Rijksdienst voor Ondernemend Nederland

Smart sector coupling: the road towards energy neutral cities and regions (integral, inclusive, large scale implementation)

Netherlands Enterprise Agency

Zuyd University

Jacques Kimman

Urgent policy: Phasing-out Gas production

Minister Eric Wiebes (Economic affairs and Climate):

"Due to continuing induced earthquakes, cabinet decided to phase-out gas production Groningen. Complete stop in 2030".

Implies earlier transition to other gas/sources for heating and production for built environment, companies and countries

Signals urgency to make quick start with the energy transition.

"The New Delta Works"

“Districts without natural gas”

Coalition agreement:

30,000-50,000 houses without gas/year

No natural gas for new houses

Existing houses? District-oriented approach

District tender (120 million)

Municipalities (&grid operators&end-users)

Results 1st tranche: 27 allocated

Innovation tender (12.8 million)

Prototype within 1 year

Industry (& knowledge centers)

- All electric / heat district systems / renewable gas / smart control / new business models / energy storage / tools

Source: Minbzk

Challenges (wicked problems): who is the problem owner?

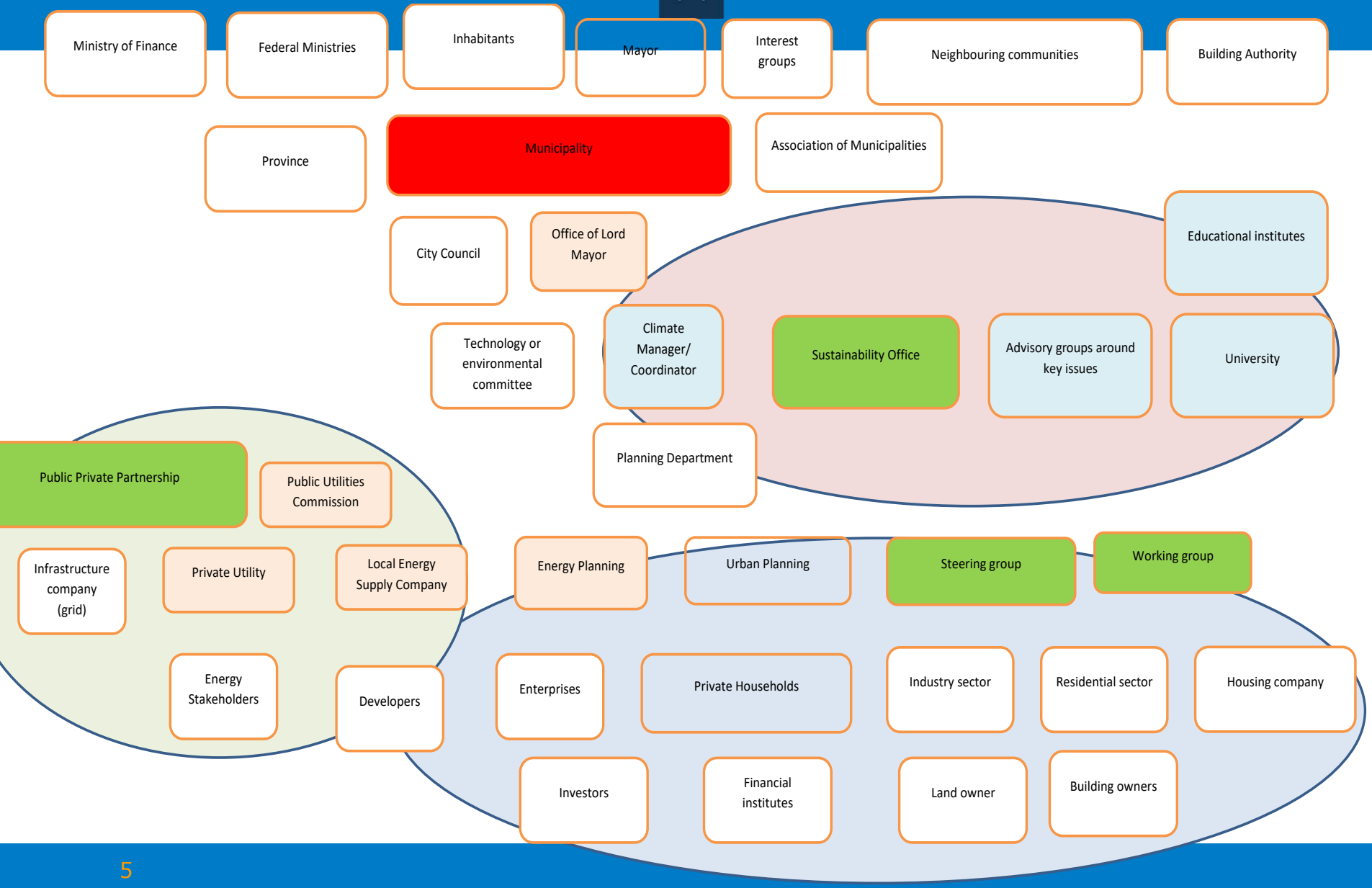
Multiple stakeholder group:

- Municipality: politicians, administration
- Housing associations, investors, water management, investors, etc.
- Architects, planners, …
- People, Tenants,..
- Etc.

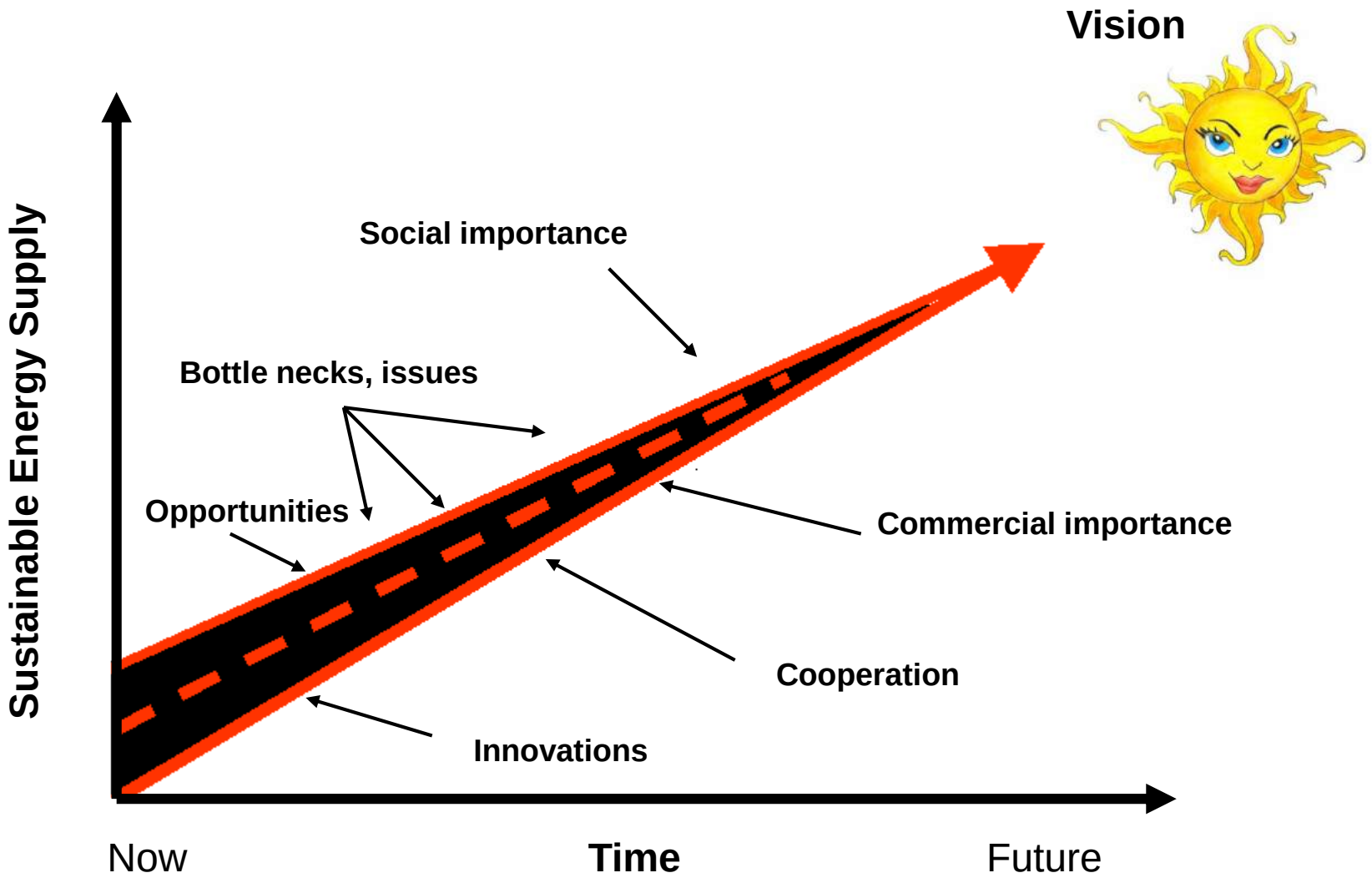
Conflicting objectives/interests:

- Economy of scale
- Long and short term goals
- Dynamic state of the art in technologies
- Fragmented budgets/ departments/ goals/ decision making
- Fragmented/ single issue instruments
- Multiple problem owners and lack of coordination
- No cooperation between urban and energy planning Public/Private domains
- Legal frameworks are often not suited
- Regular and new business (niche and regime players)
- The conceptual phase is often not financed
- Solutions for the poor and the rich people
- How to make long term goals leading for the steering process?

• Who is we? Multiple-stakeholder- involvement

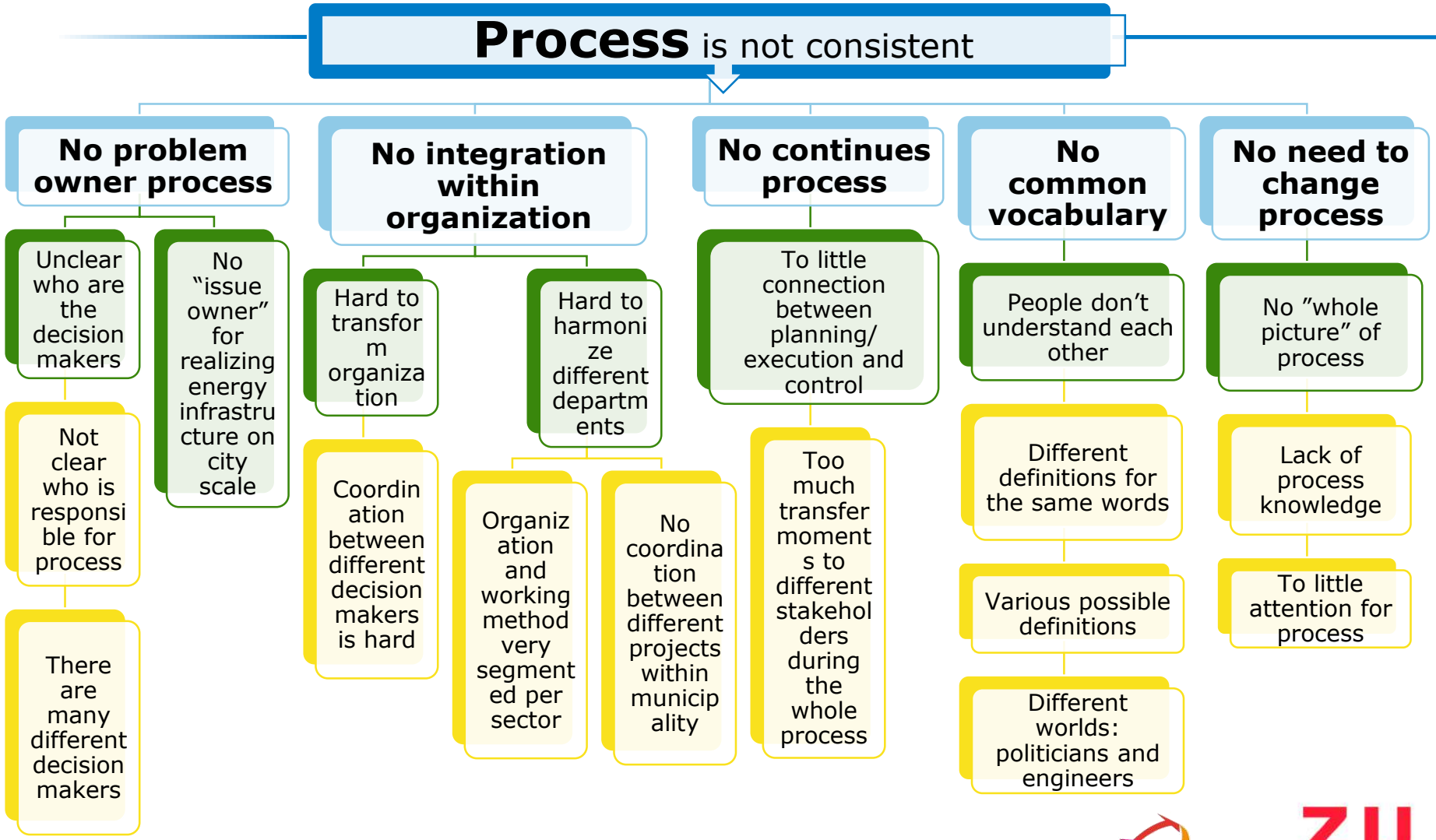


Energy transition (roadmap)






Collecting and analysing learning experiences of frontrunners (IEA-EBC)



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

Conclusions of IEA-EBC research on Cities and Communities

- 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 including co-benefits and avoided costs
  - Integral co-production
  - New work forms emerge for sustainable urban development

Strategic measures

1) Vision and target setting and commitment
2) Renewable energy strategy municipality/region
3) Enabling legislation (Make Full Use of Legal Frameworks)
4) Criteria for competitions/tenders
5) Information Tools Supporting the Decision Making Process
6) Skills and know-how
7) Technological concepts on a system level
8) Monitoring and steering on the results
9) Political support and stakeholder inclusion
10) Inclusion of social-economic impact and other co-benefits (value creation)
11) Financial/ investment models
12) Effective and Efficient Organizational Processes

Implementing Dutch Energy Policies

What to do (for RVO.nl)

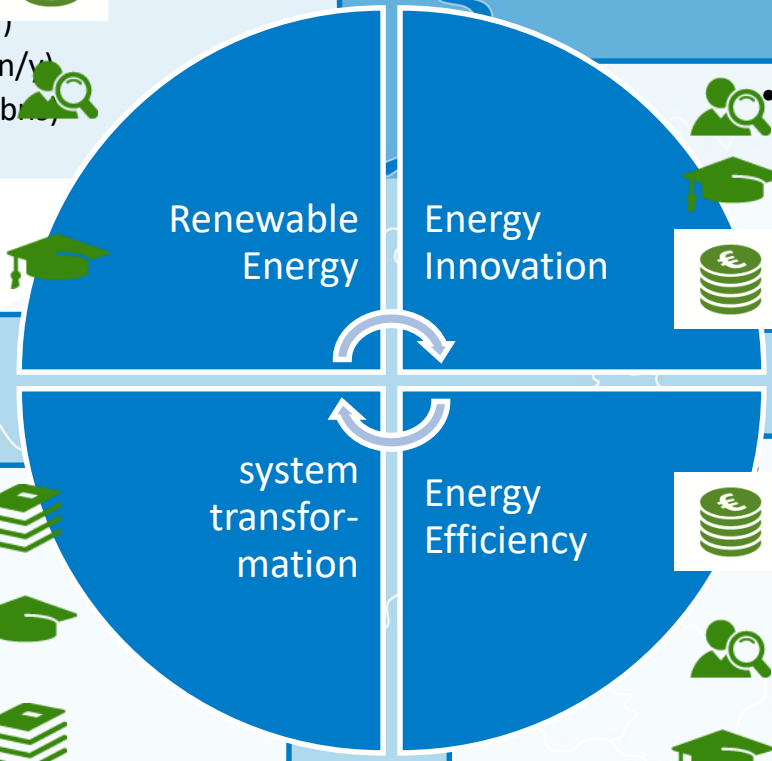
Information and advice

Business networks

Financing

Executing legislation

- SDE feed in subsidy (€ 8,5 bn growing)
- Guarantee Geothermal (€ 50 mln/)
- Subsidy small renewable (100 mln/y)
- Project prep/tenders offshore (€ b
- Round tables
- Sustainability biomass
- Spatial planning wind
- Knowledge centre heat



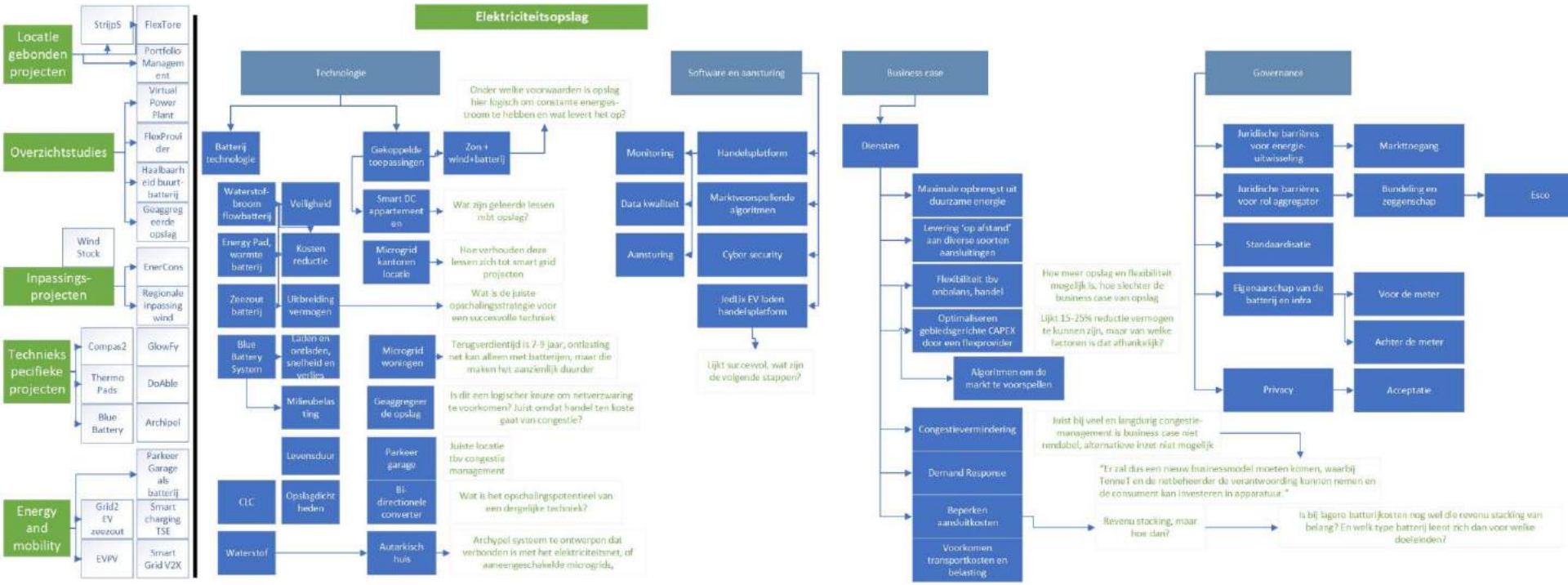
- Subsidies Energy innovation (€ 120 mln/y)
- Brokering innovation finance
- Export support energy technology
- Innovation system support

- Permits strategic energy projects
- Preparing gas system for 'non Groningen gas' : off gas
- 'regelation holiday' for local grid
- Spatial design energy regions
- Green deals

- Tax rebates efficiency investments (€ 160 mln/y)
- Subsidies energy savings private / rented properties
- Long term agreements with companies and sectors
- Energy labels built environment

https://www.youtube.com/watch?v=WwnYbLpaBx0

ANALYSIS OF OUR PROJECT DATABASE KNOWLEDGE INTEGRATION TO A SYSTEM LEVEL: KNOWLEDGE LANDSCAPES



Evolution renewable energy policies

Beyond legislation and financial support

- Spatial issues / spatial integration
- Stakeholder engagement / societal integration
- Energy infrastructure / technical integration
- ‘Smart Integration’ – variable supply, flexible and steerable demand, integration power/heat/mobility/resources, transparency and digitization. Etc.

Overview of examples and headings

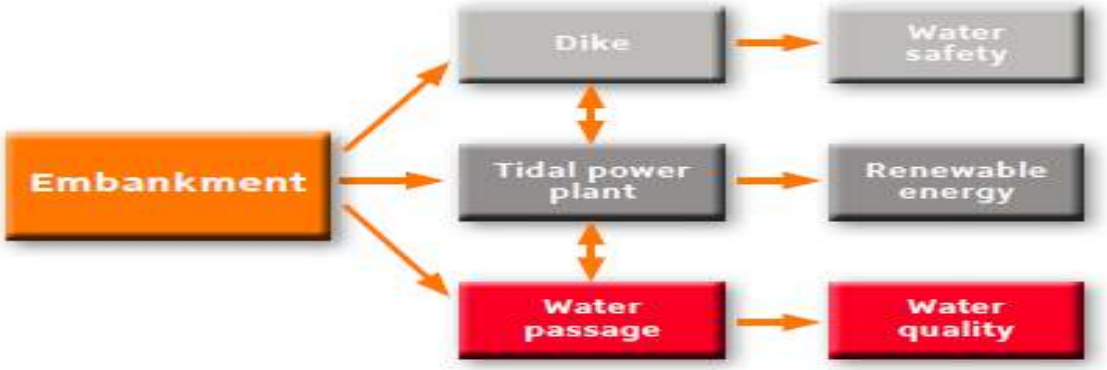
	EXAMPLES	Soil	Flora and fauna	Water	Industry	Housing	Cultural history	Care	Education	Energy	Recreation	Agriculture	Mobility
Combination of different sectors													
6	Sustainable groundwater management, Ugchelen	x	x	x	x	x				x			
8	Energy-generating road, Avenhorn	x			x	x				x			x
10	Biomass plant, Beetsterzwaag	x	x		x		x	x	x	x			
12	Wind as social and economic motor				x	x	x		x	x		x	x
14	Combinations along the Nieuwe Hollandse Waterlinie	x	x	x	x	x	x		x		x	x	
16	Water plazas in Rotterdam		x	x		x					x		
18	Multidak: the roof as a second ground level	x	x	x		x				x	x	x	
20	Ground energy in Vleuterweide, Utrecht	x			x	x				x			
22	Self supporting River System, IJsseldelta	x	x	x	x		x			x	x	x	x
24	Farm "De Groote Voort" in Lunteren	x	x	x	x		x				x	x	x
26	The Utrecht "Biowasmachine"	x		x	x	x				x			x
28	TexelEnergie Cooperative	x	x	x	x	x				x		x	x
Area development, built environment													
30	DRU industrial estate, Ulft		x	x	x		x		x		x		
32	Decentralised sanitation, Noorderhoek Sneek			x		x				x		x	
34	Avenue 2 / the Green Carpet, Maastricht	x	x	x	x	x	x		x		x		x
36	Sijtwende bypass, Voorburg		x		x	x					x		x
38	Graafseweg Alverna Wijchen		x			x	x			x	x		x
40	"Buurderij Wilde Haan, Balloo"	x	x		x	x	x	x	x	x	x	x	
42	Regional food – local cooperative Oregional	x	x		x						x	x	x

More information & cases

http://english.rvo.nl/topics/sustainability/reinventing-multifunctionality

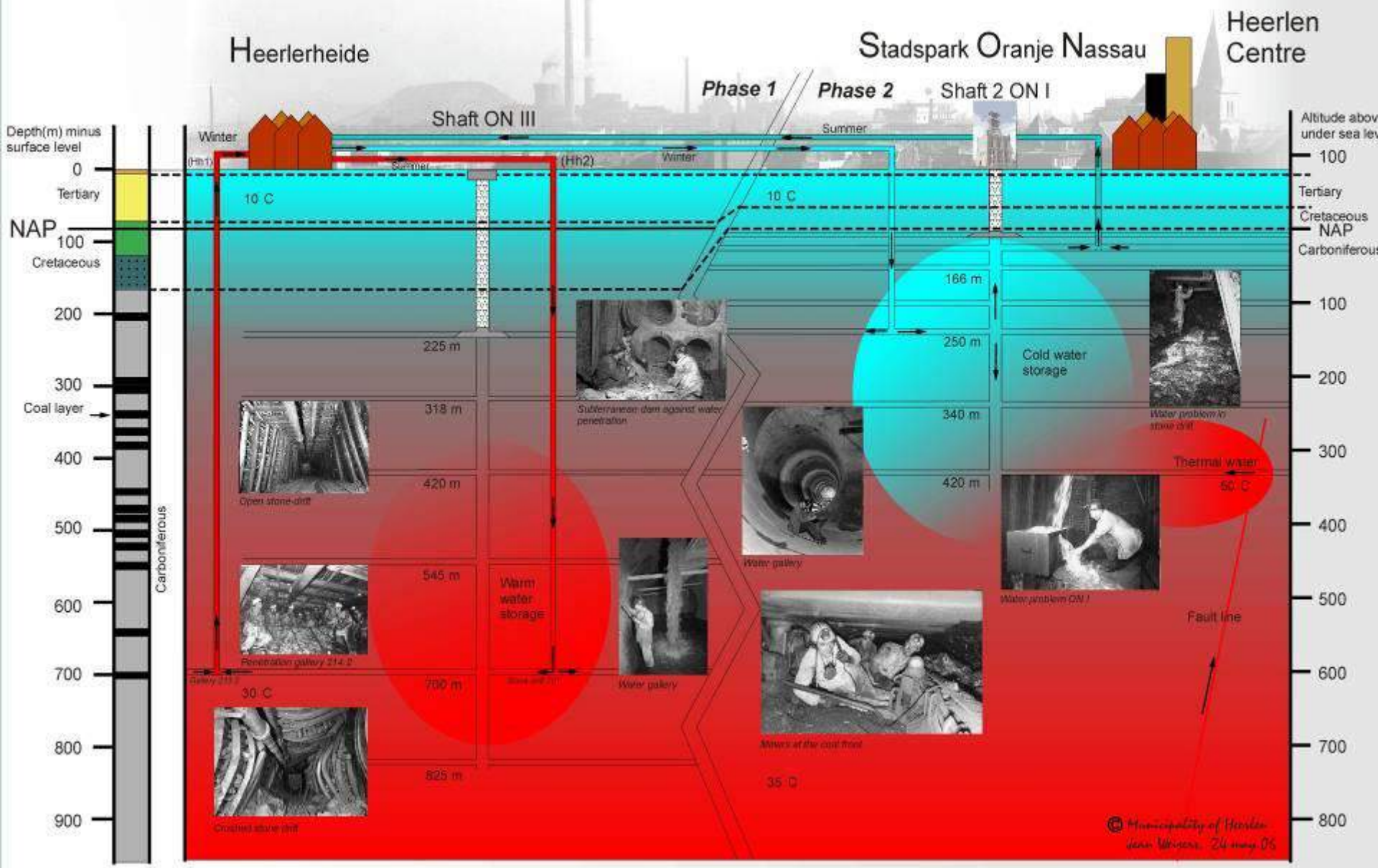
Flood safety and tidal energy

Tocardo Turbines Oosterschelde Storm Surge Barrier



Innovative energy dam → Export

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

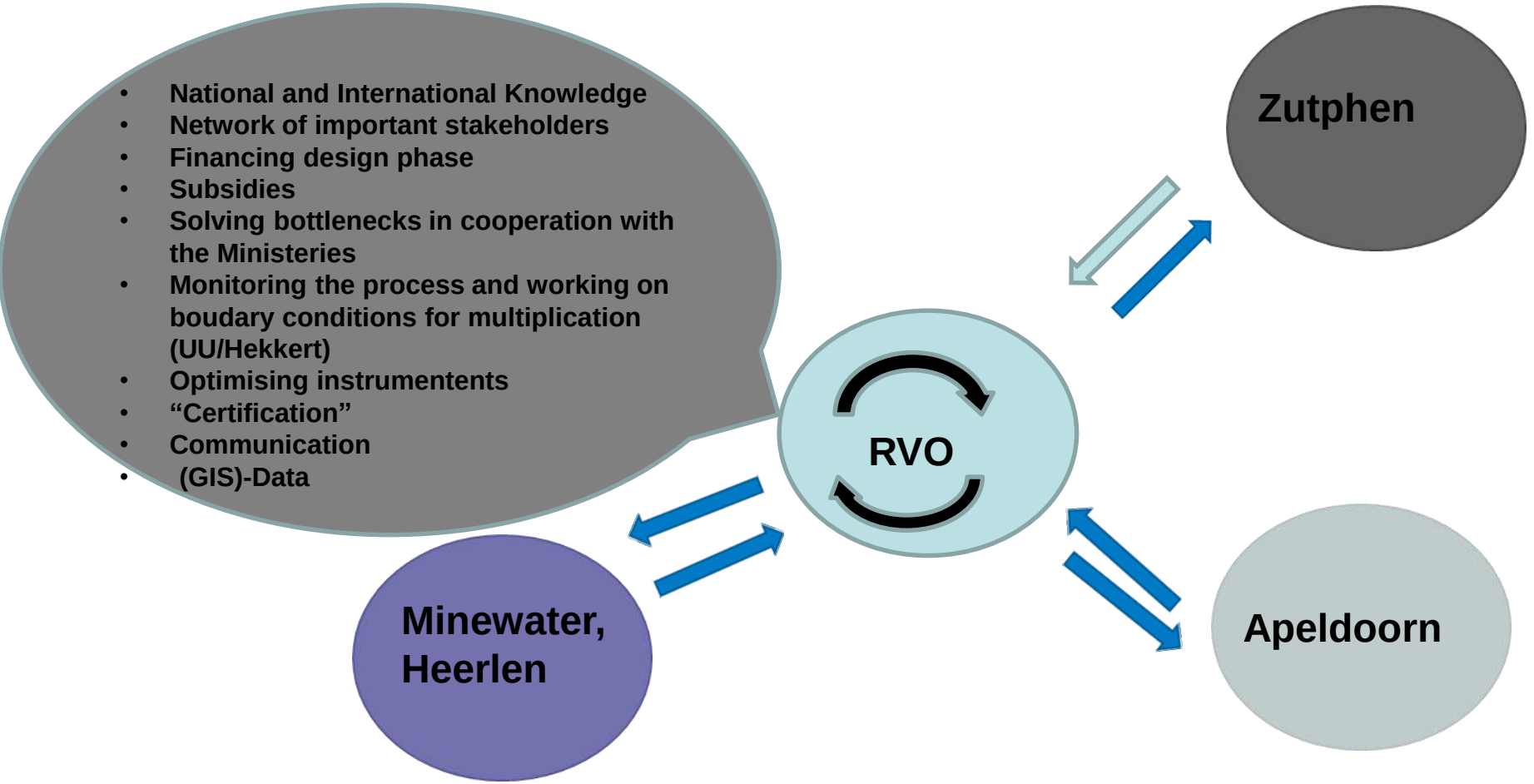


What is Transform?

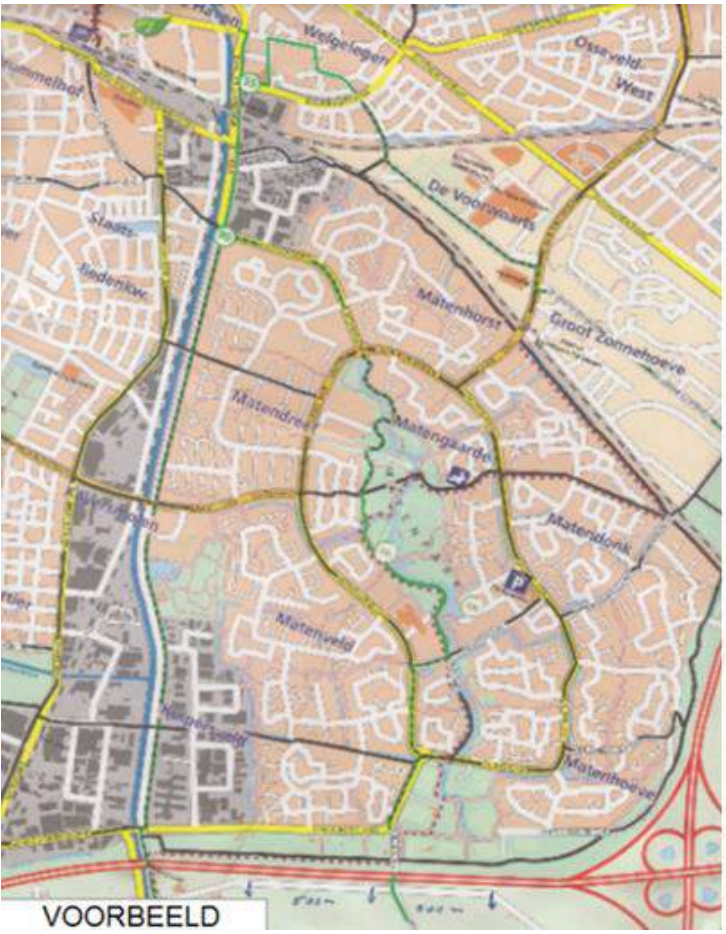
- Joint programme of the cities of Apeldoorn, Deventer, Zutphen and Zwolle
- To speed up/scale up the energy transition of the existing built environment
  - At least free of natural gas and the aim is also energy neutral
- Area development driven P-P-P approach (Public, Private, People)
- 4 cities x +10.000 homes each =
- 40.000 homes / 7 yrs (mixed: rented & privately owned)
- Long term financial planning: 30 years horizon
- Total energy related cash flow through the areas: more than 2 billion

TRANSFORM

RVO acts as a facilitator

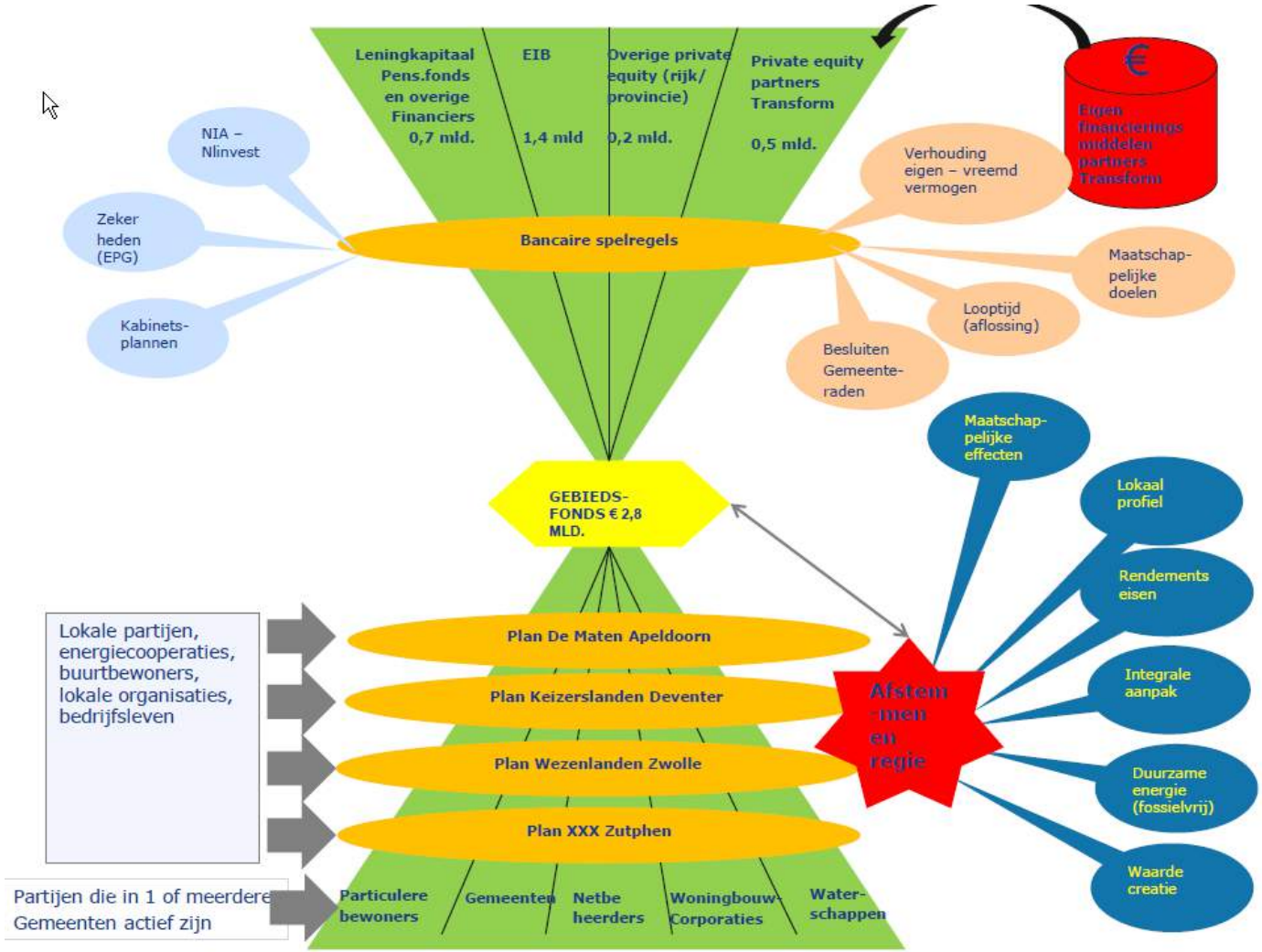


“BLOEMKOOL” DISTRICT



Approach: involvement on basis of wishes and needs of the inhabitants and making use of existing networks and cooperations and professional expertise and business in the neighbourhood.

Measure	costs M€	benefits M€
1. Buildings energy neutral	700	800
2. Intelligent electricity grid	10	15
3. Sustainable mobility	80	10
4. Vehicle to grid	40	10
5. Public lighting	2,5	10
6. Seperate sewage system	35	5
7. Decoupling rain water	17,5	5
8. Collecting rain water		
9 . High quality Green	10	12,5
10. Producing food	17,5	25
11. Health and Care	60	300
12. Removing High tension cable	5	?
13. Sound barriers with PV	20	15
14. Local Employment	50	300
Total	1050 M€	1507 M€


Leningkapitaal Pens.fonds en overige Financiers 0,7 mld.
EIB 1,4 mld
Overige private equity (rijk/ provincie) 0,2 mld.
Private equity partners Transform 0,5 mld.
€
Eigen financierings middelen partners Transform
NIA – Nlinvest
Zeker heden (EPG)
Kabinets-plannen
Bancaire spelregels
Verhouding eigen – vreemd vermogen
Maatschap-pelijke doelen
Looptijd (aflossing)
Besluiten Gemeente-raden
GEBIEDS-FONDS € 2,8 MLD.
Maatschap-pelijke effecten
Lokaal profiel
Rendements eisen
Integrale aanpak
Duurzame energie (fossielvrij)
Waarde creatie
Afstem-men en regie
Lokale partijen, energiecooperaties, buurtbewoners, lokale organisaties, bedrijfsleven
Plan De Maten Apeldoorn
Plan Keizerslanden Deventer
Plan Wezenlanden Zwolle
Plan XXX Zutphen
Partijen die in 1 of meerdere Gemeenten actief zijn
Particulere bewoners
Gemeenten
Netbe heerders
Woningbouw-Corporaties
Water-schappen

Jaarlijkse baten in Euro

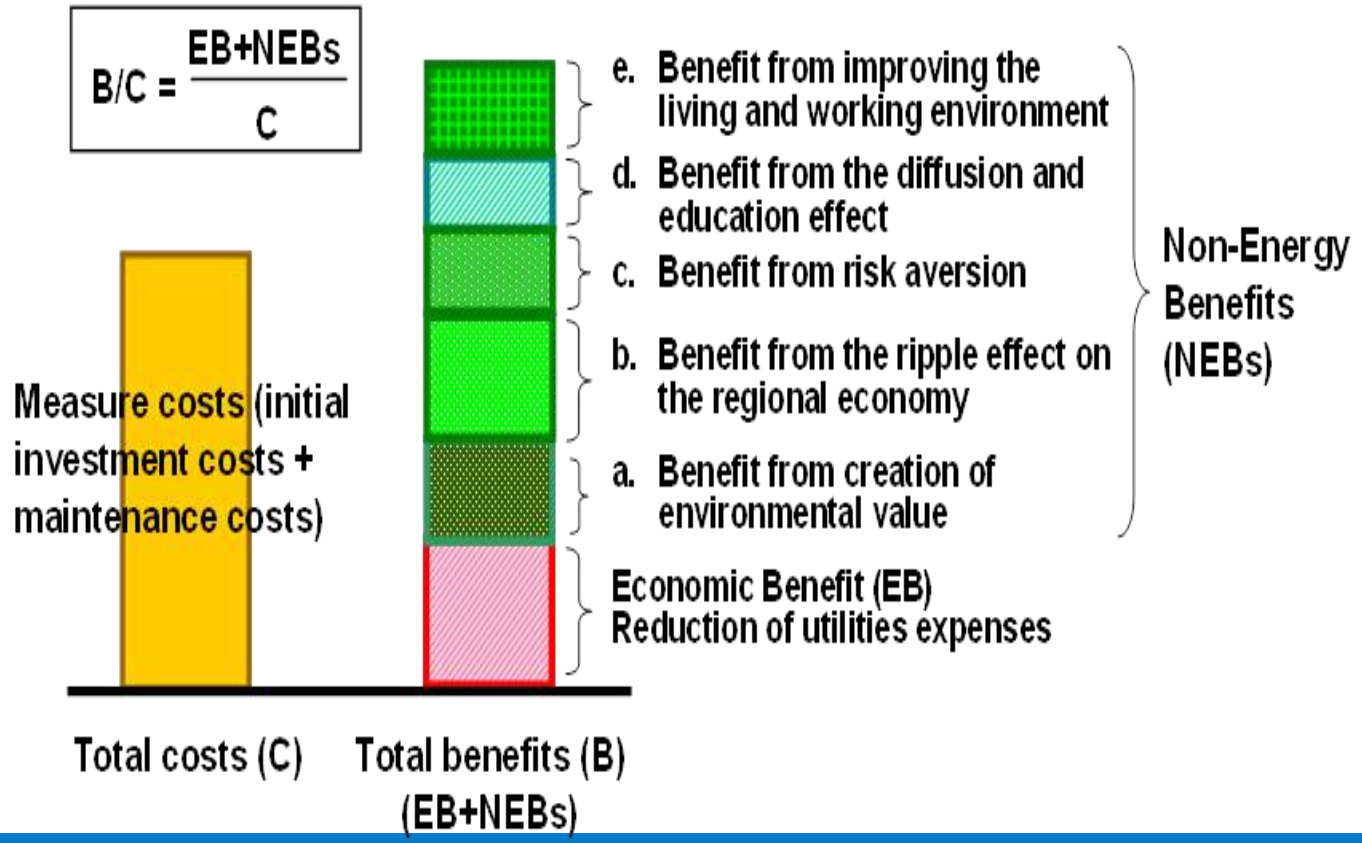
Bron: TEEB, bewerking De Urbanisten

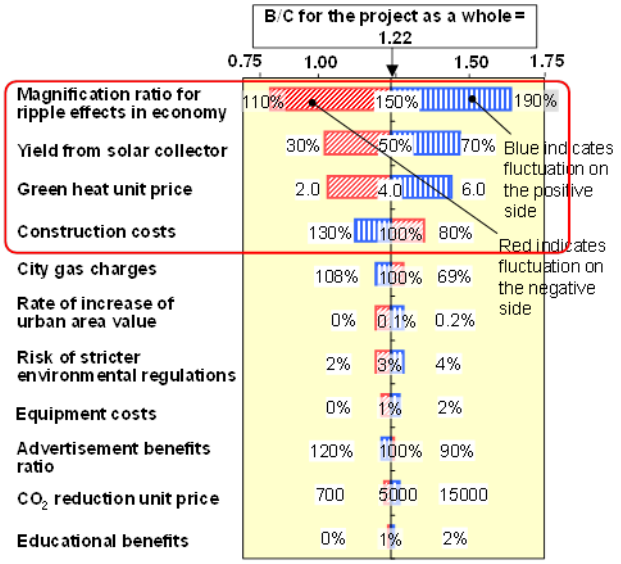
	Superspons	Singelstad	Randmeren
Vermeden kosten waterschade	€ 7.125.000,-	€ 5.041.000,-	€ 7.622.000,-
Toename vastgoed-waarde bestaande huizen	€ 11.095.000,-	€ 11.405.000,-	€ 1.978.000,-
Toename vastgoed-waarde nieuwe huizen	€ 2.490.000,-	€ 2.777.000,-	€ 7.787.000,-
Vermeden kosten waterzuivering	€ 1.780.000,-	€ 1.438.000,-	€ 3.303.000,-
Vermeden gezond-heidskosten door extra groen	€ 236.000,-	€ 298.000,-	€ 505.000,-
Toename productivi-teit door extra groen	€ 1.155.000,-	€ 1.457.000,-	€ 2.471.000,-
Besparing energie door extra groen	€ 176.000,-	€ 249.000,-	€ 369.000,-
Directe gezondheids-effecen extra bomen, riet, gras, en groene daken	€ 4.777.000,-	€ 3.253.000,-	€ 4.562.000,-
Toename sociale cohesie door extra groen	€ 19.113.000,-	€ 24.597.000,-	€ 20.926.000,-
Toename sociale cohesie door extra water	€ 4.171.000,-	€ 8.364.000,-	€ 21.034.000,-
Toename recreatiewaarde	€ 554.000,-	€ 2.675,-	€ 10.275,-

WAARDERING VAN MAATREGELEN (1/2)

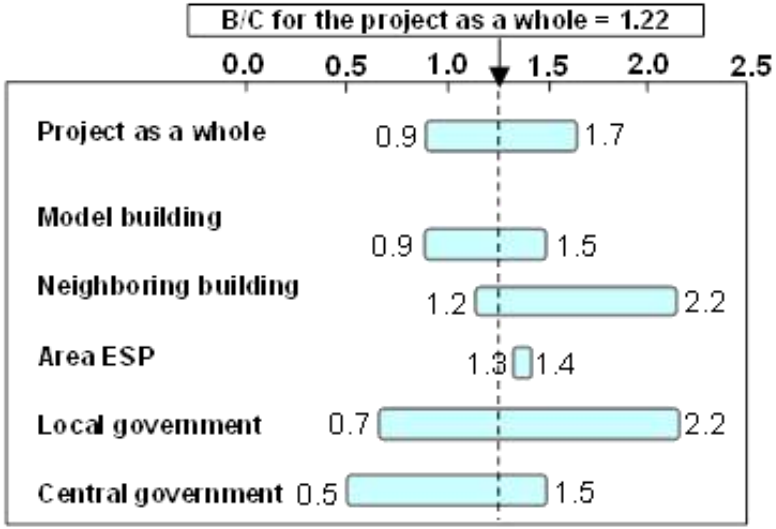
Pakket	Kosten (30 jaar)	Kostenbesparing door integrale aanpak	Kostenbesparing door volume	Kosten transform	Baten Transform	Baten - kosten	Beschrijving baten	Baten cash of maatschappelijk?	Split incetive?	Financierbaar?
Openbare verlichting	10 mln.	5%	15%	8 mln.	40 mln.	32 mln.	Energiebesparing, vermeden herinvestering lampen (levensduur)	Cash.	Deels. Afhankelijk van business model.	Ja. Marktpartijen voor beschikbaar.
Openbaar groenbeheer verbeteren	24 mln. (beheerkosten)	0%	7.5%	22,2 mln.	48 mln.	25.8 mln	Fysieke en mentale gezondheid, leefbaarheid, etc.	Maat-schap.	Grotendeels. Deel sociale baten valt binnen gemeente budget.	Alleen via begroting van de gemeente. Geen verdienmodel.
Wadi / infiltratie verbeteren	7.5 mln Beperkte investering en beheer	0%	7.5%	7 mln.	7 mln. (aanname)	0	Vermeden schade door overstroming etc.	Cash, maar onzek er	Grotendeels. Baten in geval van overstroming privaat. Kosten publiek.	Alleen via gemeente begroting, mogelijk samen met waterschap of verzekeraar.
Apparaten	110 mln	10%	25%	77 mln.	110 mln.	33 mln.	Besparing energie, besparing investering door particulier, voorkomen onverwachte kosten	Cash.	Nee. Afnemer heeft baat en betaalt.	Zeker. Leasemodellen in ontwikkeling. Schaal wel uitdagend.
Vehicle to grid voor elke woning	104 mln.	10%	20%	81 mln.	40 mln.	-41 mln.	Vermeden netverzwaring en opslagkosten	Cash	Afhankelijk van model.	Afhankelijk van model.
Elektrische auto's (nadere analyse nodig)	85 mln.	2.5%	15%	70 mln.	7 mln.	-63 mln.	Lagere brandstofkosten, vermeden emissies	Cash	Afhankelijk van model.	Afhankelijk van model in inkomen van gebruiker.
TOTAAL	**2.4 MRD**			**1.9 MRD.**	**2.4 MRD**	**0.5 MRD**				

Multiple benefits: value creation

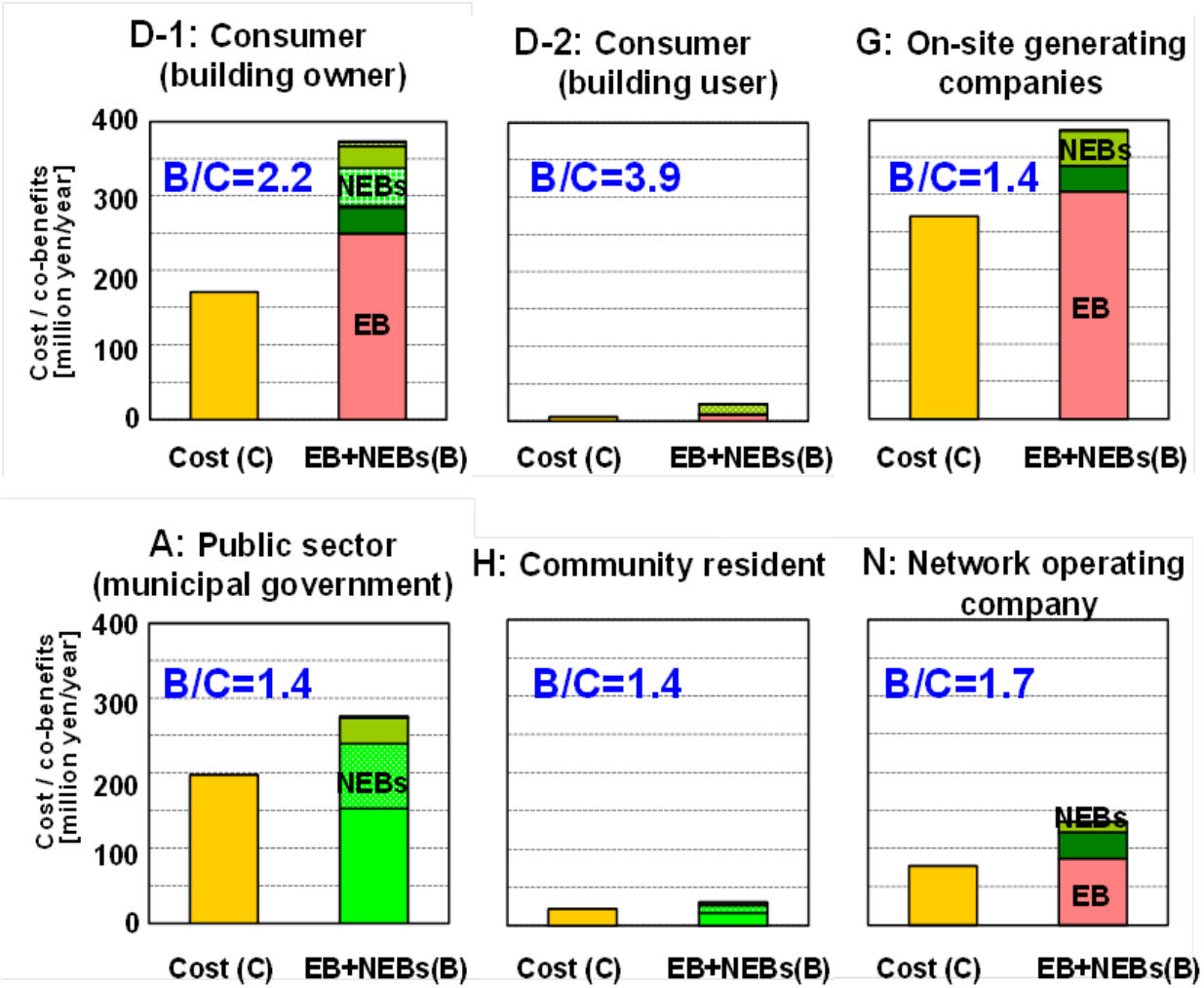




Sensibility analysis for B/C against fluctuation ratio of factors with uncertainties



10%-90% of the B/C cumulative probability distribution by stakeholders

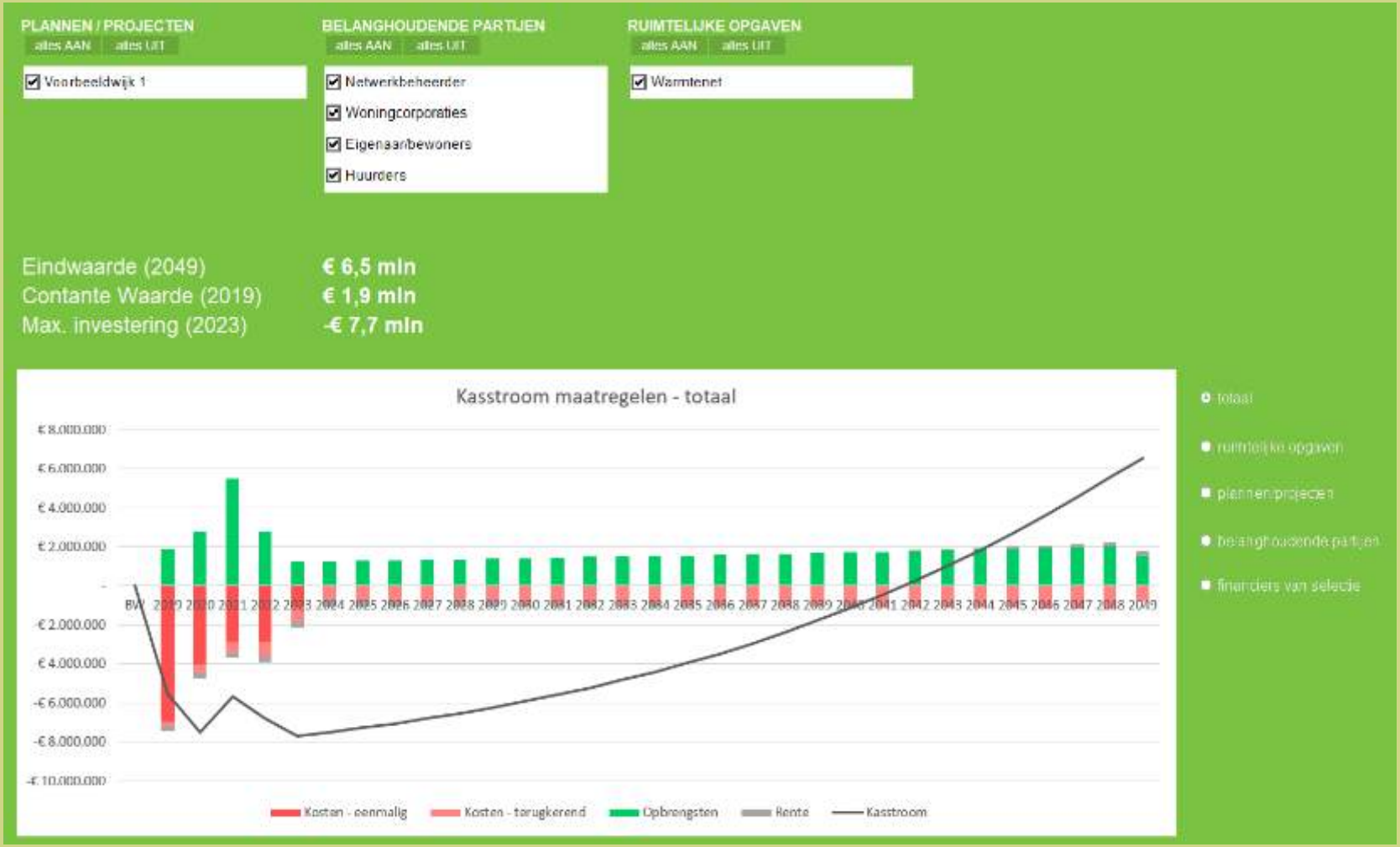

D-1: Consumer (building owner)
D-2: Consumer (building user)
G: On-site generating companies
A: Public sector (municipal government)
H: Community resident
N: Network operating company
Cost / co-benefits [million yen/year]
400
300
200
100
0
B/C=2.2
B/C=3.9
B/C=1.4
B/C=1.4
B/C=1.7
NEBs
EB
Cost (C)
EB+NEBs(B)

TREX

Transition Exploitation Model

Transform

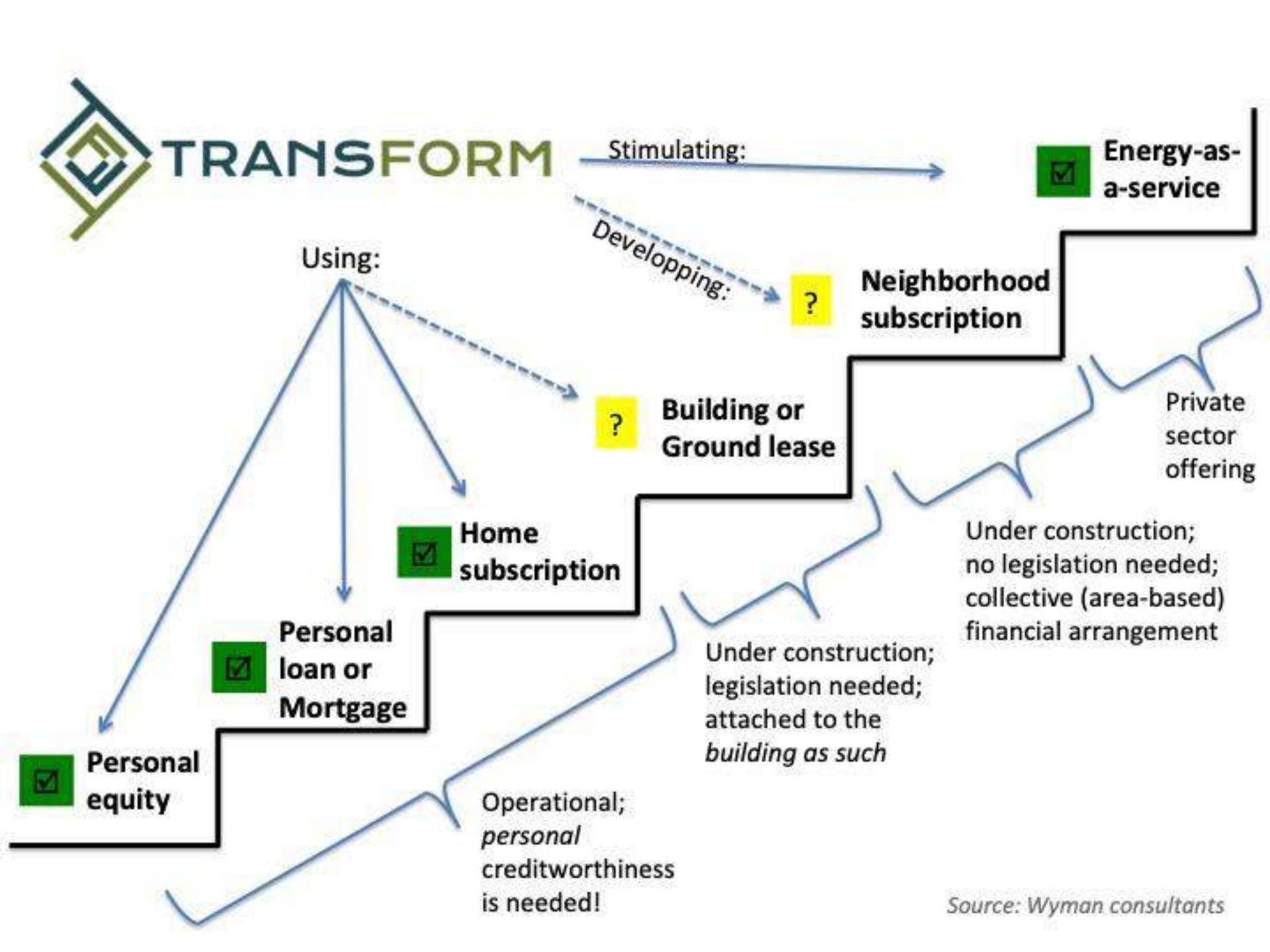
How do the results look like?



Integrated/inclusive approach

- Looking for an integrated new energy/warmth supply system for the whole area, not just a pile of measures
- Including challenges like climate adaption
- By aggregating supposed demand in the area we break the deadlock of the lack of scale
- Every inhabitant/owner can take part: we do not want an energy poverty gap!

TRANSFORM


TRANSFORM
Stimulating:
Developping:
Using:
Energy-as-a-service
Neighborhood subscription
Building or Ground lease
Home subscription
Personal loan or Mortgage
Personal equity
?
?
Private sector offering
Under construction; no legislation needed; collective (area-based) financial arrangement
Under construction; legislation needed; attached to the building as such
Operational; personal creditworthiness is needed!
Source: Wyman consultants