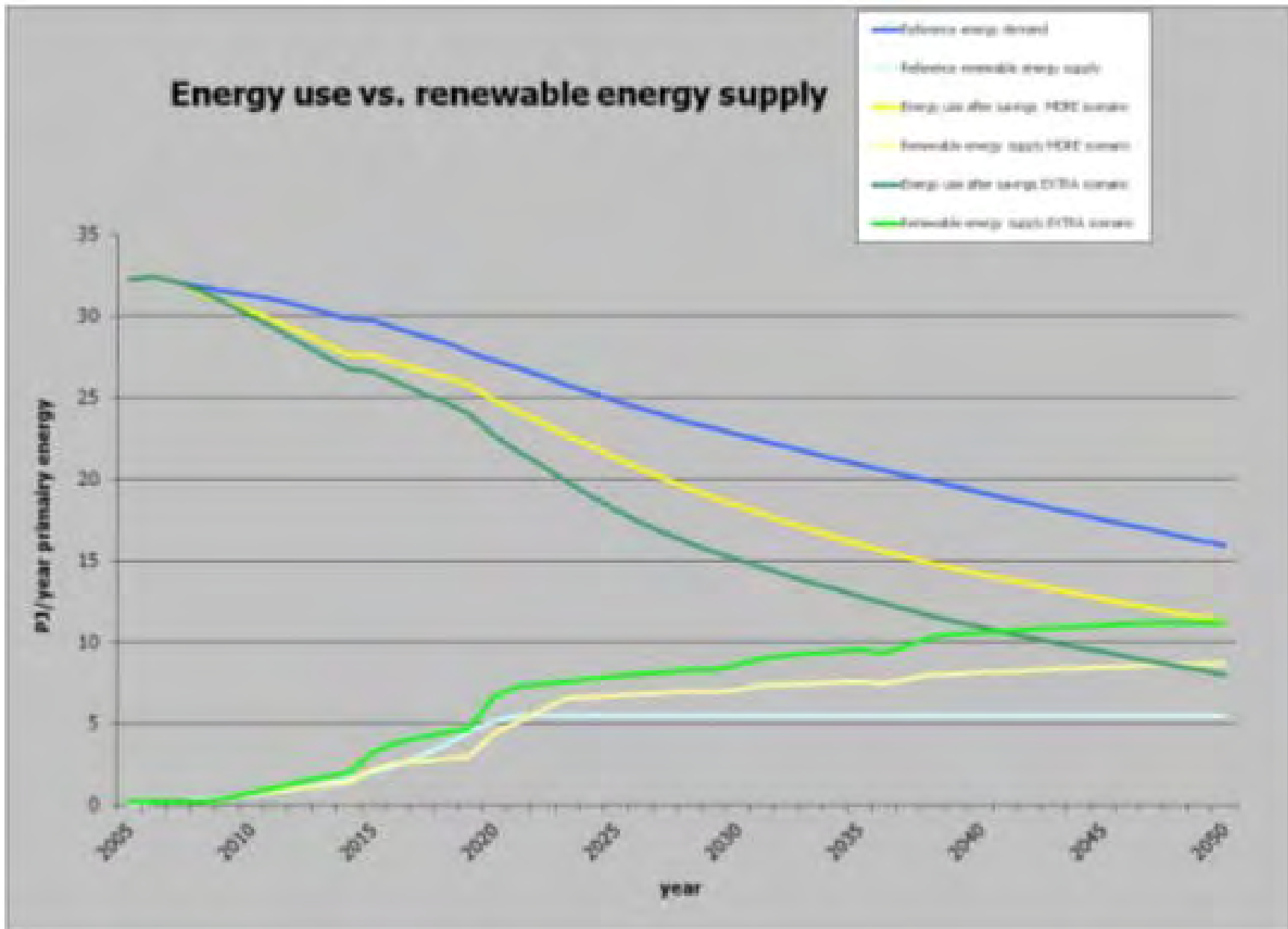
Transition project

Transition forum

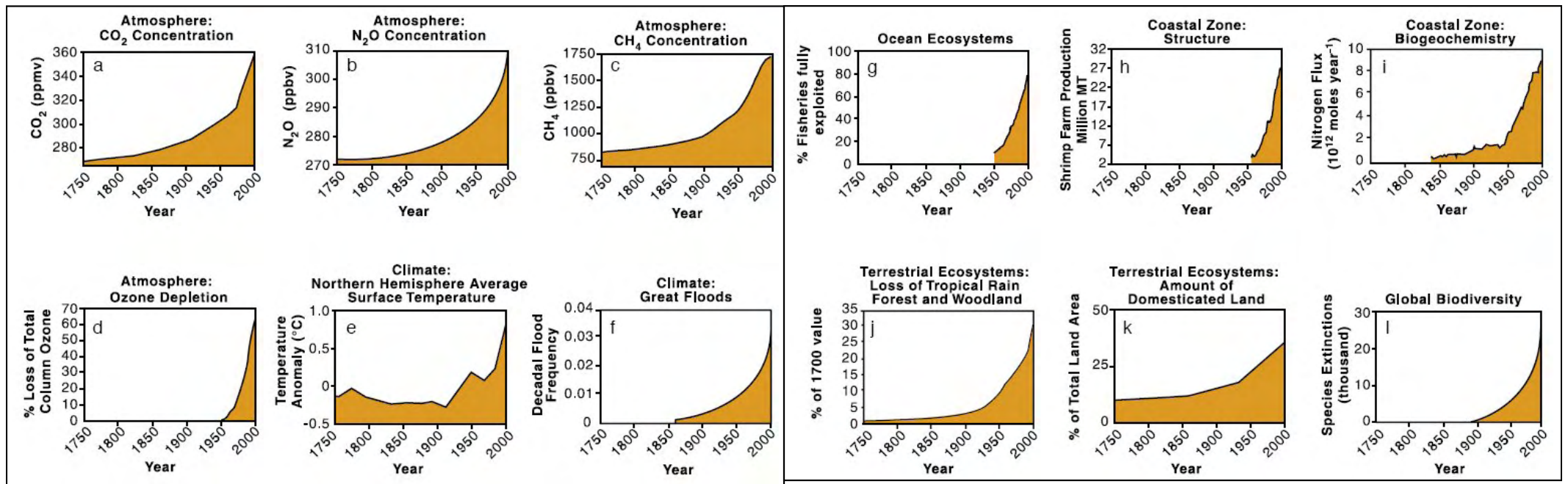
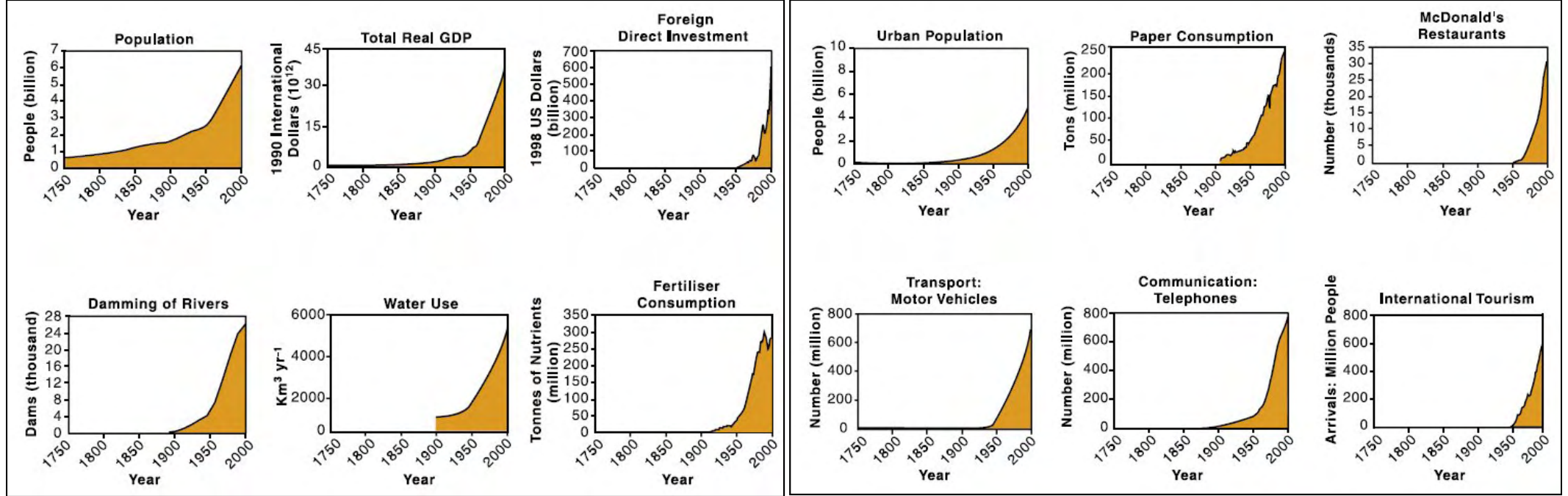




Energy Neutral in 2030?



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

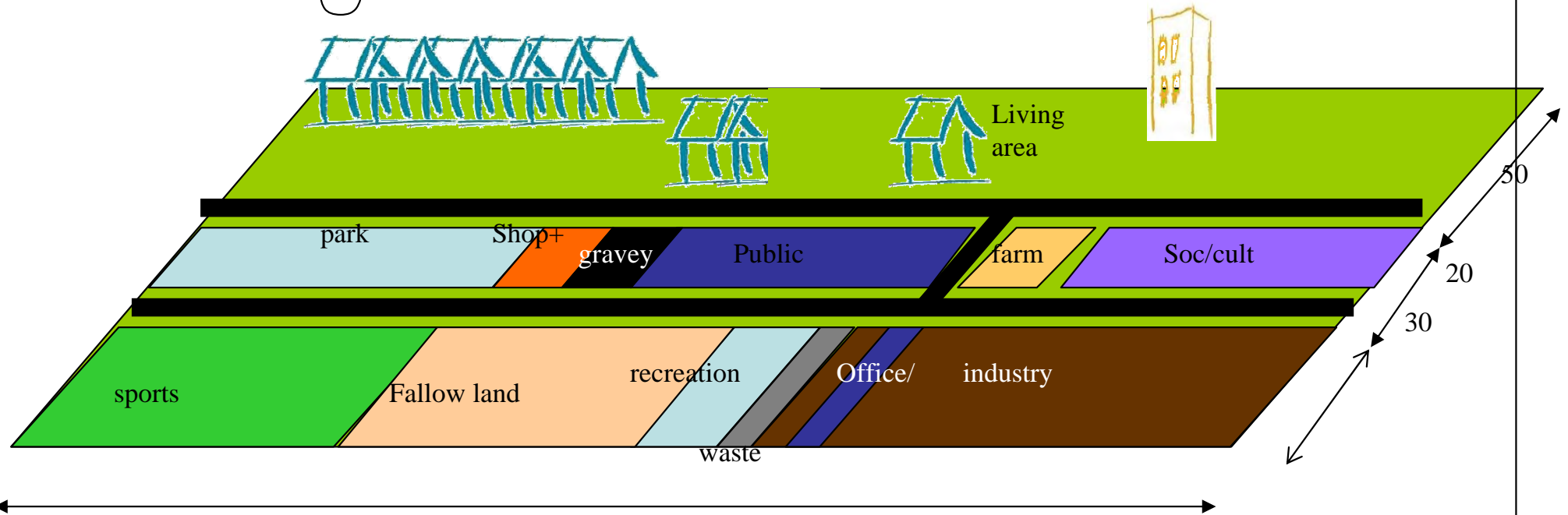


International Geosphere-Biosphere Programme



Sara Leen/National Geographic Image Collection

"average NL Urban hectare"



4360 m2 living area

9,5 houses (4 in a row, two corner houses, 1,5 semidetached, 1 villa),
4 apartments,
incl parking, 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 office level,
~1- industry-office/ha,

~90 m2 shopping + horeca

~81 m2 shop (gamma-1m2)

~4m2 hotel, (rest:5m2 pub/rest.?)

~60 m2 waste dump (incl car wrecks, 10m2)

~80 m2 graveyard (incl cremation centre)

~470 m2 greenpark

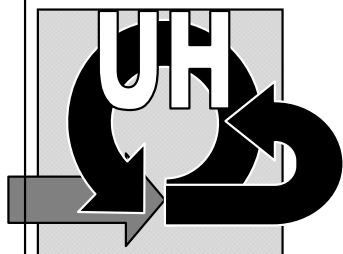
~620 m2 sportsfac. (incl indoor) (Golf:123 m2)

~200 m2 recreational area (comm.)

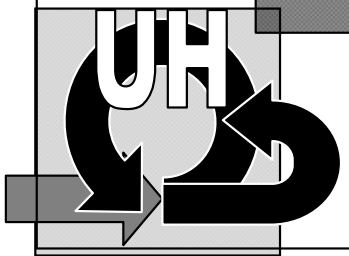
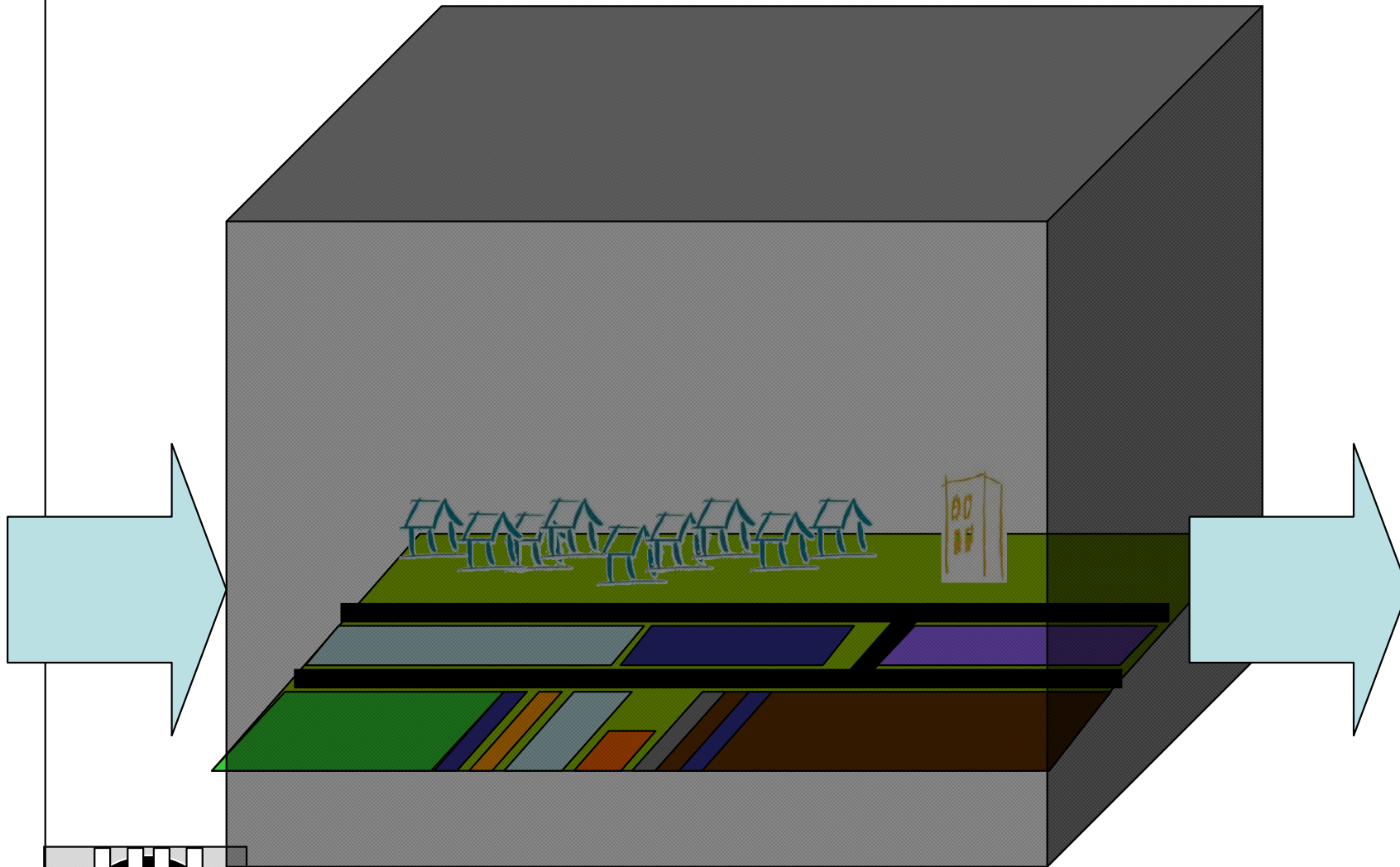
~80 m2 urban foodgardens

~1520 m2 road (250 meter road , 6mtr wide)

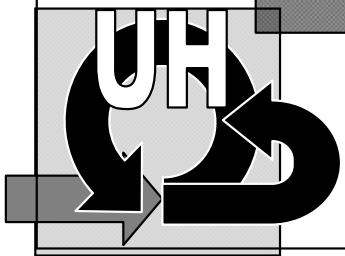
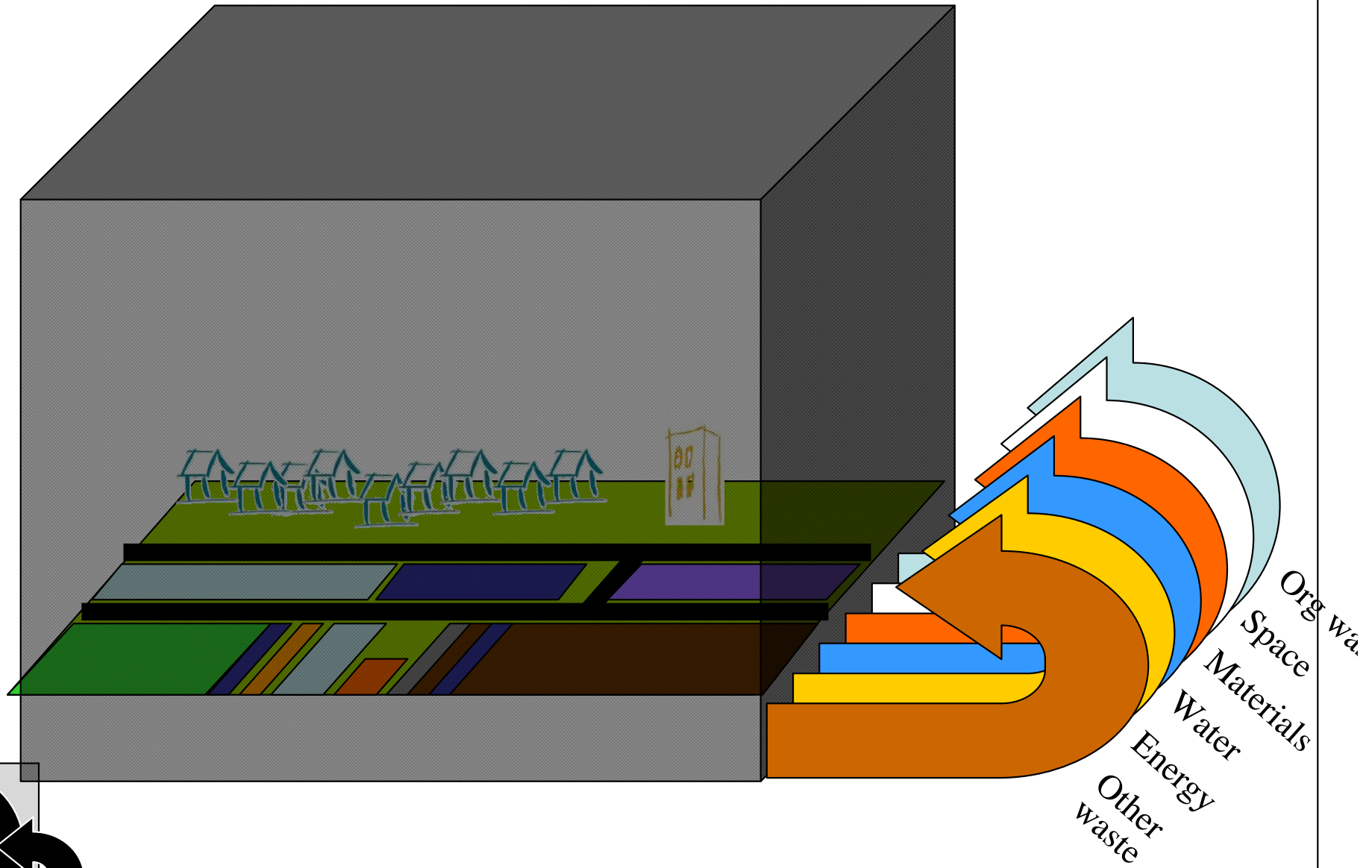
~ 630 empty constr area (build/industry)



URBAN HARVEST



URBAN HARVEST





Research Institute Built Environment of Tomorrow

Wrt 5 sources:

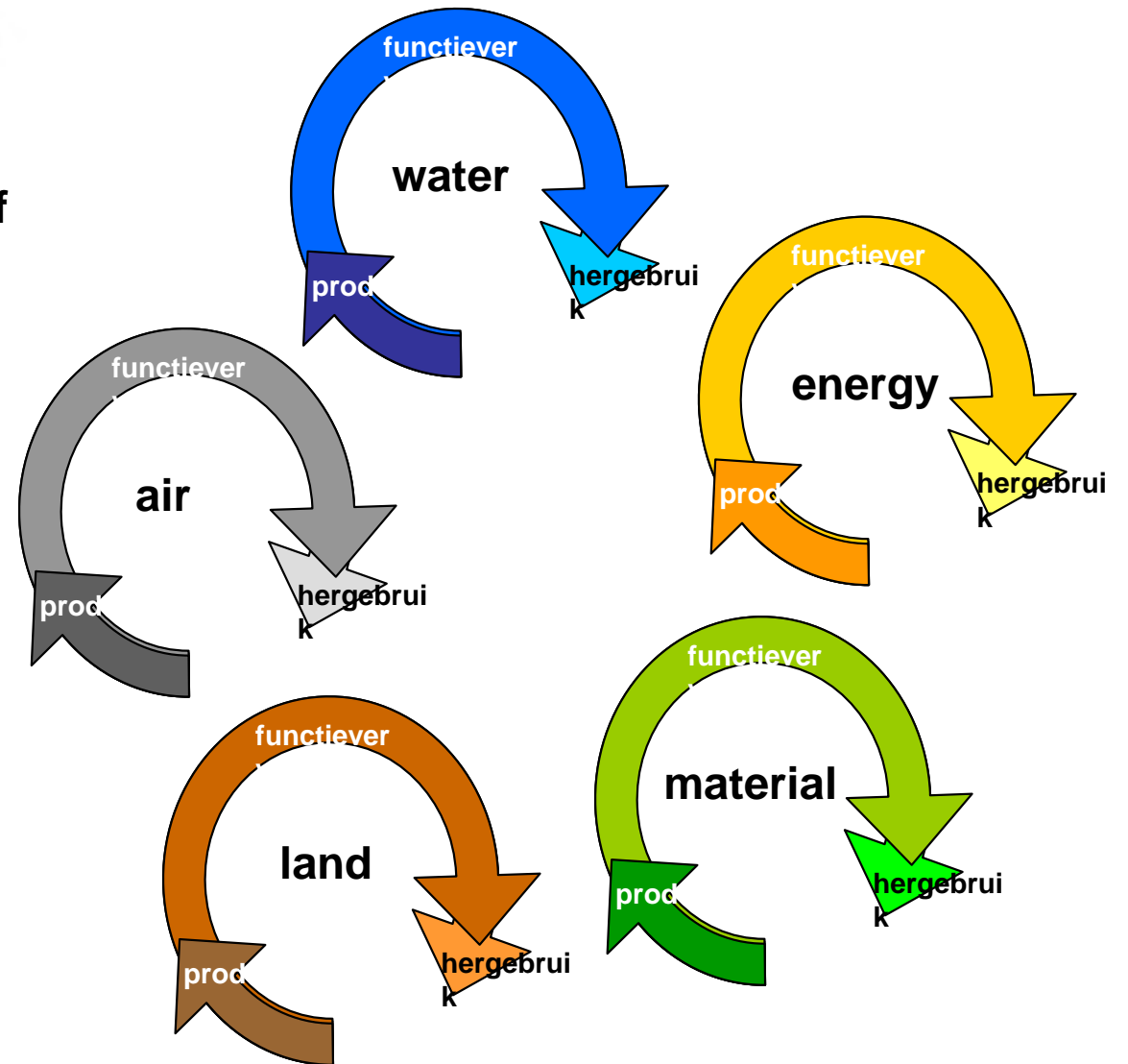
0 - material

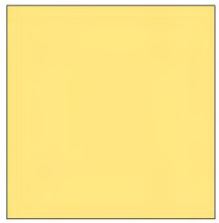
0 - energy

0 - water

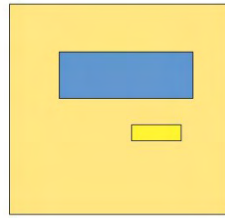
0 - air

0 - land

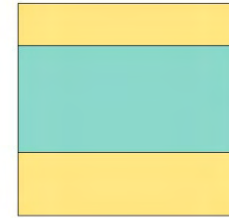




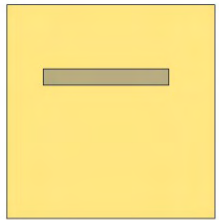
1 hectare
40 houses



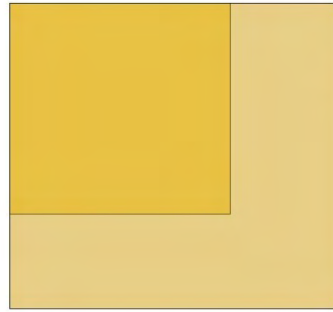
electricity
Hot water



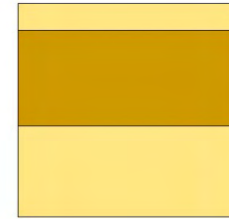
Watersupply



Greywater
cleaning
Heliofyte



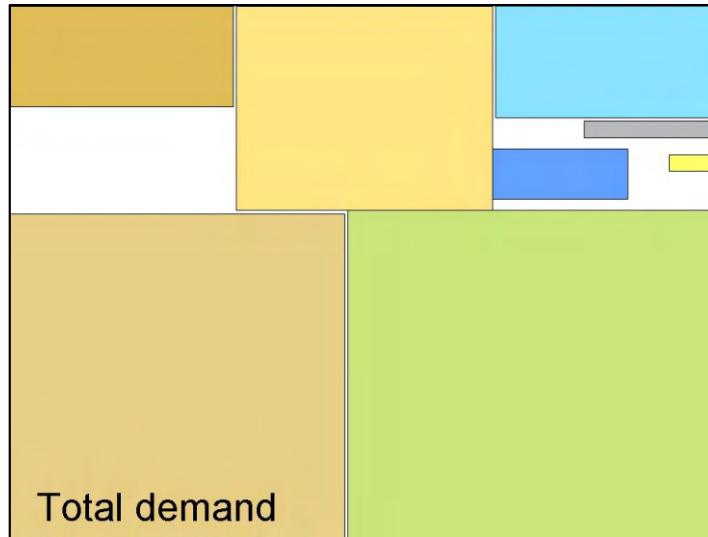
Construction
wood



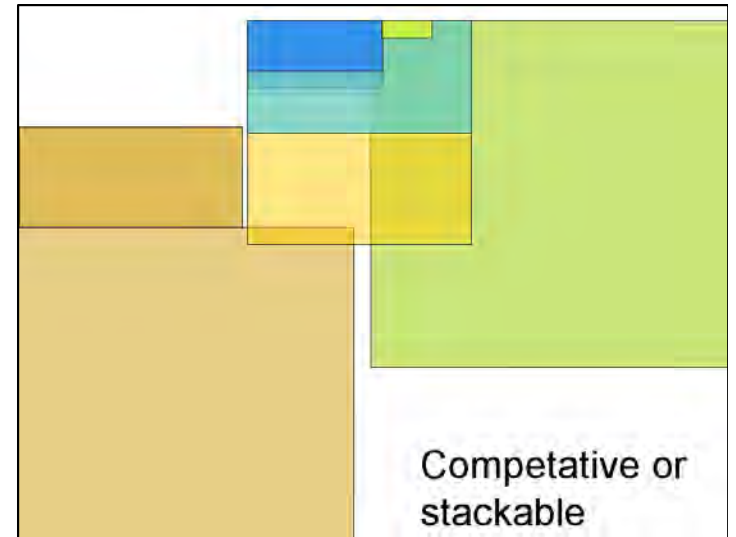
Finishing
materials



Food
provision



Total demand



Competative or
stackable





Super Sustainable City - Goteburg



Limburg in 2050



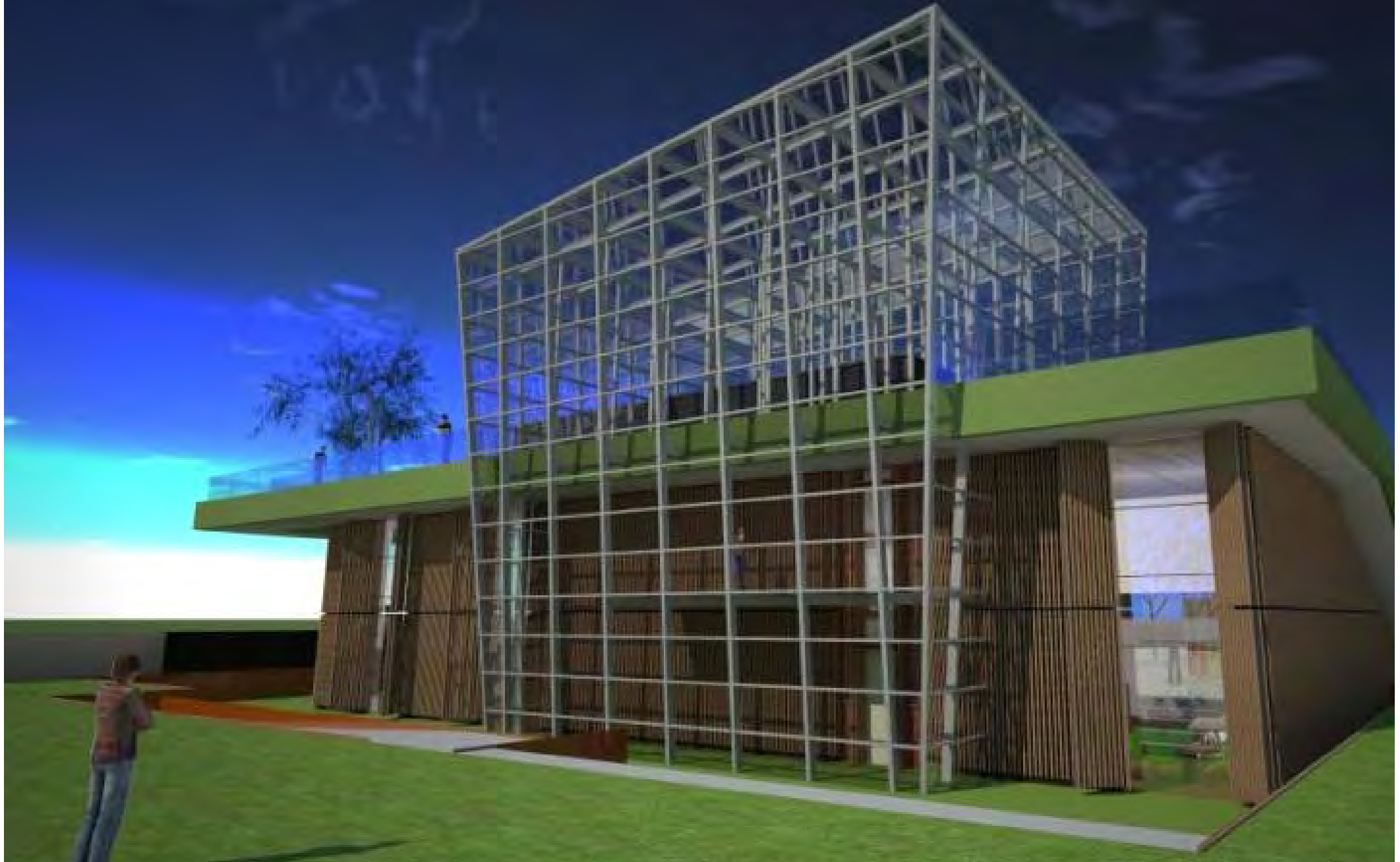


The district of tomorrow...





Design of the second expo-building



New Energy, a different way of thinking



DISTRICT OF TOMORROW

- Our own sustainable
- urban development





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
- Challenge companies for sustainable innovation

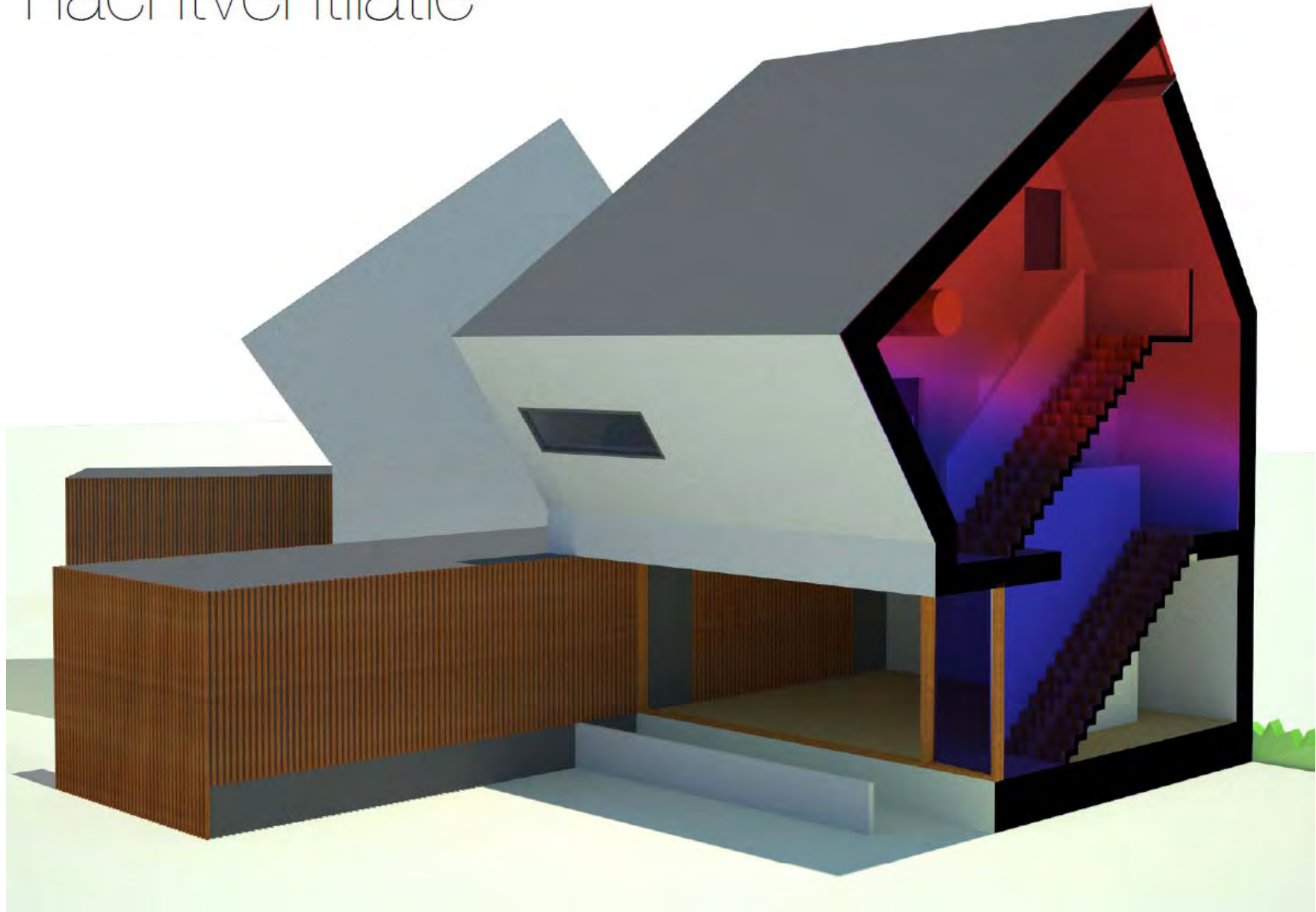
Show what tomorrow is possible with the techniques of today!







nachtventilatie











Conventional method

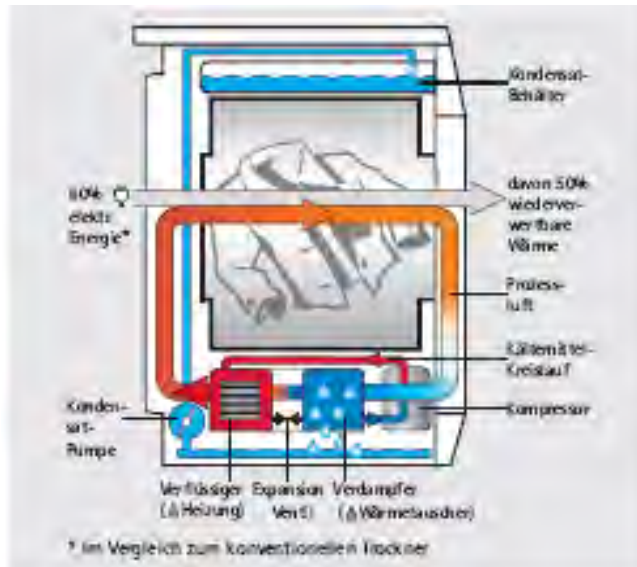
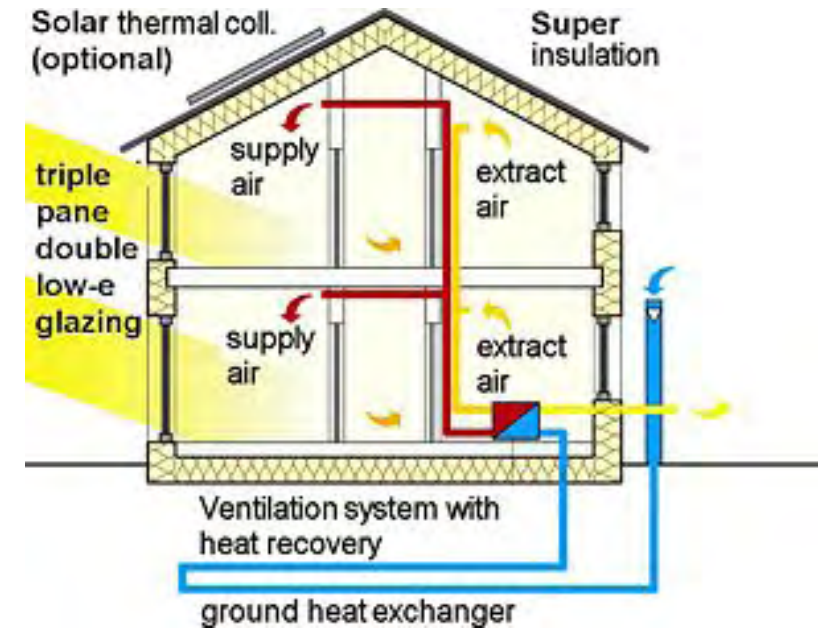








- ‘Passief Haus’ Techniques
 - Optimal insulation
 - Ventilation with heat recovery
 - Cold and heat storage
 - Efficient low temperature heating and cooling
 - Phase change materials



- 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



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



Different products with microcapsules: plaster, plasterboards, porous concrete... ..



Other systems: Energain,
Rubitherm granules



Transparent polymer solar cells



New Energy, a different way of thinking

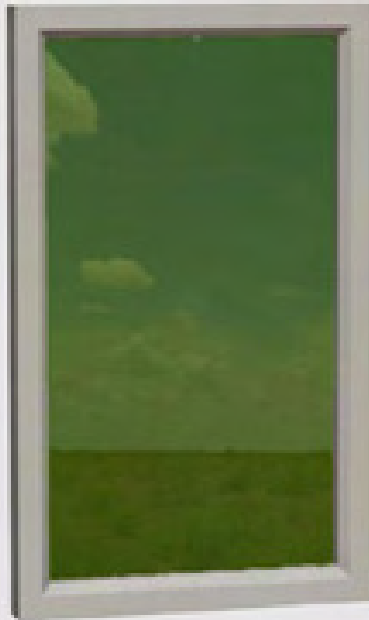


Polymer solar cells between double layered glass?

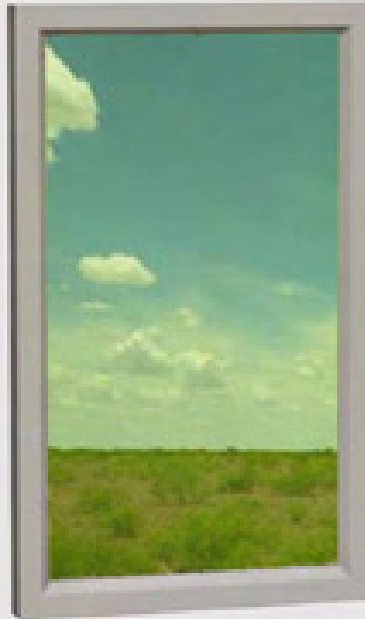




Dark



Bright



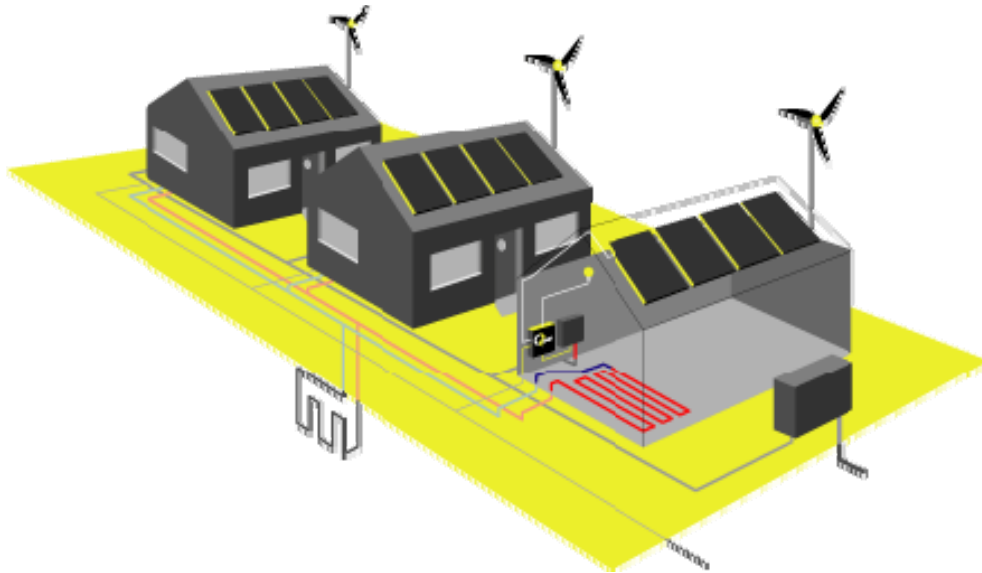
Privacy





The district of tomorrow: smart grid and mobility

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















project indicators planning

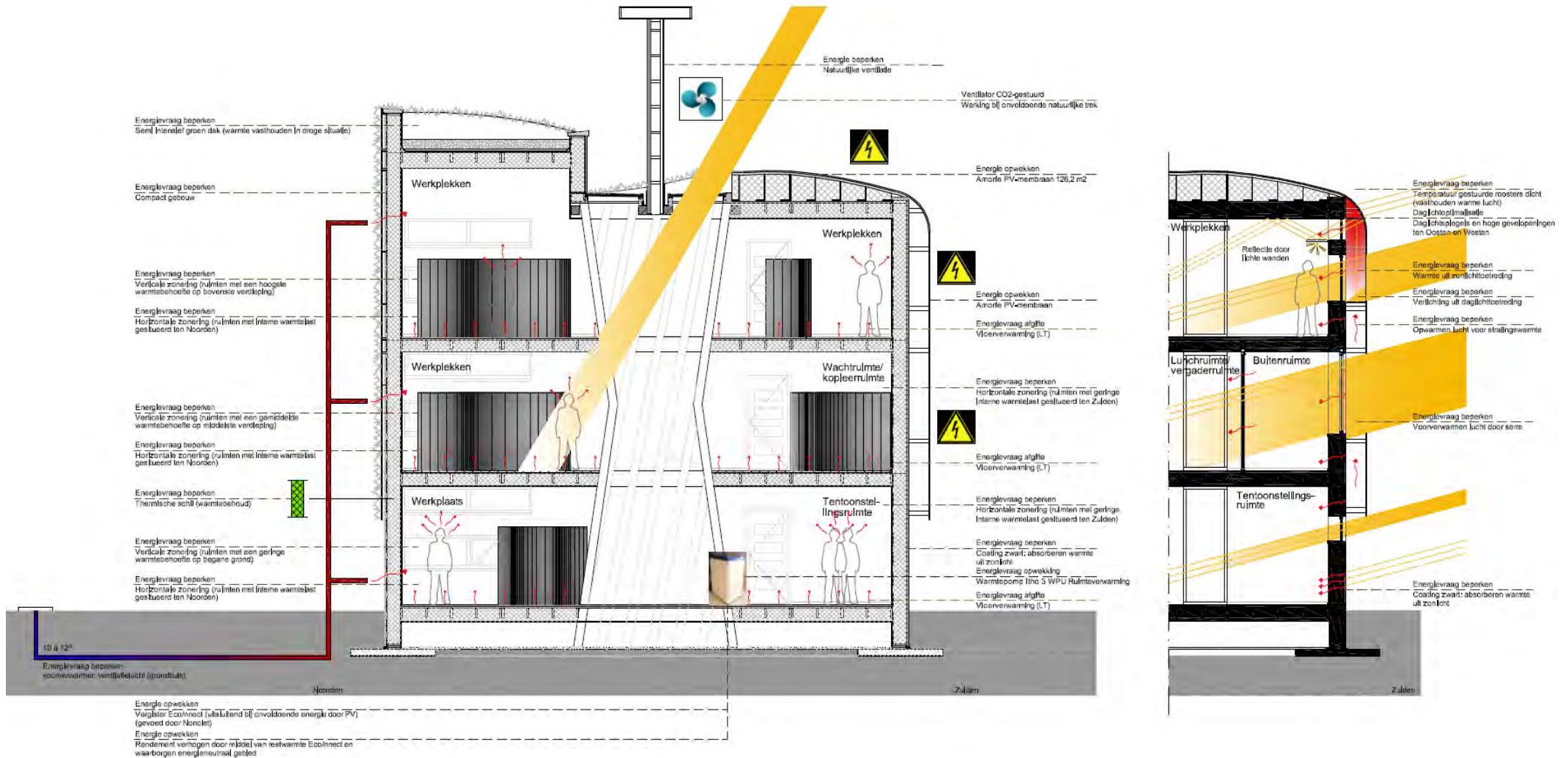
		project 1: Knik	project 2 Eco/nnect	project 3 exergie house	project 4 0-materials
					
		under construction	in detail phase	in design	planned
		energy	energy	energy	energy
demand	vraag	passive	EPC= 0,3	min-exergie	exergie 2.0
supply	levering	100%RE (0-energie)	Energieplus	e-plus	e-plus-e-auto
		Materials	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





MAXergy building

ENERGIE - WINTER





C. Create new coalitions

- 7. Create new forms of cooperation
- 8. Involve end-users in the decision making process
- 9. Share knowledge

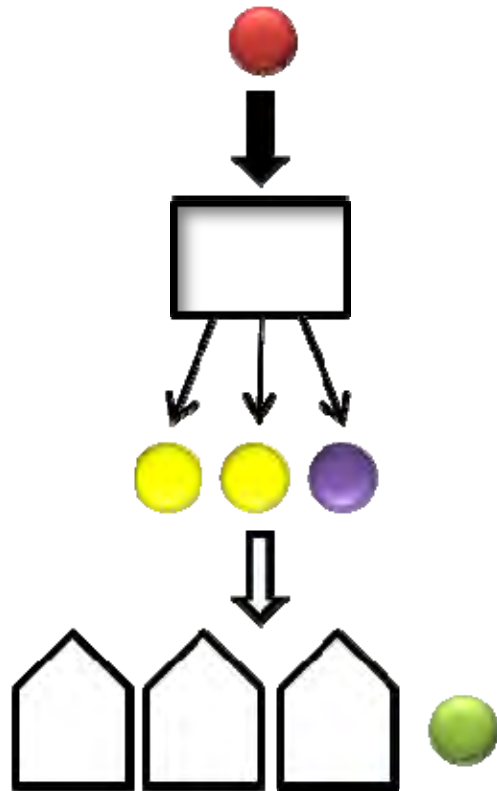


D. Clear analysis

- 10. Produce an analysis of the area
- 11. Determine the energy demand after implementation of energy saving measures
- 12. Produce an analysis of the energy potentials
- 13. Choose a suitable energy system

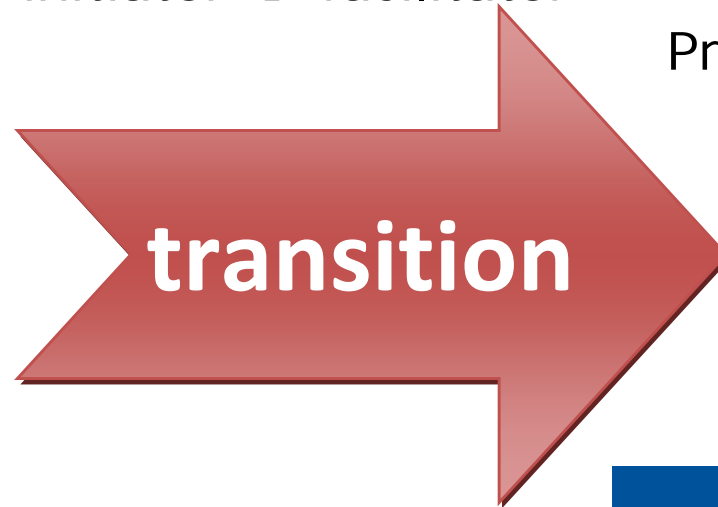
AARHUS & TILBURG: TRANSITION

Government driven

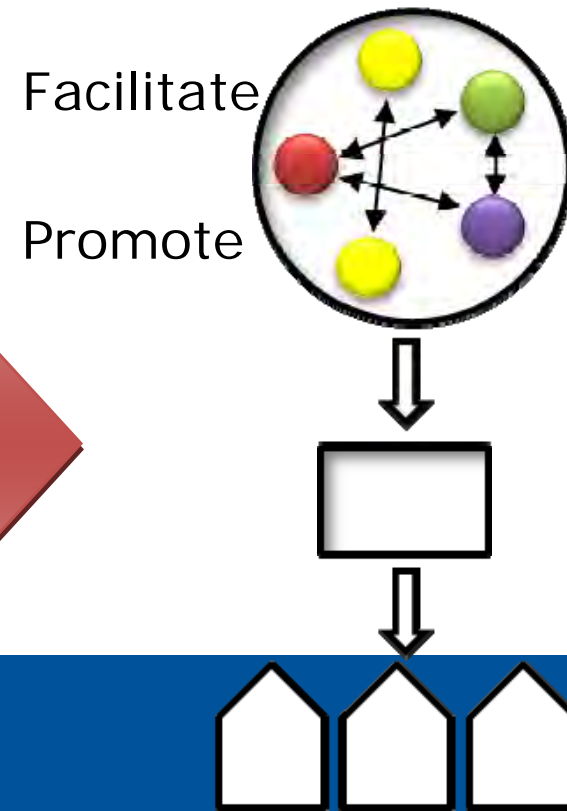


Municipality initiator,
executive and
organisor

initiator → facilitator



Frontrunners model



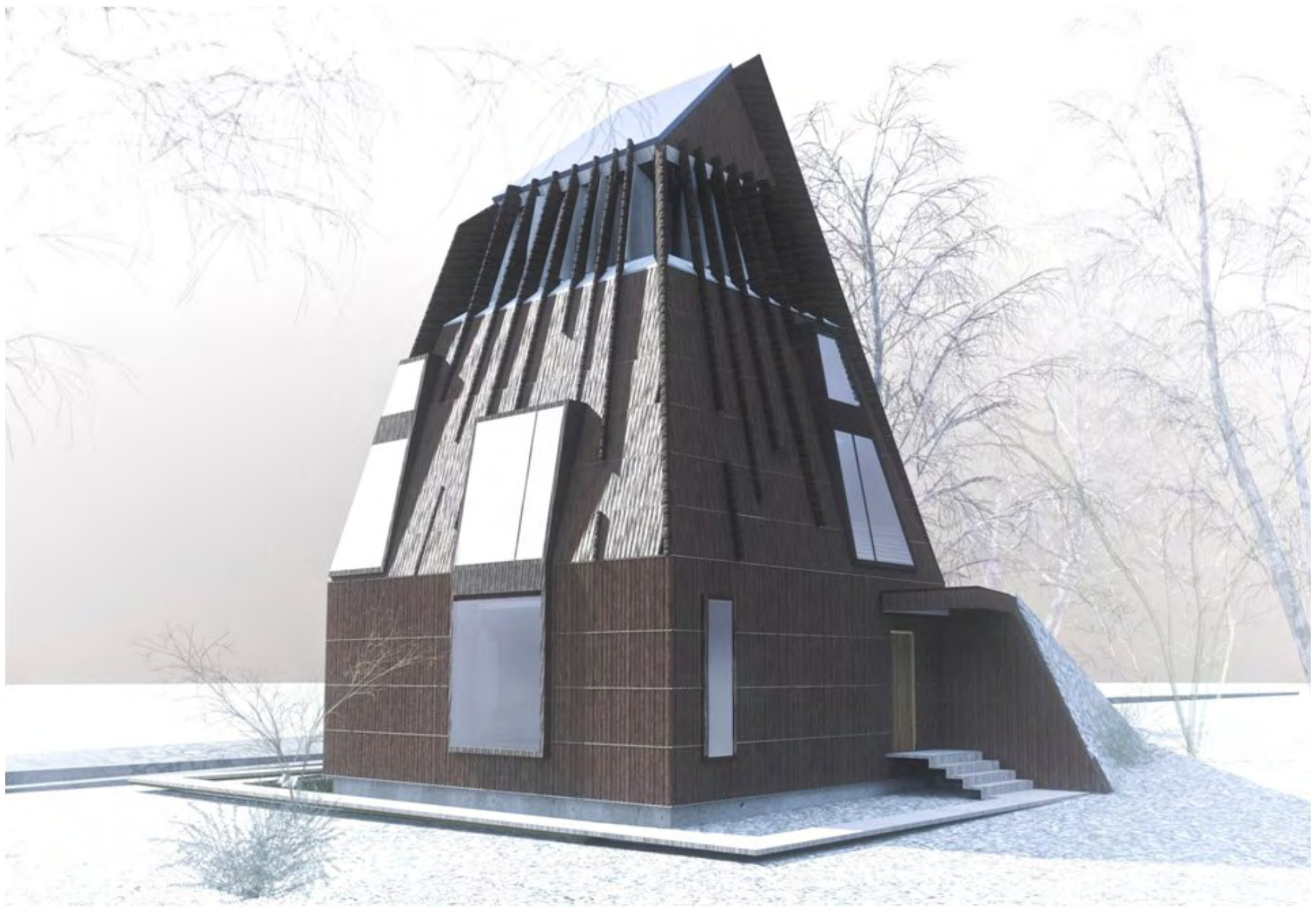
Municipality is one of
the participants in
Climate partnership



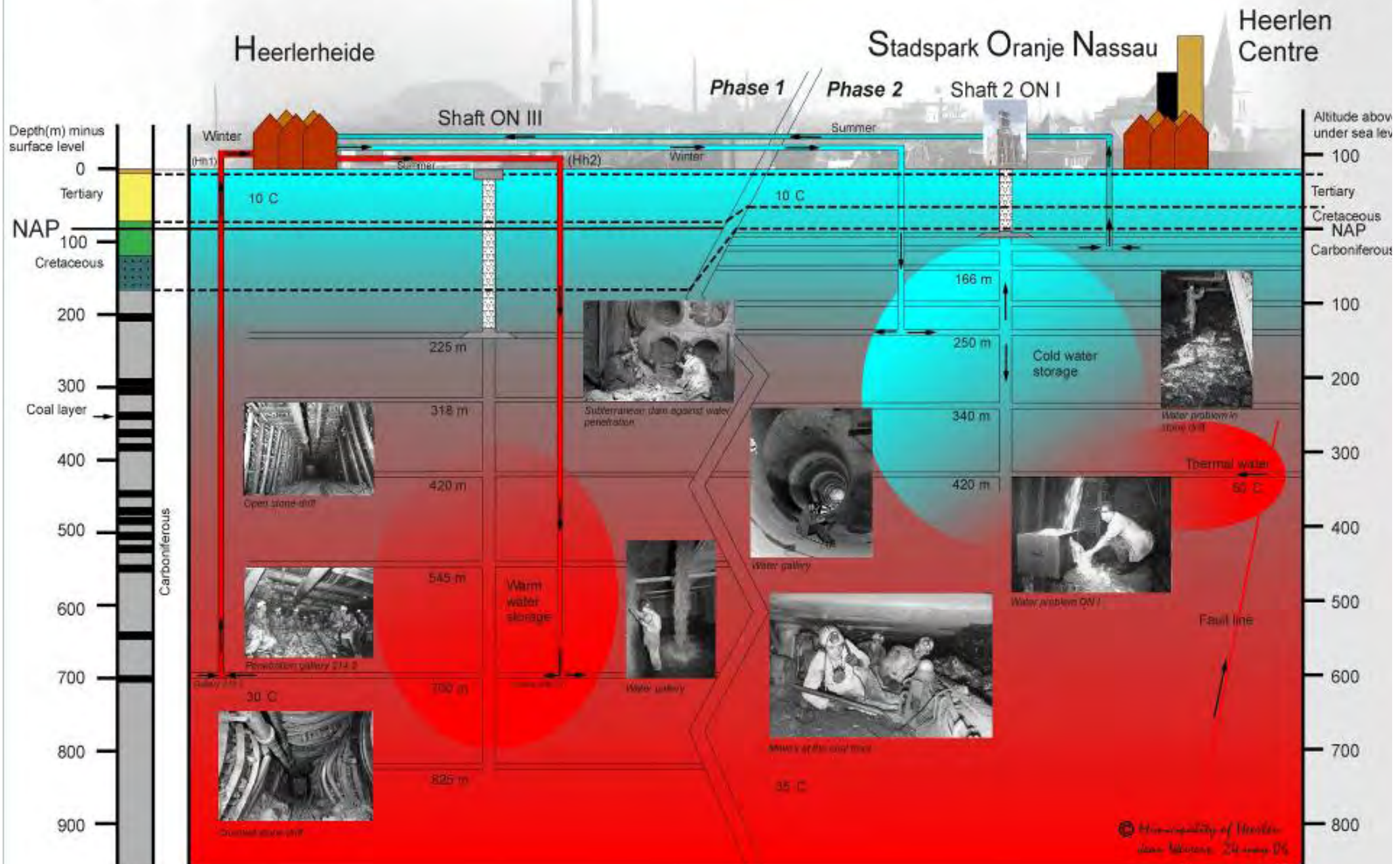
The district of tomorrow: the users of tomorrow



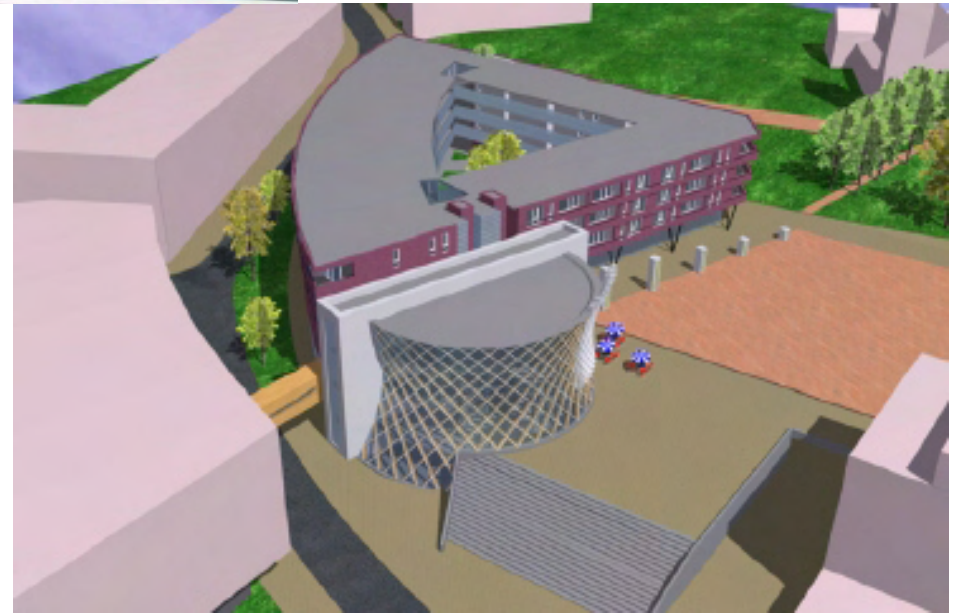
The road towards energy neutral cities



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



Heerlerheide Centre





E. Realistic plan

- 14. Draw up an integral business plan
- 15. Take the operational phase into account
- 16. Build powerful financial coalitions



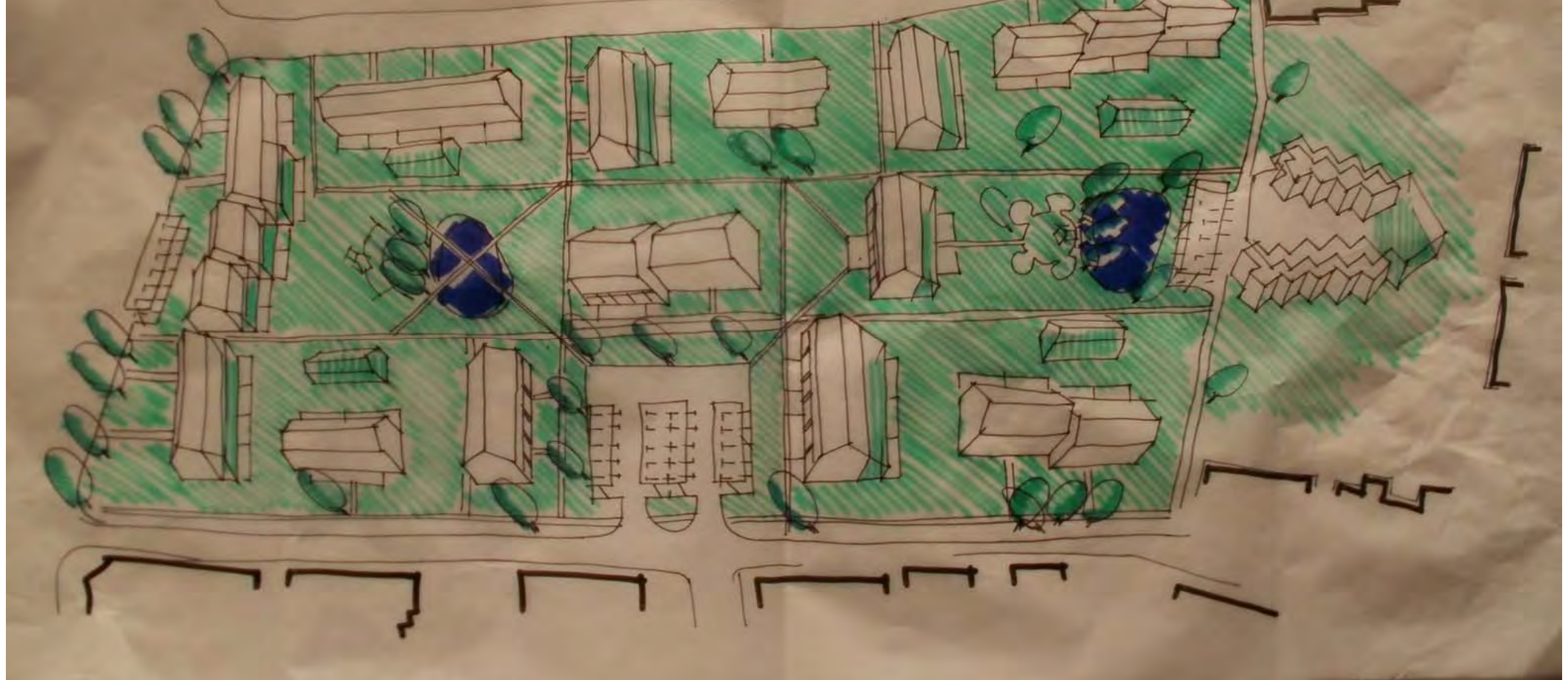
F. Decisive implementation, execution and operation

- 17. Utilize the innovation skills of companies
- 18. Assure the quality of the energy system
- 19. Monitor progress and results
- 20. Encourage energy efficient user behavior

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



FILLING IN THE TRANSITION PATH STEP BY STEP:

ONE STEP:
RENOVATION 153
HOUSES
KAALHEIDE
KERKRADE WEST





Teknologiasta liiketoimintaa



Jyri Nieminen, VTT



- 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€

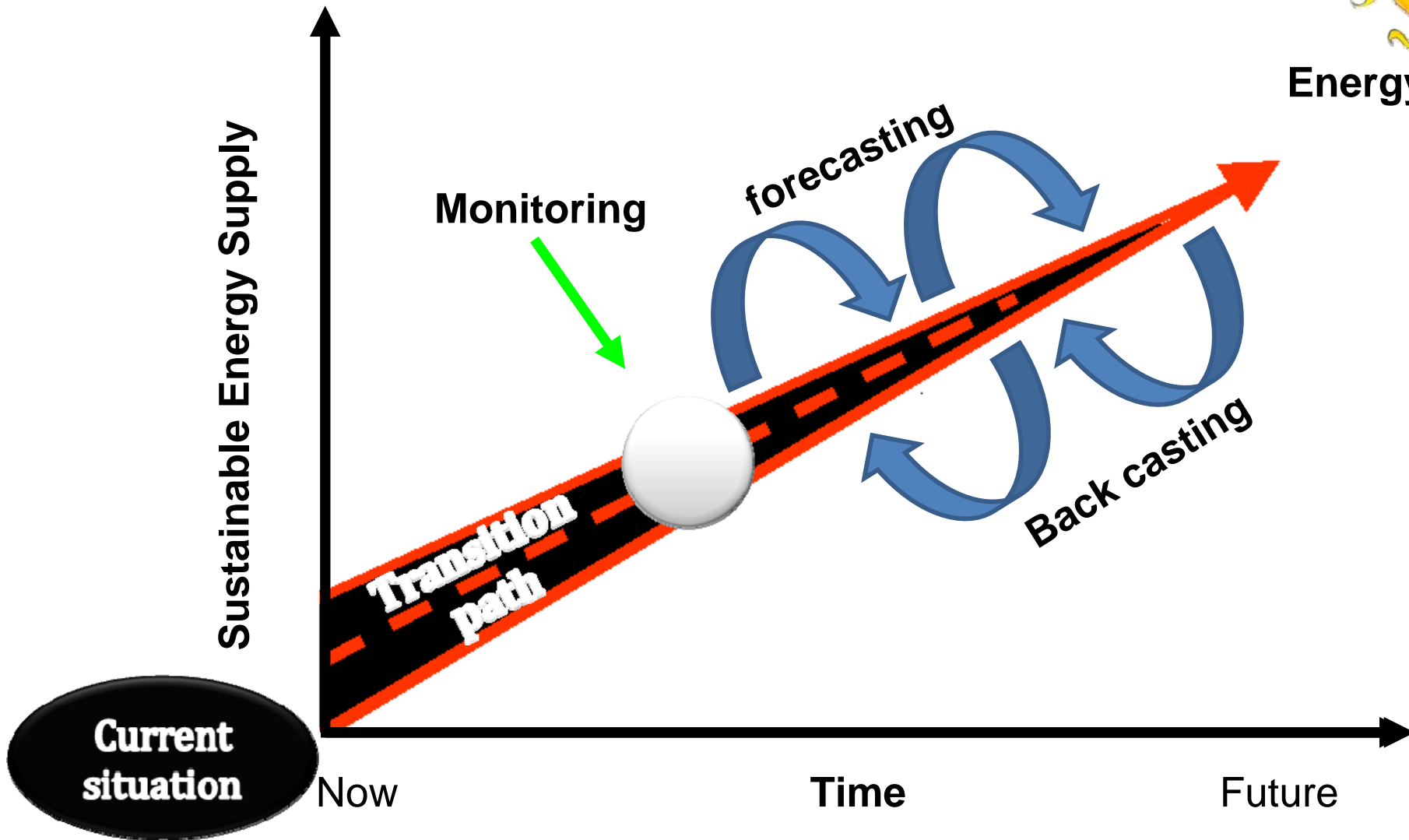


The importance of monitoring!



Energy Neutral

Defining the roadmap to energy neutral



20% reduction in 2020, and 20% renewable energy in 2020.

600.000 buildings in Limburg: 120.000 towards 0-energie, that is 15.000:

100 Kerkrade West projects, every year



IEA, Annex 51, „Sustainable city“ ...



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



 **Economic efficiency by integrated system optimization**

Source: EnBW, Karlsruhe