NORDISK ARKITEKTURFORSKNING
NORDIC JOURNAL OF ARCHITECTURAL RESEARCH

3

ISSUE 3 2016

NORDISK ARKITEKTURFORSKNING
Nordic Journal of Architectural Research

3–2016

THEME ISSUE: GOVERNANCE

Nordic Journal of Architectural Research
ISSN: 1893–5281

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Published by SINTEF Academic Press
P O Box 124 Blindern, NO-0314 Oslo, Norway.

CONTENTS

Photo on the front cover: Scott Maco

NORDISK ARKITEKTURFORSKNING
NORDIC JOURNAL OF ARCHITECTURAL RESEARCH

IDENTIFICATION OF SPACE FOR URBAN AGRICULTURE THROUGH TRANSFORMATIVE GOVERNANCE

ROB ROGGEMA

Abstract

Current food production takes place in cities only marginally. For several good reasons (environmental, social) food should be produced closer to where it is consumed, i.e. closer to urban areas. Here, it interferes with urbanism. However, urban planning often limits the growth of urban food production. Therefore, traditional urbanism approaches can be criticized and new ways needs to be explored. Insights in recent planning discourse, which gets dominated by co-creation processes, in transitions and in participative planning gives reason to amend planning processes, especially in times when ecology-based and organic urbanism (Slow Urbanism) and impacts of disasters in urban planning (Suddenism) become apparent. The design charrette is seen as the major tool to accommodate future urbanism, which is better able to provide a pathway for participative input in planning processes. The role and outcomes of three case studies, which applied a Research by Design methodology in a design charrette are tested. The case studies are INCREASE-Groningen (NL), Minamisoma-Japan, and AESOP-NL, which can be characterised by a focus on sustainability (food and energy), planning on different spatial scales, the use of a design approach and the design charrette as part of the planning process.

The outcomes of the case studies are a spatial representation of a future vision. Four criteria are used to measure the quality of the process and the outcomes: the quality of the design, the importance of the growth of food, the quality of the planning process and the overall sustainability of the final result.

Keywords:
urban agriculture, design charette, research by design, participative planning, transformation, food system

Introduction

Many current models of city planning are dealing with change by formulating a desired goal, and reaching this goal in the form of a transition process (see for instance Rotmans, et al., 2000; Gemeente Almere, 2009; Gemeente Amsterdam, 2011; Gemeente Arnhem, 2013; Gemeente Rotterdam; 2011; Gemeente Wageningen, 2013). The transition process is generally gradual, often leading to an improved version of the current city, however still embedded in existing regulations, decision-making habits and top down governance. The achieved change in land-use realised in four consecutive regional plans for the province of Groningen in the Netherlands is an estimated 2% over a period of 15 years (Roggema, 2012).

Three fundamental different urban planning paradigms can be used when cities are planned (Roggema, 2015a) – Fast Urbanism, Slow Urbanism and Suddenism (see Table 1):

- *Fast Urbanism*: When economic drivers claim space on short notice and determine uses, densities and spaces in cities.
- *Slow Urbanism*: When developments such as the growth of food, ecology, nature and cultural heritage call for slow development, lower densities and require more space in the city.
- *Suddenism*: When dealing with sudden changes, such as floods, hurricanes or bushfires.

Table 1
Three Urbanisms (Roggema, 2015a)

Urbanism	Fast	Slow	Sudden
Design strategy	Probabilistic	Possible	Imaginable
Design approach	Engineering	Design	Adaptive design
Urban change	Rapid growth	Shrinkage	Climate disasters
Problems	Housing Economic areas Water traffic Road traffic	Ecology Food Water for nature Culture	Flood Fire Earthquake Tsunami
Resilience strategy	Resist	Respond	Anticipate
Type of Action	Calculation	Creation	Intuition

The latter two types reserve spaces for slow development or suddenly required spaces. The first model is the most commonly used model for urban planning and development. This regular urban planning model is not well equipped to deal with slow or sudden changes. This can be illustrated by the difficult introduction of urban agriculture in Toronto (Wekerle, 2004; Baker, 2004) or in Rotterdam (Bünger, 2014; City of Rotterdam, 2012), the devastating effects of hurricane Sandy in New York (Abrahamson and Redlener, 2013), or Yasi in Queensland (Beeden, et al., 2015) or the flash-flooding effect in Melbourne (Kundzewicz, et al., 2014).

Urban environments that have been developed according to Fast Urbanism principles, such as malls, urban expansions, office environments, CBD's, etc., are not as highly valued as urban spaces with trees, water and green areas (Sheets and Manzer, 1991; Van den Berg, 1999; Wassenberg, 1994; Reneman et al, 1999), nor are they prepared for the impacts of disasters (as Katrina, Yasi and Sandy have shown).For both reasons there is a quest for more resilient urban environments (Vale and Campanella, 2005; Colucci, 2012; Desouza and Flanery, 2013). In this regular planning model, public involvement is seen as a constraint (Newman, et al., 2004; Al-Kodmany, 1999; King, Feltey and Susel, 1998), because some of the changes are often not desired by the public (Crommentuijn, et al., 2007), for instance when urban expansion occupies nature and landscape, or new offices or malls replace historic urban precincts. The public is much more engaged in development of local food production (Thrupp, 2000), but also in discussing the risks of climate impacts in their direct environment (Pidgeon and Fischhoff, 2011), as these concern their safety and/or are developments the public initiates themselves. The local spatial impact of the changes under the Slow Urbanism and Suddenism model require understanding and knowledge of the direct environment of citizens, hence an active role for the public (Dogrusoy and Dalgakiran, 2011). More space for green, food or culture generally costs money in the short term and the chance of a disaster is seen as too small to invest in expensive urban land, just a reserve area for something that has a low perceived probability. However, Parry, et al. (2009) calculated that the costs of preparing for climate impacts are much lower than the cost of recovery and rebuilding afterwards. In order to accommodate slow or sudden urban change through participative urban planning a transformative governance model is needed (Roggema, Vermeend and Van den Dobbelsteen, 2012). The transformation of urban environments to become more adaptive to slow and sudden land use changes also implies a different role for the public.

There are several reasons to increase the amount of food growing in urban environments. Urban Agriculture is defined as:

> *[...] an industry located within (intra-urban) or on the fringe (peri-urban) of a town, an urban center, a city or metropolis, which grows or raises, processes and distributes a diversity of food and non-food products, reusing mainly human and material resources, products and services found in and around that urban area, and in turn supplying human and material resources, products and services largely to that urban area* (Mougeot, 1999).

The urban environment stretches to the city region (Roggema and Spangenberg, 2015), as this is the spatial scale at which produce and consumption of food can be directly linked and cycles of energy, water and material flows can be closed (Van Timmeren, et al., 2012; Petcou and

Petrescu, 2011). Further food security gives reason to grow local food, e.g. the availability of food (FAO, WFP and IFAD, 2013), and also food safety, e.g. to know what is produced and how (Satin, 2008). There are also societal reasons of community building (Veen, 2015), and environmental reasons (Barrell, 2010; Keeffe, 2012). Overall, an increasing amount of food produced at the city-region scale adds to the overall sustainability of the city. Apart from the food issue, sustainability in cities can be increased when urban water management is adjusted, renewable energy is generated, social cohesion is improved, materials and resources are reused and recycled and less waste is produced (Newman, 1999; Roggema, 2014).

Currently the space for producing food within urban boundaries is approximately delivering 0.002% of the food consumed (Roggema, 2015b). Even for the Netherlands, which is one of the main export countries of food products (Gowling, 2014), the Sankey diagram (Hajer and Dassen, 2014) shows that many products are currently imported. Therefore, in order to give urban food production a substantial role in urban development, new urban planning models are necessary.

This paper suggests that working towards a new planning model requires elaborations in three fields of research:

(1) A form of participative planning (Oude Vrielink, Verhoevenen and Van de Wijdeven, 2013; Tonkes and de Vilde, 2013; Van Berlo, 2012; Van de Wijdeven, de Graaf and Hendriks, 2013; Oude Vrielink and Van de Wijdeven, 2011) allowing stakeholders to genuinely co-create spatial plans.

(2) A manner of spatial planning which is less regulatory and more anarchistic (Davy, 2008; Newman, 2011; Miraftab, 2006; Miraftab and Wills, 2005; Boelens, 2010), giving citizens the opportunity to influence the spatial future of their city.

(3) Transition/transformation thinking (Rotmans, et al., 2000; Geels and Kemp, 2006; Geels, 2002; 2005; 2011; Kemp, Rit and Schot, 2001; Ainsworth-Land, 1986; Roggema, Vermeend and Van den Dobbelsteen, 2012), which is needed to change urban planning hence the urban layout.

In this paper, theories within these three fields are brought together within the context of transformational governance. In the second section, these theories will be briefly introduced. In section three the research question and methodology are presented, before, in the fourth section, the case studies are introduced and, in section five, the results of the research are presented. Section six discusses the results after which section seven finishes with the conclusions.

Theoretical background

The recent attention for Urban Agriculture is mainly ignited through groups of citizens who create their own productive garden (see Roggema and Keeffe, 2014a; 2014b; Viljoen, 2005; Viljoen and Bohn, 2014; Phillips, 2013; Gorgelewski, Komisar and Nasr, 2011). In this paper, the scale of Urban Agriculture therefore contains both the city itself as the city region food system, a regional landscape across which flows of people, goods and ecosystem services are managed (FAO and RUAF, 2015). It is rather difficult to find and/or create space for Urban Agriculture in current planning practices. Many municipalities, both in Europe as well as in North America and Australia, currently develop their food strategies or food visions, but the majority of these visions lack a spatial planning perspective (Gemeente Ede, 2014, Gemeente Groningen, 2012; Toronto Public Health, 2010; City of Vancouver, 2013; Gemeente Rotterdam, 2012; City of Melbourne, 2012; Gemeente Amsterdam, 2014). In many urban areas this results in fragmented food production, spatially dispersed and isolated in small neighbourhood projects. In this paper, we build on theories of participatory planning, planning theory and transformation thinking to build the case for new city concepts enhancing urban food production.

1. Participatory planning allows stakeholders to genuinely co-create spatial plans

The recent increase of planning initiatives by citizens is noteworthy. The type and number of projects started by residents with or without governmental involvement is rapidly growing (Oude Vrielink, Verhoeven and Van de Wijdeven, 2013; Tonkes and de Vilde, 2013; Van Berlo, 2012; Van de Wijdeven, de Graaf and Hendriks, 2013; Oude Vrielink and Van de Wijdeven, 2011; Chaskin, 2001; Irvin and Stansbury, 2004; Fung, 2015; MACI, undated; Begum, 2003; Putnam, 1993; Skidmore and Craig, 2004). For instance, the role of the public and residents in Urban Agriculture is an important driving force (Barrs, undated; Goldstein, 2011; Dale, Dushenko and Robinson, 2012; Institute for Sustainable Communities, 2013; Veen and Mul, 2011; Gemeente Rotterdam, 2012; Vissers, 2013).

Traditional planning methods often do not satisfy when residents have the ambition to co-create the plan. There is a misfit of the planning process and the role citizens want to play. From this perspective planning is malfunctioning (Gerard, 2011) and novel methods, in which people are placed in the position to contribute and create the plan together with "experts", could be explored.

Participatory planning is embedded in a broad range of literature and applications. One of the core works, *The deliberative practitioner*, discusses the different approaches to planning, advocating a participatory process (Forester, 1999). "Participatory planning is an urban planning paradigm that emphasizes involving the entire community in the strategic and management processes of urban planning; or, community-level

planning processes, urban or rural" (Lefevre, et al., 2000). Participatory planning aims to harmonize views among all of its participants as well as prevent conflict between opposing parties. In addition, marginalized groups have an opportunity to participate in the planning process (McTague and Jakubowski, 2013). In practice, one of the successful ways to apply participatory planning is the design charrette, in which stakeholders can be engaged in a concrete way (Roggema, 2013, Roggema, Martin and Vos, 2014; Roggema, Vos and Martin, 2014). The design charrette is a tool to give stakeholders and participants a role in co-creating and enforcing innovative and transformative plans.The NCI defines the charrette as: "a collaborative design and planning workshop that occurs over four to seven consecutive days, is held on-site and includes all affected stakeholders at critical decision-making points" (Lennertz and Lutzenhiser, 2006). Building on this, Condon formulates it as: "a time-limited, multiparty design event organized to generate a collaborative produced plan for a sustainable community" (Condon, 2008).

Participatory planning can also be positioned in governance theories. An interesting theory of governance distinguishes three philosophies: Optimist, Realist and Pessimist (Bovens and Hart, 1996). When there is a driver for transforming the city and citizens are involved in co-designing new urban concepts, the optimistic philosophy is the most applicable. In this philosophy, instrumental efforts are taken to solve societal problems, and barriers are removed by optimising the actors and governance process (Biesbroek, 2014). Of three analytical lenses (Bovens and Hart, 1996; Biesbroek, 2013), governance as problem solver belongs to the optimistic philosophy, while others are seen as realistic as competing values and interests, and as institutional interaction or pessimistic as dealing with structural constraints. The interventions taken in a design charrette process (see Lennertz and Lutzenhiser, 2006; Condon, 2008; Roggema, 2013; Roggema, Martin and Horne, 2011) is in line with the optimistic philosophy, e.g. problem solving governance. It is a condensed form of creative design workshop in which a mixed group of participants work on design solutions for a complex or wicked design problem. It is oriented on integrated design, stakeholder driven; it is open for novel land use and emphasizes flexibility in plans (see Table 2).

2. Spatial planning becomes less regulatory and more anarchistic

The position of Urban Agriculture in urban design is naturally part of the spatial planning discourse. In spatial planning theory, new perspectives have recently been launched in which planning moves away from its traditional base: the government as regulatory planning body, allowing influence of residents when it suits the government, towards a sort of planning, which takes risks, disposes tightening regulations, allows insurgence and appreciates more influence and a bigger role of citizens. Examples of this emergent transformation in the planning discourse

are planning without pressing constraints (Davy, 2008), post-anarchistic planning (Newman, 2011), insurgent planning (Miraftab, 2006; Miraftab and Wills, 2005) and the Actor Relational Approach (Boelens, 2010). Spatial planning adapts to new demands in society. When planning fails to keep up with the pace of change in the society, other phenomena such as guerrilla gardening (Reynolds, 2008) emerge. Planning is adjusting its theories, and practices, to create a role for the citizen as a planner, without the traditional habits of traditional planning approaches. Theorising about the ways to plan for emergent new developments includes the debate about loosening tight regulations or a less directive government. Planning needs to enhance flexibility in its regulatory frameworks, such as the Dutch Spatial Planning Framework (Overheid.nl, 2015)), accommodating the possibility for more dynamic land-uses, which could meet the needs of society.

3. Transformation thinking is needed to change urban planning

In order to establish change in urban land-use, and to develop and realise new city concepts, the existing city needs to be transformed, based on a planning approach that allows for thinking and designing these concepts. Transforming the city implies then also transforming the planning process. Transition theory (Geels and Kemp, 2006; Geels, 2002; 2005; 2011; Kemp, Rit and Schot, 2001; Rotmans, et al., 2000) and transformation scholarship (Ainsworth-Land, 1986; Roggema, Vermeend and Van den Dobbelsteen, 2012) both offer insights in how change in urban environments can be established. Transition describes the change of the current (urban) system to a desired new state of the same system. Theoretically, transitions are seen as a reformulation of the existing system (De Roo, 2008). Transformation theory describes the process in which the current system is replaced by a new system. The new system takes over the old system. Examples of transformations are the changeover from the agricultural society to the industrial, and nowadays the transformation from the industrial era towards the network-society can be experienced (Toffler and Toffler, 2006). According to Geels (2011), niche developments and innovations need to influence the current regime, e.g. the current spatial planning practice, and change it towards a way of designing urban plans that could offer the flexibility possibly to include more space for land uses that are related to Slow Urbanism and Suddenism. When the urban fabric has to change fundamentally, this will lead to fundamental new city concepts (Roggema, 2015a) and hence a transformational pathway is more suitable. Transformational pathways do not change the existing city in gradual, subsequent steps, but start from a different starting point (Roggema, Vermeend and Van den Dobbelsteen, 2012). Rather than taking the existing urban fabric as the starting point for change and gradually adjust that, transformational thinking starts from a new urban design and then defines the required adjustments of the built environment.

Table 2
Comparison of traditional planning process and the design charrette process

	Traditional planning	Design charrette
Orientation	Procedural	Design oriented
Leading actor	Governmental driven	Stakeholder driven
Perspective on land-use	Fix the existing use	Develop new land use
Output	Land use plan	Integrated design
Program	Programmed	Open for novel uses
Type of plan	Fixed plan	Flexible plan

Problem definition and methodology

"If you do what you did, then you get what you had". A fundamentally different planning approach is needed to get principally different results. In Dutch regular spatial planning, processes of growing food is underrated or absent (see recent structure visions adopted by municipalities in the Netherlands: Gemeente Almere, 2009; Gemeente Amsterdam, 2011; Gemeente Rotterdam, 2011; Gemeente Arnhem, 2013; Gemeente Wageningen, 2013). With limited spaces made available in these visions for food production it will be hard to produce substantial amounts of food within city boundaries. The city must transform dramatically if we would like to produce more than the current 0.002% of the needed food for urban consumption (Roggema, 2015b). This leads to the following research question: What are the potentials and constraints of using design charrette as a planning approach to identify space for urban agriculture?

Methodology

The methodology used for the research presented in this paper is Action Research (AR) (Whyte, 1991; Brydon-Miller, Greenwood and Maguire, 2003; Susman and Evered, 1978; Stringer, 2013) in combination with Research by Design (RbB) (de Jong and Van der Voordt, 2005; Lenzholzer, Duchhart and Koh, 2007; Kelly, 2003; Zimmerman, Forlizzi and Evenson, 2007; Järvinen, 2007). Action research is a very good way to experience participative processes and understand participants' behaviour and actions during the planning process. Research by Design is very useful, because the subject of using new urban planning models (e.g. Slow Urbanism and Suddenism) requires an exploratory method, in which several design options can be explored without being tunnelled to one solution for an area. The Research by Design method allows the planning process to be very open for participation, as all participants, even if they are not professional designers, can design and fully participate in identifying spatial solutions, by drawing and visualising their ideas.

The design of the research process consisted of the following steps:

1. A review of literature on the three fields of theory (planning theory, the theory of participatory planning and transformation theory).
2. Definition of the problem and hypothesis.
3. Choice of methods for the research, i.e. Action Research, to participate in the case studies, and Research by Design, to allow the emergence of different design options.
4. Identification of the case studies and selection on the basis of several considerations:
   - The case studies needed to accept the use of the design charrette, or similar tools, as a form of participatory planning.
   - It should be possible to test the new planning models at different local scales, e.g. urban, sub-regional and at the city-region level, all being urbanised areas.
   - The case studies needed to lend themselves for Action Research.
   - They needed to have a clear design-oriented question, where the Research by Design methodology could be applied.
5. The selection process took place as follows:
   - The first choice was to include the regional plan Groningen, in which both Research by Design- and Action Research-methodologies have been applied. This case study originally focused on energy, but during the Research by Design process, food became an equally important topic.
   - Secondly, the Minamisoma planning process was chosen, because the methodologies have also been applied here. The focus in this planning process was originally on the recovery from the tsunami and nuclear disaster of Fukushima, but in the design process it very quickly became clear that the food topic was also a dominant factor, as the potential for local farmers to earn money and cultivate crops was dependent on the safety of the water and the soil.
   - The third case study, the four AESOP-LABs, were deliberately chosen as an Action Research and Research by Design task with the focus on the potentials for food production in the urban environment.
6. The composition of the three case studies gave us the possibility to include different spatial scales, made it possible to discuss the design outcomes for food supply, discuss the success of the Research by Design and Action Research methodology, and gave insights in the potential of using the design charrette as a tool for participatory spatial planning, hence applying alternative urban planning models, such as Slow Urbanism and Suddenism.
7. Evaluation of the results of the case study design processes in an iterative and cyclic process during and after each of the design charrettes took place on the basis of four criteria: design quality, the area for food, sustainability, quality of the process. These criteria were chosen because in this way the estimated transformation both in the process as well as in the planning could be tested. Other aspects such as eco-

nomics, human behaviour or human wellbeing have been excluded, as these aspects were not tested in the design processes of the case studies.

- Design quality is measured by the spatial configuration of land-uses. The scale, structure and size of spatial components are elements of the design quality. Moreover, the way the design builds on the natural environment, such as the water system, the soil, ecology and topography, forming the basis for a sustainable future was taken into account.
- Food inclusion discusses the size (area), and type of food system that is proposed in the designs. The estimated number of people fed by the local production as percentage of the total population is also taken into account.
- Process quality is judged on the basis of the program carried out during the design charrettes, the spread in background of the participants, the role of citizens and evaluations taken after finishing the design processes.
- Sustainability takes into account the inclusion of other issues than just food, such as the way the water management is organised, if and how renewable energy sources have been applied, if mobility is efficient and supporting sustainable alternatives (electric transport, virtual transportation) and if social inclusion and participation is improved.

8. Comparison and discussion of results; compare on the criteria, but also on the used methodologies and the potential to use the approach for alternative urban planning models (Slow Urbanism, Suddenism).
9. Conclusions.

Case studies

For this research, three case studies were selected (Table 3). As mentioned above, the selection process took place on the basis of the ambitions of identifying case studies involving both relevant content and applied planning processes. The case studies needed to contain a design question about how to spatially design the growth of food, whilst integrating other topics in the design, such as forms of land use linked to Slow Urbanism (water, nature, culture) or Suddenism (e.g. impact of climate disasters).

In the first case study, Groningen Fast Forward, a group of international experts and stakeholders came together in China in a design charrette of 2x3 days. The initial objective was to design a zero-fossil region, i.e. a region in which equal amounts of renewable energy are supplied to the area as are used by the area, and the carbon emission in the area is zero. In this plan, the energy use of the food sector, the water sector and mobility needed to be integrated in a design for the city region of Groningen, the Netherlands. Moreover, the plan needed to create spatial

reservations for sudden climate impacts, in this case space for flooding. This assignment needed to lead to an integrated spatial long-term vision. (Roggema and Boneschansker, 2010).

The second case study is located in Minamisoma, near Fukushima where the "Rethink, Reborn, Return" project brought together local stakeholders and experts, academics and designers from Japan, Australia and the Netherlands, and local residents to develop a spatial vision in a five-day design charrette. The design question included the re-establishment of food production in the radioactively contaminated area, to create spatial reservations for the coastal protection and potential floods, and to establish the renewable energy supply for the tsunami-hit area of Minamisoma prefecture at the sub-regional scale (Roggema, 2015c).

The third case study consisted of four locations in the Netherlands, which were taken as the subject in design LABs during the 6th AESOP conference[1] in which international experts, stakeholders, entrepreneurs and residents took part in four design sessions each. Their design task was to create a substantial amount of space for food production, but the task included also a renewable energy supply for the location, and a design for urban water management in which space was reserved for flash flooding (Roggema and Keeffe, 2014b).

1 AESOP is the European association of spatial planners, in which different working groups are active. One of these working groups has adopted the food theme and organises a conference on "Sustainable Food Planning" every year. The 6th version of this conference series was held in november 2014 in Leeuwarden, the Netherlands.

Table 3
Case studies

	Groningen Fast Forward	Rethink, Reborn Return	AESOP-design labs
Objective	Design zero-fossil region	Design after disaster plan	Design food space in urban environments
Content	Energy, food, water, ecology, flooding	Food, culture, energy, ecology, water, coastal protection, flooding, leisure, social cohesion and economic aspects (jobs)	Food, mobility, education, flash flooding, entrepreneurship, social cohesion
Scale	Regional	Sub-regional	Urban
Process	2x3 days design charrette	5 days design charrette	4x2 hours design LABs
Involved	International academics and policymakers	International academics, designers, local leaders, high school children, residents	International academics, policymakers, entrepreneurs, students

Results

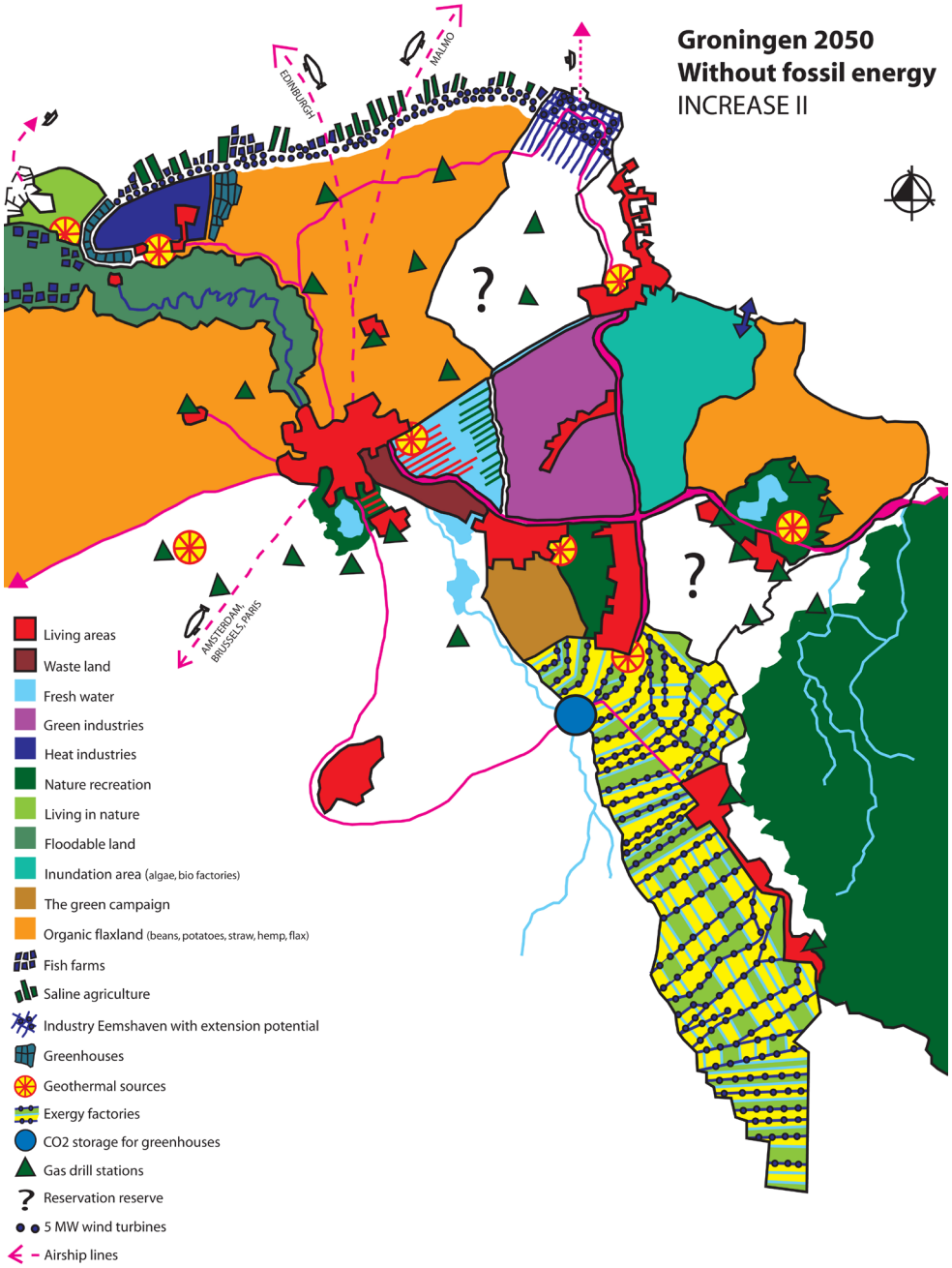
In this section, the case study areas will be briefly described and the achieved results will be discussed.

Groningen Fast Forward

This area is currently in use for small towns and settlements, and agricultural crops such as wheat, beet, potato, canola and chicory.

The regional plan developed in the Groningen Fast Forward project (Figure 1) consists of areas reserved for a combination of water storage, energy generation and food supply. Around 90% of the plan is in use for this mix of land use, with food as the main occupant of space. The food produced in the plan is mainly used to provide food for the local inhabitants, different from the existing situation in which most of the crops are used in industries and are processed and exported.

Figure 1
Plan resulting from the Groningen Fast Forward design charrette.



In the design charrette process, the interaction between different skills, competences and backgrounds created an open learning environment, in which the participants could develop their ideas in interaction with each other. In this design charrette, the participants were divided into two groups, each with a separate task – one focusing on the design and the other on calculations. During the process, the groups continuously exchanged information. Therefore, rough design ideas and concepts could be tested on their numeric consequences, such as how much renewable energy could be generated and how many households could be provided for. The results of these calculations could then be instantly brought back into the design team, which used these outcomes to come up with new and adjusted designs. This mutual interactive relationship between the two groups caused a strong commitment of every participant to the success of the design charrette and proved the method successful in generating grounded design concepts in a short time, supported by all.

In this design process both Action Research and Research by Design methodologies were applied. The researchers became part of the design team during the process, allowing them to understand first hand what the considerations, activities and doubts amongst the participants were. From this, the researchers learnt the priorities put forward in the plan, but also where the main concerns were, such as the way to make the idealistic ambition of the design task realistic. Therefore, they introduced additional tasks in the field of energy demand and supply calculations and development of a suitable governance model. During the process several models, sketches, proposals and ideas were launched and researched on their merits to contribute to the overall aim of the project, namely to become free of fossil resources in 2050. All these design propositions proved their benefit for the project, as elements of each proposition could be used to create the overall design proposal. This way, the Research by Design approach benefitted both the content of the final design and it stimulated the exchange of ideas and the conversation during the planning process.

The quality of this design lies in the gentle ordering of different, combined land-uses, such as food production, energy harvesting and water infrastructure in the landscape where these aspects fit in with the historic lines of infrastructure (roads, and canals), natural streams and the elevation. The different components of the plan could operate by themselves, but they also require connections with neighbouring areas, because this makes it possible to exchange temporary shortages and surpluses of energy, resources, and water. The components are linked together through long lines of roads and urban developments. In the plan, two large areas are marked as reservations for flooding. These spaces can be used for future developments, but also for temporary use in case a flood hits the landscape.

The amount of space for food in the plan is large. The existing land-use in the area is mostly growing crops (potatoes, wheat and beet), which are mainly processed in industries. In the design, the production of food is adjusted to provide the crops and products required by the population in the area. A large greenhouse zone in the south offers the opportunity to grow large amounts of food, in a high-tech way. The total amount exceeds the food demand of the local population (Roggema and Boneschansker, 2010).

The sustainability of the plan is high. Besides creating the space for food, which can feed the entire region, there is also sufficient energy generated to supply the people in the area. Rainwater in the area is retained where possible and used for food production or in nature. The ecological qualities in the region are increased with the large nature reserve in the east, the nature along the river in the North and the wetlands in the centre area as main examples.

Rethink, Reborn, Return

The Minamisoma prefecture is located between 20–30 kilometres north of Fukushima. The landscape is characterised by agriculture (mainly ricefields but also vegetables in smaller amounts, and hills to its western side). The area was hit by a double disaster in March 2011. The tsunami flooded parts of the area and a nuclear plume dropped in the area as result of the accident in the Fukushima nuclear power plant. The design explorations in the project "Rethink, Reborn, Return" (Figure 2) delivered a plan, which included substantial areas for growing food, especially along the existing rivers (Roggema, 2015c). These areas will consecutively be reused as soon as an area is declared clean from nuclear contamination. This process increases the space for food production step-by-step. The other main change in land-use is the plan to create an extensive coastal zone to protect the hinterland. This area is located between the planned seawall and the inland line to where the tsunami intruded. In this area seawater is not rejected, but accepted and used to feed algae fields. The algae, in turn, clean the water and are used in CHP's (Combined Heat and Power Installations) to produce heat and electricity. The plan provides enough food to feed the entire population of Minamisoma prefecture. The energy generated through the algae projects could, together with several additional solar power projects, provide enough energy for the regional demand.

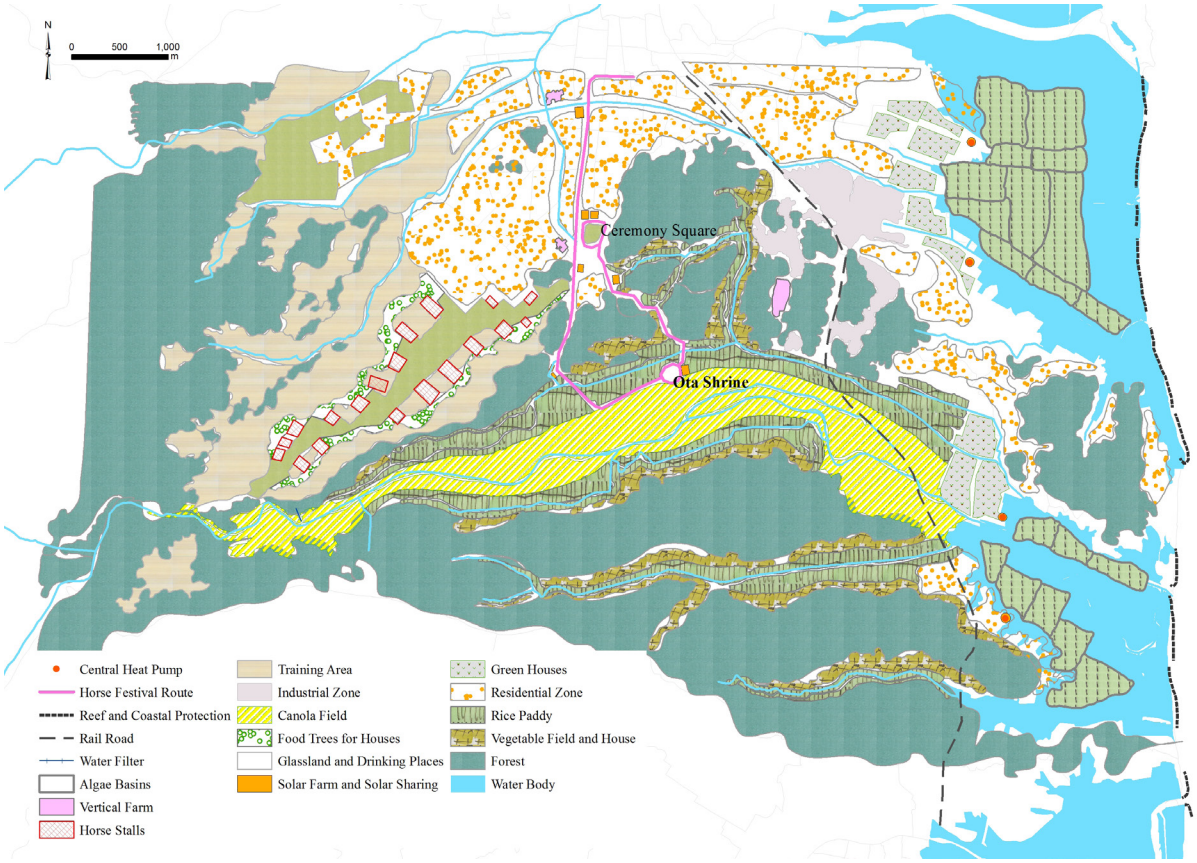


Figure 2
Plan for the Minamisoma prefecture.

In this design charrette, a strong interaction between experts, academics and the local population provided a fertile basis for innovative design proposals. The approach of working in several groups with a continuous interaction through intermediate presentations, the diversity in analytical and creative tasks and the involvement of everyone in very tactile tasks, such as drawing, sketching and model building, led to binding amongst the entire group, commitment and creative contributions of all participants hence caused a large involvement of all participating. The fact the experts came from Japan, the Netherlands and Australia increased an atmosphere in which transformative designs could be developed. In this case study, Action Research and Research by Design have both been very functional. The researchers were part of the entire process and could observe the involvement and contributions of the participants. They led the different design sessions and group work. The participants, students of the local agricultural high school and local leaders showed great involvement and brought interesting and creative new ideas to the table.

The quality of the design encapsulates the features of the natural system in the coastal landscape. The coastal zone adheres to the principles of building with nature (Waterman, 2007; 2008; 2010; Waterman, Misdorp and Mol, 1998; de Vriend and Van Koningsveld, 2012), allowing the powers of nature and the sea to shape the coastal zone. The land-forming power

of the rivers, creating the typical elevation alongside them, is used as the basis for the food planning, with rice paddies near the stream, crops of vegetables upon the slopes and eatable forests on the hill. The purifying quality of the little streams is used to clean the riverbeds from the radioactive contamination, the side and upper streams first, and the main river as the last one. The sub-regional scale of the plan makes it possible to exchange land-use over time, as circumstances demand change. The structure of the design follows the landscape patterns and heritage lines, such as the old ceremonial route for horses.

The amount of food-space in the plan is approximately 40 % and most of this space is concentrated alongside the streams and in greenhouses, which profit from the CHP installations using the waste material of the algae (Roggema, 2015c). The calculations show that these components are capable of producing enough food for the entire prefecture. The proposed plan for Minamisoma prefecture pays attention to different aspects of sustainability. The ecological qualities are strengthened and the water system is adjusted to retain the water in the system to do its purifying task. Besides the interventions to establish a strong food system, energy is generated using renewables. The algae provide the resource for electricity and heat production (Keeffe, 2009), solar sharing is used as mean to produce solar power in a layer above regular crops (Movellan, 2103; Richardson, 2015) and one solar tower (Grose, 2014; Brightsource, 2015; Mesanovic and Philippsen, 1996) is proposed in the city centre. The re-introduction of food spaces, the horse keeping area, and the algae basins and greenhouses require a workforce that is trained in horticulture and agriculture. The people that originally lived in the area and left because of the disaster are given a reason to return to their land and play a significant role in building up the food system (Roggema, 2015c). At the same time, they regain the pride for their community by giving a signal to others it is worthwhile to live in this area. This is an important socio-economic aspect of sustainability.

Four AESOP-plans

For the design LAB's four urban areas were selected. Each of these areas needed to be in a stage of transition, with a design question on how to spatially develop the area in the near future. The second requirement was that each of these areas had a problem owner, who is responsible for the implementation of the future design.

The four areas have in common that they are all socially and physically a bit rundown; they have lost their original use and are physically isolated from their surroundings. For each of these four areas, plans have been developed during the AESOP conference (Van Hall Larenstein University of Applied Sciences, 2016). The designs for the four areas (Figure 3) all include strong connections with their direct and distant surroundings.

They increase the space for food production in public spaces, on roofs and on barges, and each of the designs reflects in one way or another a social dimension, such as links with education, supporting local entrepreneurs or arranging training opportunities for less advantaged people (Roggema, 2015b). The designs were developed collaboratively by academics from different countries, entrepreneurs, local citizens and government representatives.

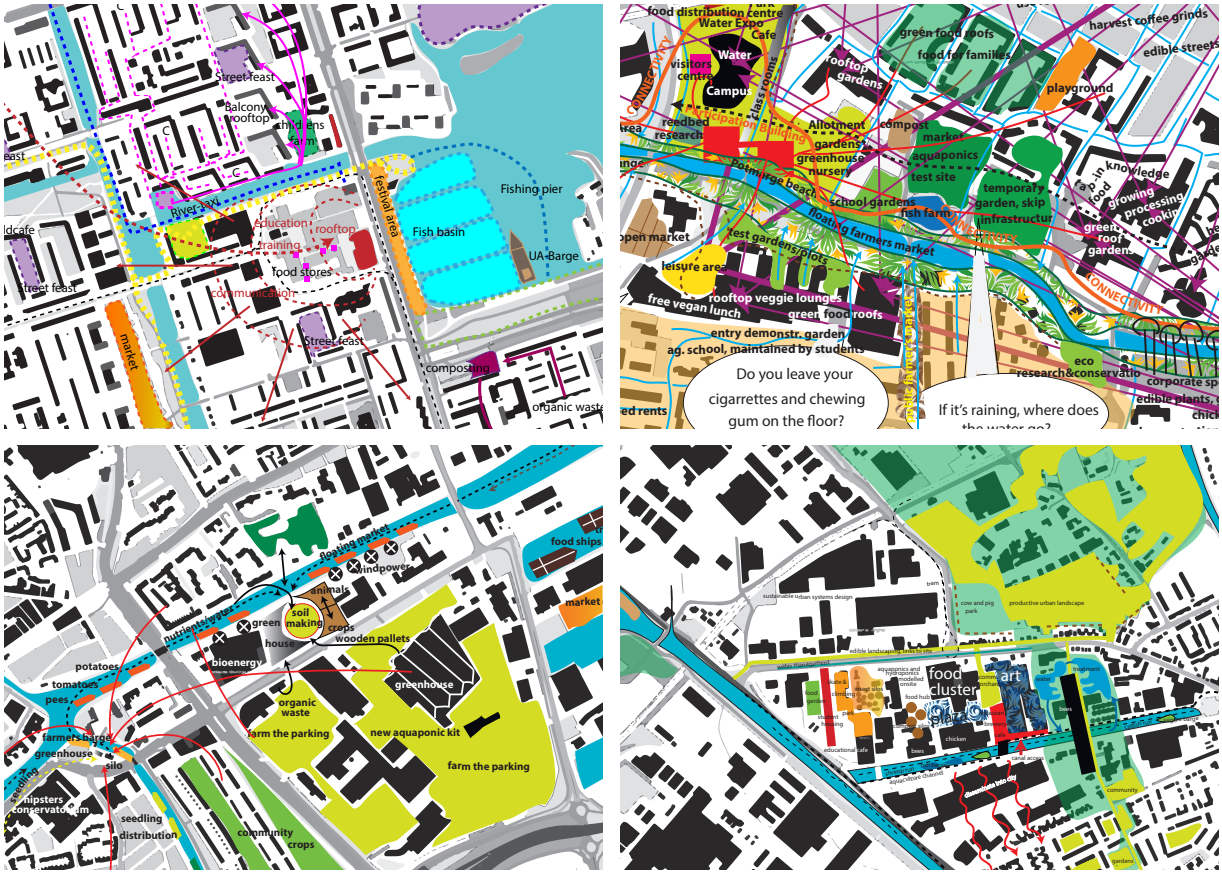


Figure 3
Respective plans for Meervaart, Potmarge, Graansilo and Noordkade.

The participants of the conference were designing in groups in an interactive and collaborative way. The task in each of the four LAB's was to design a spatial plan for the urban precinct, including productive spaces for growing food. Each of the LAB's started after 3–4 paper presentations, which could be used as an inspiration for the design process. For every case study, four LAB's occurred during the conference. People could swap between locations or stick to the same in repetitive LAB's. During the LAB's, the participants were supported with basic information and all the tools needed for design. Students and the case owner provided this information. This "mini" design charrette approach caused interaction between the participants, as some moved locations and others continued working in the same group. For each new session, the collaboration was easier due to the availability of a growing amount of know-

ledge gathered in earlier sessions. Because most of the participants were academics, they found it easy to provide knowledge, which could then be used for the design process.

The quality of the designs in these four cases shows a relatively high intensity of land-uses and functions, and the mix of uses is generally overwrought. This results in a weak spatial structuring of these areas. There are relatively too many different uses occupying too little space. The advantage of the designs is that there is a certain conglomeration of proposed uses, which could create a sense of traction and attraction to these areas. For the food system in these municipalities, these spaces could then start to function as the centre. However, the question is whether these specific locations are the right places when it comes to urban centre forming at the level of the entire city.

The space for food in the plans is abundant. Every available space in the urban context is used to produce food or provide the resources supporting the growth of crops. Spaces, such as public parks, small green spaces, public space along infrastructure and canals, façades and rooftops, are all used to create a higher productivity.

Overall, the sustainability of the plans is reasonable. In each of the plans, food issues are linked with water management, waste treatment, mobility solutions and energy generation. Each of the plans exhibited strong social components, such as links with education, training, job availabilities for less advantaged and the possibility to begin start-ups.

Results and comparison of the case studies

The process of the three case studies showed a high level of interaction in each of the teams and between sub-groups. In the Groningen and Minamisoma cases, Action Research worked very well and allowed the researcher to gain in-depth insights in the considerations, actions and commitment of the participants. In all three case studies, the Research by Design methodology was applied successfully. It created an atmosphere in which exchange and searching investigation was possible, and made it easy for participants to attach to. In this sense, Research by Design fits very well in a design charrette process. It also caused a combination of analytical and reflective considerations and creative contributions. Finally, the analytical comments on design ideas and concepts during the process improved the final design.

The results of the case studies are summarised in Table 4. The content of the outcomes of the three planning processes showed that the Groningen and Minamisoma plans provided sufficient productive space for food and energy supply. These two plans also included reservations in their plans for sudden impacts. The four AESOP plans provided less space

for food production and energy generation, though this may be caused by the fact that these areas were all inner-urban precincts. In all three plans an intensive mix of functions was proposed, in which energy, food, water, ecology and industrial use were integrated. The plans for Minamisoma and AESOP both showed a strong socio-economic factor.

Table 4
Results of the three case studies

	Groningen	Minamisoma	AESOP
Results food, water, reservations	Sufficient renewable energy and sufficient food for inhabitants of the region (over 100 %). 90 % in use as mix of energy and food supply. Specific locations in use as reservation for eventual flooding.	Sufficient amounts of food and energy for the population (close to 100 %), innovative coastal protection proposition with spacious areas where to accommodate eventual flooding, re-establishment of horse festival	Approx. 25 % food supply for the population, integrated mix of functions, transportation and connectivity between site and rest of the city, connection between food production, processing and consumption. Minimising flash-flooding through storage of rainwater on roofs, in green spaces and use for food production
Methodology	Interaction between two groups, calculations and design mutually informed each other. Action Research allowed harvesting of the success factors of the process. Research by design encouraged participants to think, rethink and develop new design ideas	Interaction between four groups through intermediate presentations. Successful Action Research to harvest the activities, opinions and commitment of the participants. Research by Design worked well in encouraging participants to analyse the design propositions of each other and adjust weak points.	Interactions within and between LAB's was large. People exchanged ideas and changed groups leading to a continuous exchange of ideas and design propositions. Action Research was relatively weak, as the researchers were only partly participating in the LAB's. Research by Design was a strong element through the permanent analytical attitude within the LAB's and the reflexion that was possible on each of the design proposals.

As mentioned in the beginning of section five the case studies have been judged on four criteria: design quality, food inclusion, process quality and sustainability (Table 5). Compared to each other, the three case studies each have their strengths (Table 5). The Groningen and Japanese projects design for the regional scale, which makes it somewhat easier to create spaces for food production than in an already confined urban context. The process quality of the AESOP project can directly be linked with the design quality as the time permitted to design prevented the participants to produce a design quality as the other two projects. The process of every project is of high level and international. The Japanese planning process stands out as the involvement of large groups from the local community has been very well arranged. The Japanese and

AESOP projects included social aspects of sustainability in their designs, while Groningen focused on the more traditional sustainability issues of water, ecology and energy. The AESOP projects included the most widespread range of topics. All in all the three case studies scored well and showed great results.

Table 5
Comparison of the case studies

Case study	Groningen Fast Forward	Rethink Reborn Return	AESOP plans
Design	Regional, embedded in regional structures	Sub regional based on natural features of the landscape, building with nature	Could be improved, overkill in uses in too small areas
Food	Sufficient for regional consumption, greenhouses, crops in open fields	Sufficient for local consumption, greenhouses, vertical farming, open fields along rivers	For an urban context good results, not self-sufficient. Processing important
Process	Highly interactive, international, lack of residents	Highly interactive, international, strong interaction with local groups and stakeholders	Very interactive, conference participants. Weak participating of residents
Sustainability	Energy, water, ecology are linked, social dimension is weak	Energy, water, ecology are linked, strong sense of social sustainability (jobs for former farmers)	Energy, water, waste, mobility and social aspects are linked with the food system

Discussion

Some critical notes can be placed discussing the outcomes.

First, as several plans already resonate, food is not the only use of space in urban landscapes. In the case studies, sufficient space has been arranged to grow food. However, there is severe competition for space, especially in denser urban areas. During the design charrettes the more dominant land-uses, such as infrastructure, housing and economic functions, have been put in the background, while in practice these uses play a dominant role in urban planning. This pressure on space is in urban environments the key issue influencing whether food can be included in the city or not. In circumstances of higher densities, the inclusion of food production space requires combinations of functions and uses. The question is how to integrate different uses in one space in a sensible and productive way.

Secondly, design charrettes are a recommended method to bring people out of their comfort zone, to develop transformational designs, which are able to create more space to grow food. However, after the charrettes, there is a question about how the follow-up of these innovative ideas and concepts is organised; are the results of the design charrettes

embedded in regular decision-making? It is hard to integrate these kinds of proposals in regular planning debates, exactly because they are transformative. This is the second question that requires further research: how can transformative outcomes of design charrettes be sustained in implementation processes, and decision-making?

The sessions during the AESOP-conference (LAB's) lasted two hours each (Roggema, 2015b), which is very short to completely dig into the design task and come up with transformative solutions, despite the fact that the groups were explicitly asked to do so and each location was four times the subject of a LAB. Because the process of the design sessions was completely new in a conference setting, the capability to develop well thought design was overambitious. Hence, the designs show the direct insights of the coincidental participants put together in drawings. Here is room for improvement, for instance if the groups stick to the same case study and participants do not move during the design sessions, which then could also be introduced more extensively.

Conclusions

Based on this research study the following conclusions are drawn:

- The case studies have highlighted differences in thinking about designing the urban environment. Food production could be a powerful driver of urban development in the form of structuring principles, which are based on the conditions for food production (i.e. available and type of space, fertility of the soil, availability and quality of water).
- In each of the case studies, the design charrette played a crucial role in engaging stakeholders, and created an atmosphere in which optimistic governance principles are applied. The outcomes of the design charrettes delivered views for a sustainable food production, but also harvested visions on the future of water and energy. The endurance of these outcomes in decision-making and implementation requires further research.
- It is worthwhile to enhance the role of food production in the planning process, and a bigger role in the development of spatial designs at different scales. In the analytical stages of designing, an investigation on the potentials to grow food, may give the directions on how and where to create urban environments that support food production. Emphasising these potentials in the analytical phase of designing will enhance the attention for the issue in the design phase and, at the urban level, the food system will appear as a more intense and connected network of spaces.
- The attention for food is not a single-issue. When developing plans for sustainable food systems, other aspects should be balanced in integrated designs. A sustainable food system, water-, energy- and resource-management, as well as social aspects need to be integrated in the development process.

- The Action Research method, which was used in the three case studies, is an applicable way of harvesting research results. It allows researchers to indulge in the process and to become part of the teams of participants. It allows them to observe the planning process, the role of the participants and the way design propositions and solutions came to be.
- The Research by Design methodology was applied in each of the case studies. The combination of reflexive and creative responses and adjustments of the design propositions during the planning process led to improved designs. The method also created an atmosphere, which was accessible to all participants and allowed for a continuous exchange of ideas. It makes the design process equally open for design experts and non-designers. The Research by Design methodology is extremely suitable to use in a design charrette context. It makes a complex design task manageable and fit for discussion amongst experts and other participants, who might normally be less capable of discussing complex problems or design concepts, ideas and propositions.
- The three case studies and the applied methodologies were successful in addressing the new planning models. In each of the case study designs space is allocated to uses attributed to so-called Slow Urbanism. The space for food production, energy generation, water for nature and culture is in every design proposal manifest. Especially in the designs for Groningen and Minamisoma reservations were included which can be used to accommodate sudden spatial changes. The AESOP designs were in this perspective indirectly effective, as they included extra storage for rainwater hence preventing flash flooding to happen.

Acknowledgement

Special thanks to Lisa Vos for reading and improving the text.

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