

Models + Games in policy processes: some experiences

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A Dutch experience: DuBes

- Restructuring post-WW2 neighbourhoods
 - sustainable building
 - social-economical vitality
- Direct decisionmaking to sustainability
 - what constitutes a sustainable neighbourhood?
 - what decisions contribute most to sustainability?
 - how can decisionmaking be directed?
- Approach
 - substantive analysis with MEDIA
 - process design and process management



Laadbouw



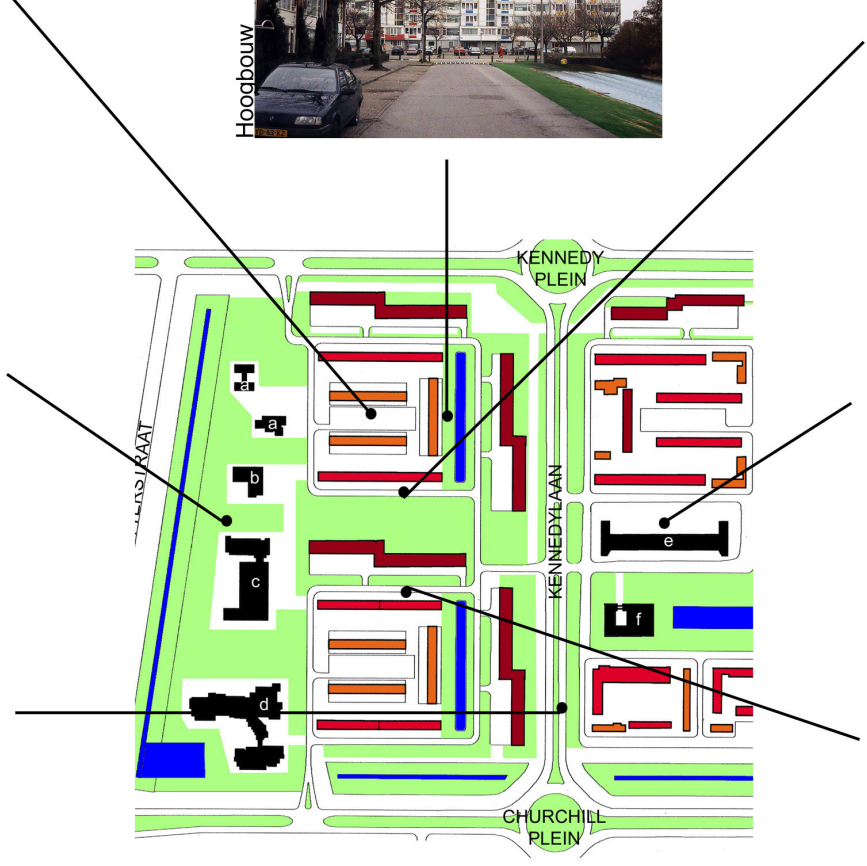
Hoogbouw



Middelhoogbouw



School



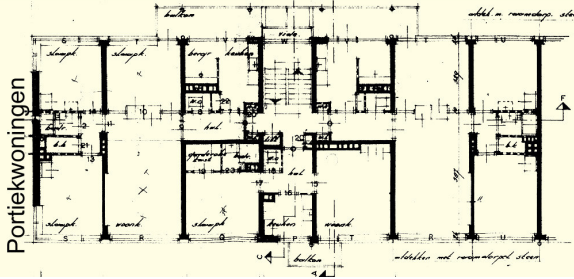
Winkels + Woningen



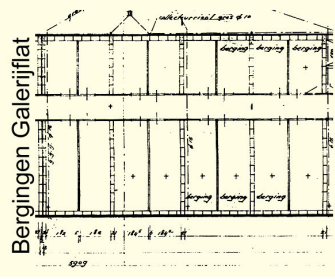
Kennedylaan



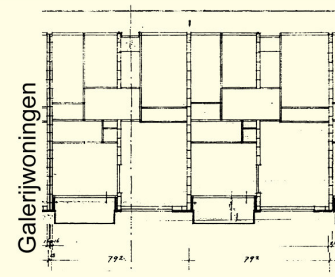
Openbare ruimte



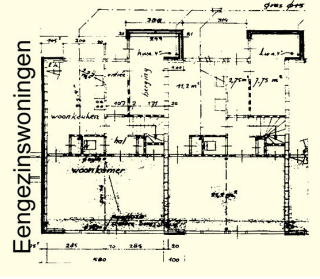
Portiekwoningen



Bergingen Galerijflat



Galerijwoningen



Eengezinswoningen

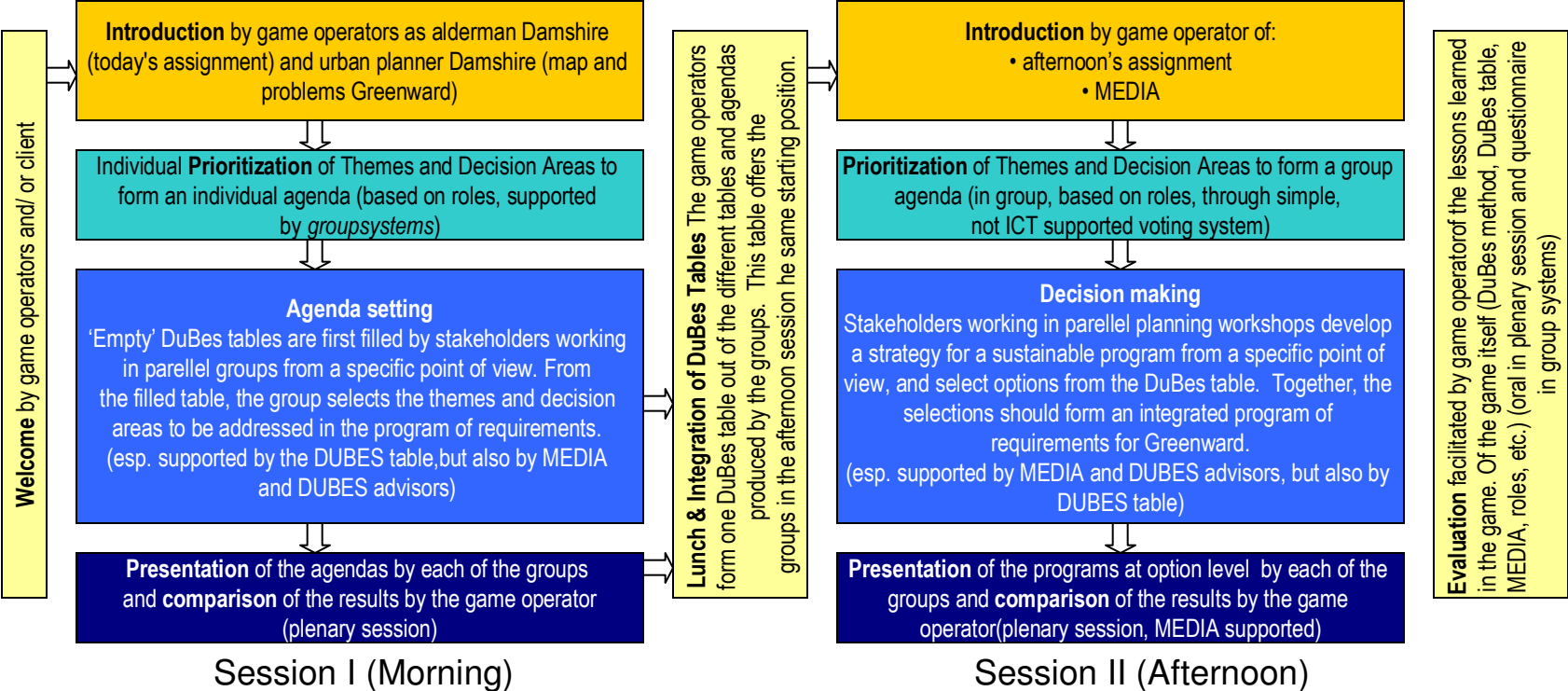
Actors and their objectives

- Many actors hold a stake in urban reconstruction
 - residents
 - municipal authorities
 - housing corporations
 - building contractors
 - providers of energy and drinking water

- Actors have preferences regarding
 - specific decision options
 - expected impacts

and will strive to satisfy these preferences
by exercising their (limited) influence on decisions

DuBes Game: Structure and Program







Modeling Environment for Design Impact Assessment

AIDA + Actor Network Analysis

- Decision areas
- Decision options
- Variables

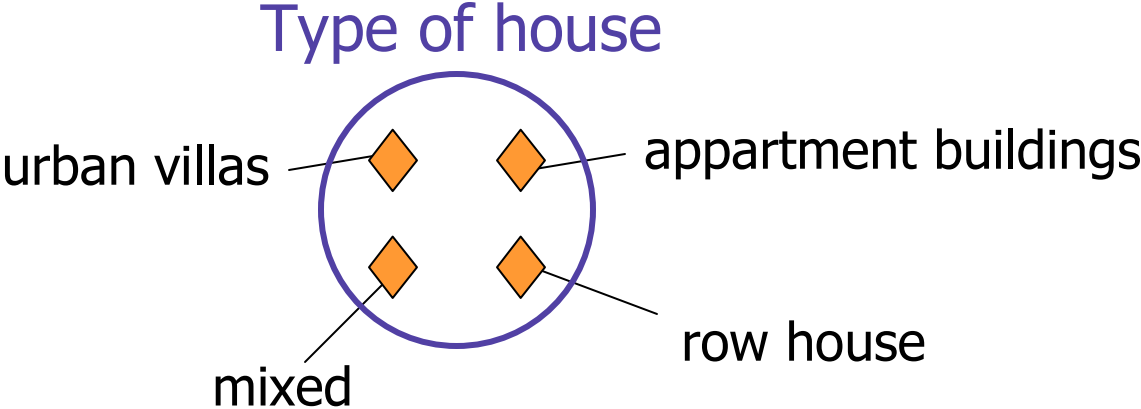
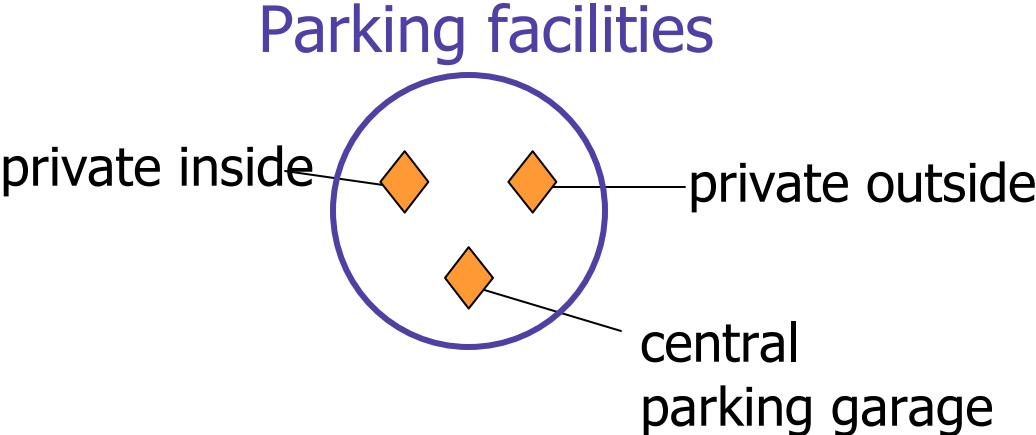
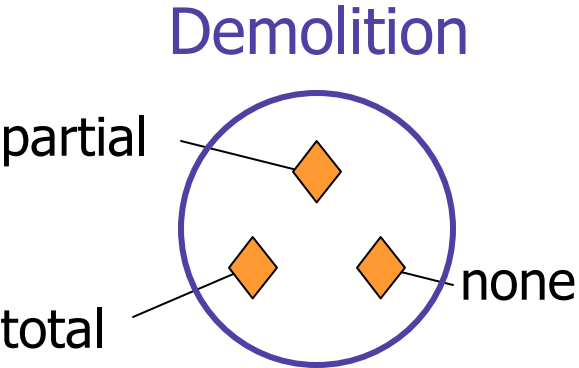
Computer model



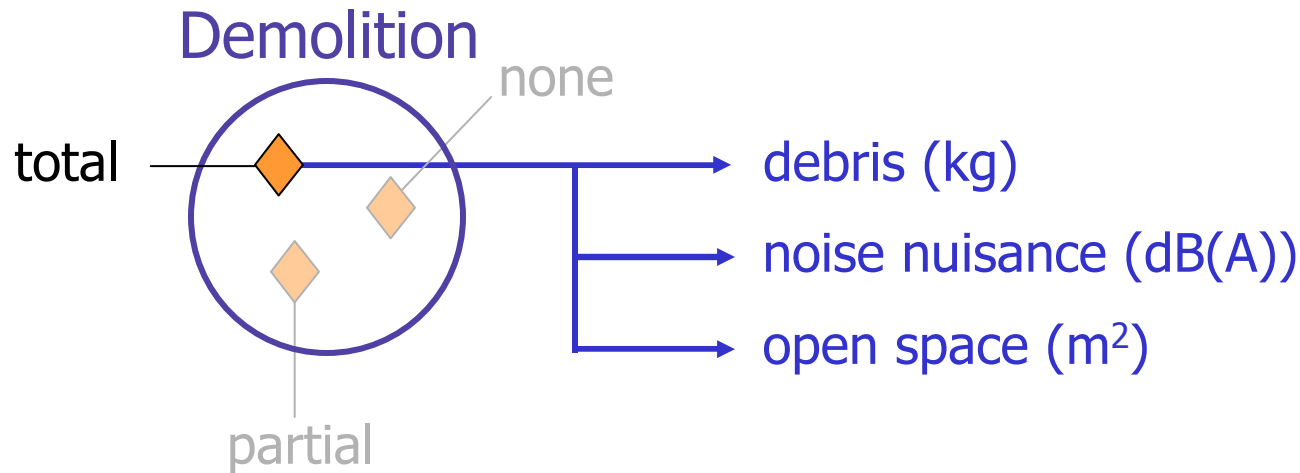
Simulation game

- Actors
- Objectives
- Policy frames & instruments

Decision areas and options



Decision options impact variables



- Number and type of variables can vary per option
- Chosen option has impact on specific variables

Equations define impacts of options on variables

The screenshot shows a software window titled "Decision areas, options and their effects". The window contains a tree view of decision areas and their associated equations. The tree view is organized as follows:

- bedrijvigheid: horeca
- bedrijvigheid: industrie
- bedrijvigheid: kantoren
 - geen
 - grootschalig
 - bouwkosten bedrijven/voorzieningen [€] = $1200 * (\text{ruimtebeslag kantoren})$
 - elektriciteitsvraag bedrijven/voorzieningen [MJ] = $110 * (\text{ruimtebeslag kantoren}) / (\text{meervoudigheidsfactor})$
 - ruimtebeslag kantoren [m²] = $15.5 * (\text{meervoudigheidsfactor}) * (\text{aantal woningen})$
 - warmtevraag bedrijven/voorzieningen [MJ] = $100 * (\text{ruimtebeslag kantoren}) / (\text{meervoudigheidsfactor})$
 - waterverbruik bedrijven/voorzieningen [m³] = $0.75 * (\text{ruimtebeslag kantoren}) / (\text{meervoudigheidsfactor})$
 - kleinschalig
- cultureel erfgoed: archeologie
- cultureel erfgoed: groen
- cultureel erfgoed: monumenten
- cultureel erfgoed: stratenpatroon
- cultureel erfgoed: verkavelingspatroon
- cultureel erfgoed: waterpartijen
- energie: elektriciteitsvoorziening bedrijven/voorzieningen
- energie: leveringsvariant
- energie: productie elektra buiten de wijk
- energie: productie elektra wijk niveau
- energie: productie elektra, locatie
- energie: productie warmte buiten de wijk
- energie: productie warmte wijk niveau
- energie: productie warmte, locatie

Design = chosen options per spatial level

The screenshot shows a software window titled "Designs" with three main panels:

- Designs in case:** A hierarchical tree structure showing spatial levels. The root is "Erwin", followed by "Regio 1", "Stad 1.1", "Wijk 1.1.1", and further sub-levels like "Blok 1.1.1.1", "blok 1.1.1.2", "woning 1.1.1.2.1", "Blok 1.1.1.3", "woning 1.1.1.3.1", "woning 1.1.1.3.2", "wijk 1.1.2", "blok 1.1.2.1", "woning 1.1.2.1.1", "Energiezuinige wijk", "Energiezuinig blok 1", and "Energiezuinige woning".
- Decision options in design:** A list of decision options with checkboxes and diamond icons. The options are:
 - AA grondsoort
 - kleigrond
 - veengrond
 - zandgrond
 - AA wijk berekening basisgegevens
 - berekeningen
 - bedrijvigheid: detailhandel
 - geen
 - grootschalig geconcentreerd
 - kleinschalig, verspreid
 - bedrijvigheid: horeca
 - geen
 - kleinschalig
 - uitgebreid
 - bedrijvigheid: industrie
 - geen
 - lichte industrie (gezoneerd)
 - zware industrie
 - bedrijvigheid: kantoren
 - geen
 - grootschalig
 - kleinschalig
 - cultureel erfgoed: archeologie
 - beperkt archeologisch onderzoek
 - geen archeologisch onderzoek
 - uitgebreid archeologisch onderzoek
 - uitgebreid archeologisch onderzoek &
 - cultureel erfgoed: groen
- Precluded decision areas:** A list of areas that are precluded, each with a red circle icon:
 - bedrijvigheid: detailhandel, soort in wijk
 - energie: productie elektra wijk niveau
 - energie: productie warmte buiten de wijk
 - energie: productie warmte wijk niveau
 - water: beschoeiing
 - energie: productie elektra blok
 - energie: productie warmte blok
 - energie: productie elektra woning
- Problems & Promises:** A list of problems and promises, each with a diamond icon:
 - [ideal] groenstructuur: kwaliteit
 - hoog (ecologisch)
 - groenstructuur: kwantiteit
 - hoge norm
 - [ideal] fysieke infrastructuur: bouwrijp maken
 - niet ophogen / handhaven grondwa
 - groenstructuur: functie
 - ecologische functie
 - [ideal] groenstructuur: functie
 - ecologische functie
 - groenstructuur: oppervlakteverdeling
 - aaneengesloten

MEDIA computes impacts of a design variant

Design impact assessment

objects:

Erwin

- [1x] Regio 1
 - [1x] Stad 1.1
 - [1x] Wijk 1.1.1
 - [10x] Blok 1.1.1.1
 - [15x] woning 1.1.1.1.1
 - [4x] blok 1.1.1.2
 - [150x] woning 1.1.1.2.1
 - [4x] Blok 1.1.1.3
 - [10x] woning 1.1.1.3.1
 - [10x] woning 1.1.1.3.2

	Scenario	Default	Default	Default
Criterion	Unit	Current	Basis	Energie
overig water	m3		6886	4560
drinkwater	m3		9173	2.52E04
water naar in-situ zuivering	m3		2940	2125
toiletwater	m3		5076	0
zwartwater naar RWZI	m3		6036	1.8E04
grijswater naar RWZI	m3		1.33E04	3.84E04
elektriciteitsvraag	MJ		2.429E06	7.672E06
centraal gasverbruik	MJ		6.189E06	

Basisontwerp DEFAULT for Erwin Legend: most desirable ■ ■ least desirable

Underlying computations can be fully traced

Basis: Impacts of Basisontwerp

- ✓ ▶ aantal verdiepingen [#] = 4
- ✓ ▶ aantal verplaatsingen auto [#] = 2.209
 - + [1x Regio 1] AA berekeningen: berekeningen = 2.209
 - + = 2.12
 - + / ▶ aantal verplaatsingen auto blok [#] = 0.476
 - + / ▶ aantal blokken [#] = 14
 - + / ▶ aantal verplaatsingen auto wijk [#] = 0.05593
 - + / ▶ aantal wijken [#] = 1
- ✓ ▶ aantal verplaatsingen auto blok [#] = 0.476
- ✓ ▶ aantal verplaatsingen auto wijk [#] = 0.05593
- ✓ ▶ aantal verplaatsingen bus [#] = 0.5527
- ✓ ▶ aantal verplaatsingen bus blok [#] = 0.0896

▶ [Regio 1] aantal verplaatsingen auto wijk [#] = 0.05593

- + [1x Wijk 1.1.1] voorzieningen: locatie winkels; dagelijkse boodschappen: maximaal 1 km = -0.023
- + [1x Wijk 1.1.1] voorzieningen: locatie winkels; non-food: maximaal 5 km = 0.0079
- + [1x Wijk 1.1.1] voorzieningen: locatie winkels; wekelijkse boodschappen: maximaal 5 km = -0.0071
- + [1x Wijk 1.1.1] mobiliteit: bereikbaarheid dagelijkse boodschappen: goed bereikbaar = 0.013
- + [1x Wijk 1.1.1] mobiliteit: bereikbaarheid wekelijkse boodschappen: goed bereikbaar = 0.014
- + [1x Wijk 1.1.1] mobiliteit: bereikbaarheid winkels (non-food): goed bereikbaar = 0.026
- + [1x Wijk 1.1.1] mobiliteit: o.v. locatie: halte > 300 m = -0.014
- + [1x Wijk 1.1.1] mobiliteit: o.v. structuur: alleen stadsbus = 0.05
- + [1x Wijk 1.1.1] AA wijk berekening basisgegevens: berekeningen = -0.01087

10 error(s) | 27 warning(s) | node 42 | Scenario: DEFAULT for Erwin

Functions of the DuBes gaming simulation

- Validate: *Does the model work?*
- Convince: *The model works!*
- Train: *How to work with the model?*
- Research: *Why does the model work?*

Combination model + game

- Makes complexity transparent and manageable
- Decision process as point of entry
- May be used early in the process
- Allows integrated impact assessment
- May be used in interactive setting
- Tension creativity ↔ structure
- User ↔ model interface needs improvement

French experiences: ComMod

- Sharing representations of actors (including the researchers)
- Gradual modification and validation of a hybrid representation: the “model”
- Render this model dynamic: “simulations”
- Gradual modification and validation of this simulation model
- Continuous switching between knowledge improvement and the decision process

Principles

- Recognize and visualize all the different view points on the situation that is being investigated
- Work towards representations that are more shared, to improve the mutual knowledge of the actors (including the researchers)
- Learn collectively while creating, modifying or observing simulations based on these representations
- The simulations have an impact on the decision process:
 - by creating/modifying representations
 - by integrating the time dimension in the representations
 - by articulating several levels and scales in the representations

Tools

- Agent-Based Systems: the preferred formalization tool (the *Cormas* modeling platform)
- Role Playing Games: the preferred form of communicating with the actors
- Other tools are used: maps, GIS, scale models, comic strips, ...

Example: Tadla case

(Kuper et al. in Ecology & Society, 2009)

Participation to a session of RPG with other leaders



Technical workshop and individual farm projects



Finalising the feasibility study with members



Purchase of a plot of land to install the basin



2005

Jan. 2006

Sept. 2006

Jan. 2007

July 2007

Nov. 2007

March 2008

May 2008



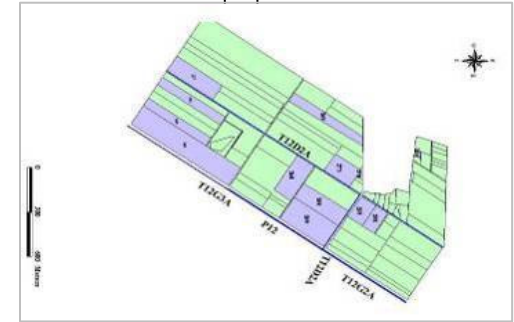
The milk cooperative leader visits farms using drip irrigation



Involvement of fellow farmers and visits to farms using drip irrigation



Second series of visits and joining of new members



Technical study (consultancy firm), and creation of a management structure

Learn more?

- papers & reports on DuBes
 - <http://www.envplan.com/abstract.cgi?id=b31149>
 - http://www.delftcluster.nl/website/files/files_org/AIO/Collaborative_decisionmaking_for_sustainable_urbanetc..pdf
 - <http://www.iospress.nl/loadtop/load.php?isbn=9789040725951>
- the MEDIA modeling software
 - <http://media.actoranalysis.com/>
- www.commod.org
- www.ecologyandsociety.org (see the special feature on participatory methods in water management)
- contact me at p.w.g.bots@tudelft.nl