

Simlandscape: serious gaming in participatory spatial planning

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SUMMARY

In an attempt to improve support for contemporary spatial planning practice, Simlandscape has been developed. In this document the development of Simlandscape as “serious game” in digital form is described. In its current state, Simlandscape exists in two methodological forms; as an analogue game and as a planning support system using GIS for research and design. The game focuses on simulation of plan processes and on the resulting transformation of areas involved. Players interact with an analogue area model. The planning support system focuses on design and evaluation of plan scenarios and the data handling and presentation accompanying this process. A major challenge now is to integrate, upgrade and digitize components of the analogous game with the planning support system. Several interesting components (practical and scientific) of this project are identified and are discussed.

KEYWORDS

participative spatial planning, collaborative plan making, scenario method, ‘serious gaming’, GIS design, GIS evaluation, data visualisation

INTRODUCTION

A central focus of planning is decision-making in the present, to influence and guide future developments for the benefit of the future community. (Myers, 2001) For a long time, planning practice was aimed at regulation of social dynamics through activities like allocating, zoning and protecting. The last few decades, a trend can, increasingly be observed, that governments intend to cooperate more with relevant stakeholders, like owners, private developers or other interest groups when exploring future planning and design options.

This type of planning, called development planning, is characterized by a participatory process, with complementary parties, aiming at integral area development, and, improvement of spatial quality, by executing and financing several related spatial projects. (Dammers et al., 2004) Participatory methods of planning are commonly regarded important tools for modern planners and policy makers. They are believed to improve integration of knowledge of various disciplines involved in spatial planning processes and have positive effects on the acceptance of spatial plans by citizens. Many of these participatory planning methods, however, mainly focus on the creation of strategic plans, while in many cases realization of spatial plans remain underexposed. (de Waard, 2005)

A drawback of participatory planning, however, is that it makes planning more complex. It leads to a demand on communication about, and exchange of (spatial) information. (Al-Khodmany, 2001) Currently, Planning Support Systems (PSS) are being developed to support participatory spatial planning processes by combining process models of spatial planning with geo-information based instruments for analyzing, visualizing and communicating data (Geertman and Stillwell, 2003)

Examples of PSS, which focus specifically on communication and exchange of geo-information can be found in the STEPP methodology (Carsjens and Ligtenberg (in press)) or the Maptalk and MapTable systems (Vullings et al., 2004) The SALIX projects (Lammeren et al., 2003) and research on 3D of large-scale land use models, like VisualScan (Beurden et al., 2006), are considered examples of PSS that have special focus on the support of visualization of designed plans in planning processes. Communityviz , K2Vi (Brail and Klosterman, 2001) and the PSS toolbox developed by Geertman (2002) are other major PSS developments which focus on the efficient design, evaluation and (3D) visualization of spatial plans.

Apart from research on PSS, there is a considerable body of work on collaborative working interfaces. In recent years, various collaborative interfaces have been developed for spatial planning decision support in the Netherlands. Alterra/WUR designed the Maptable, which offers collaborative support to the use of GIS, making the use of geo-information in spatial decision-making processes possible. (Bulens, 2006) Interesting functionality is the ability of data-layering and the existence of polygon drawing tools. Geodan has developed the Tangitable, which has initially been designed, to promote eco-awareness and planning, by tracking real-time impact of pollution and waste disposal based on GIS. (Scottà, 2006). An interesting technical issue comes with this system as it is able to deal with more interactions (multiple users) with the system at the same time. This functionality is also possible with the Virtual Maquette (VM), designed by the design systems group of the technical university of Eindhoven. By order of the university board, VM has been designed to visualize information about future developments on the university campus. (Vries et al. 2006). Besides, more commercially oriented systems are available with extra touch and identification functionality. Examples are Diamondtouch and the TouchTable, developed initially to support defence specialist decision making.

Simlandscape can be considered as a PSS, which is developed in close coherence with planning practice. It is a support system for design and research in planning, based on scenario methods and cadastral GIS. According to de Waard (2005) the purpose of a scenario method is in essence to obtain strategic understanding of possible future developments.

Scenario methods can contribute to the improvement of planning in a number of ways (Waard, 2005):

- 1) bridging the gap between planning and realization;
- 2) improving communication and collaboration of stakeholders in planning and development;
- 3) facilitating and stretching thinking about the future
- 4) supporting decision-making; and
- 5) monitoring actual development compared to the developed scenarios and established policies.

In its current state, Simlandscape exists in two methodological forms; as an analogue game and as a planning support system using GIS for research and design. The game focuses on simulation of plan processes and on the resulting transformation of areas involved. Players interact with an analogue area model. The planning support system focuses on design and evaluation of plan scenarios and the data handling and presentation accompanying this process.

A major challenge now is to integrate, upgrade and digitize components of the analogous game simulation with the planning support system. Goal is to make the scenario method much more efficient, interesting and feasible for professional and educational purposes. State-of the art software and hardware components should be implemented and developed to make this integration feasible. Main goal of this project is to develop and upgrade Simlandscape into a digital 'serious game', which can be used (maybe partly) in the professional planning context or as role playing game with educational purposes.

Simlandscape is considered a 'serious game', since its aims at using 'real' geo-information, playing it with 'real' actors and developing 'real' area plan-scenarios. Moreover, this system enables users to put forward their desires and perception of a future organization of the environment and explore different starting points. Special focus is to create realistic 3D-views to make future plans better comprehensible. Besides, developing spatial plans are continuously tested on limiting conditions. Lastly, the large amount of potential stakeholder behavior can be limited simulated by agent technology.

METHODOLOGY

Simlandscape development

The development of the Simlandscape system has been divided in different phases. In the first phase of the project a definition study is undertaken to identify to which type of spatial planning processes, Simlandscape could be supportive to. Several strategic and operational planning processes, ranging from participative development of structure plans to the process of land re-allocation and consolidation, could potentially be supported by Simlandscape. This definition study identified some global state-of-the-art software and hardware components which could be useful for Simlandscape, as well.

The second phase of the project aimed at the development of a global course of the game Simlandscape. Parallel to this document, a mockup with (fake) functional specifications of the system is created and is used for two purposes. It funneled discussion about system development within the project group, as well as it could be presented to potential users (practice partner) to obtain useful feedback.

In the third phase, specific cases from practice are selected and are used for elaborating on more specific functional specifications of Simlandscape. Consequently, the system will be divided into a couple of components. Due to time restrictions, the most interesting (also scientifically) components

will actually be implemented in subsequent phases. Before potential components are treated, some basic aspects in Simlandscape should be discussed.

Simlandscape basics

Within Simlandscape, areas are considered a patchwork of delivered projects. These areas (projects) are identified as the result of the combination of administrative visions and rules, and of the design, development and management of lots by their respective owners. Transformation of landscapes occurs basically at parcel-level. Actual transformation only takes place, when the government and the owners both agree on planned developments. Besides, also other important factors influence the possible transformation of parcels. For example, the value (price) of property and physical natural restrictions (soil and water) influence this process.

In Simlandscape each relevant stakeholder (government, owners and other interest groups) of an area development project is offered the opportunity to design and plan at its own desired level of scale. Government should efficiently make a plan for the whole plan-area, while owners or project developers are more interested in the level of (assembled) ownership-parcels.

Simlandscape planning process

In general, Simlandscape is based on an iterative, explorative process of design and research and of funneling and selecting to simultaneously improve scenarios. Four steps can be discerned (see also fig.1):

step 1. defining the study area, the problem perception and the policy challenges

step 2. the iterative development of scenarios

step 3. the evaluation of the developed plan (realisation) scenarios

step 4. decision-making

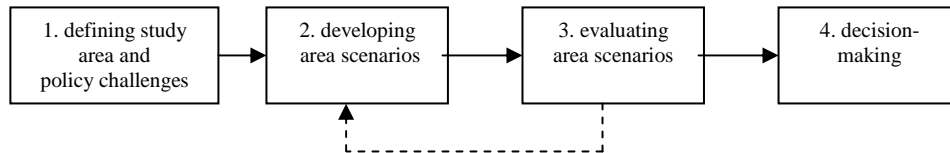


Figure 1: four steps describing the Simlandscape planning process

Simlandscape scenarios

The main goal in Simlandscape is to make spatial area scenarios. Two types of important area scenarios that can be developed in Simlandscape should be discerned:

1. planscenarios – global or detailed descriptions of the desired (spatial) development of areas

2. planrealisationscenarios – describe, through simulation of the (speculative) responsive owner behaviour, the effects of plan scenarios on the actual transformation of study areas (test for feasibility)

Planscenarios used to be made by governments, but also semi-public or private bodies can undertake this in the context of the development of an area. In planrealisationscenarios more focus is on the integration of a planscenario with ideas and plans of owners and private developers. Often, planscenarios are part of planrealisationscenarios, where for example planscenarios introduced by the government are tested for feasibility.

The main action in Simlandscape takes place in step 2; the development of scenarios. In figure 2 a more detailed overview of this subprocess is shown in a scheme.

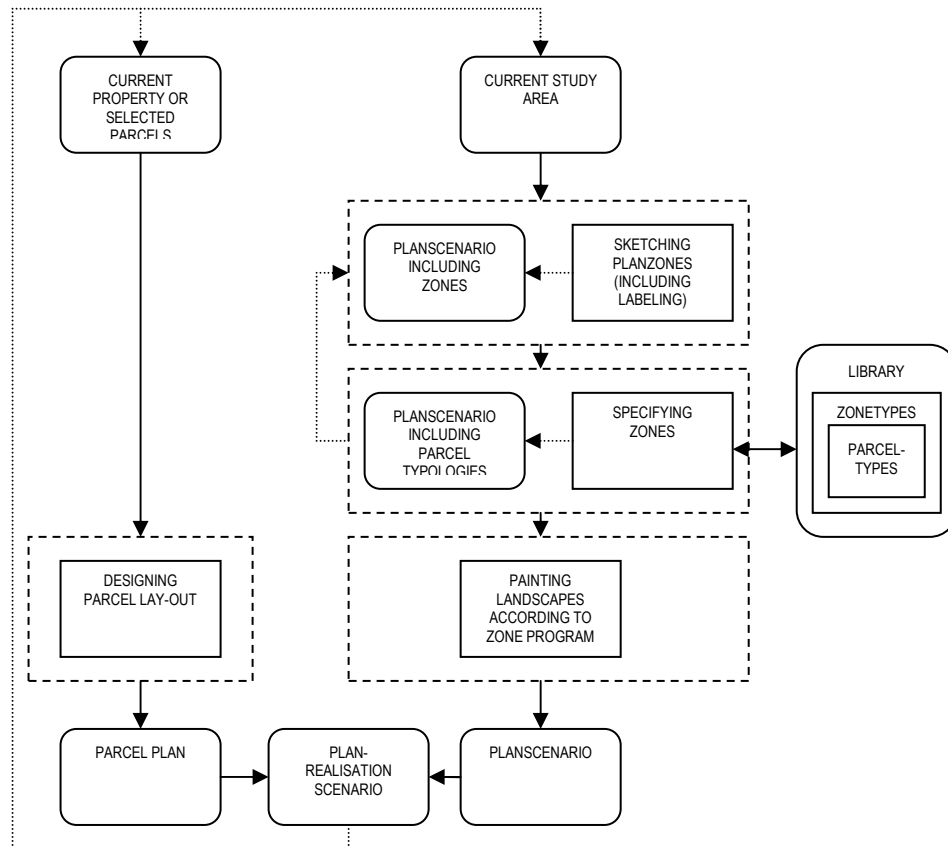


Figure 2: detailed overview of scenario development in Simlandscape

Each stakeholder in area development processes has the opportunity, within Simlandscape, to contribute its own ideas by designing on their desired scale level. Administrative bodies have the opportunity to design plan-scenarios for the whole area in a top-down way, through zoning and selection of allowed parcel typologies to the level of lay-out design of topographical units. Cadastral typologies have a central place in Simlandscape. Depending on the attributes that are linked to the used dataset several typologies are possible. However with two basis qualities, economic function and physical layout, quite comprehensive scenario studies can be made. In figure 3 a cadastral typology including its distinguishable attributes is shown. With simlandscape these cadastral typologies can be created and adjusted as desired.

Owners and private developers for example, design and work out their future ideas on selected parcel-level, while other interest groups develop scenarios on their desired level. These scenarios are brought together and can be evaluated for plan program performance and feasibility. With plan program performance evaluation scenarios are tested to what extent they fullfill the goals stated in the policy challenges, in advance of a plan process.

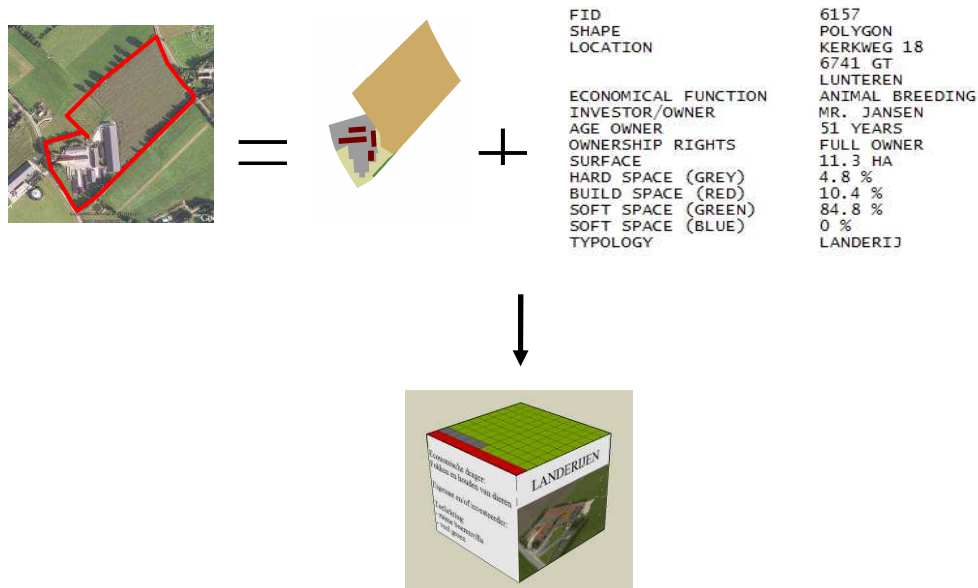


Figure 3: a parcel with properties is standardized into a cadastral typology

TECHNOLOGY

Simlandscape set-up

The whole simlandscape process will take place in three types of collaborative settings, called spaces (see also fig. 4):

- Personal space – to support the design and creation of plans in privacy
- Joint space - to support the formation of a coalition between actors to create plans together
- Public space – to support public plan creation and plan evaluation

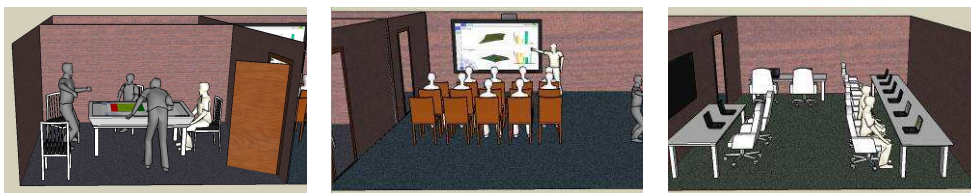


Figure 4: the three spaces of Simlandscape: joint space, public space and personal space, respectively

Simlandscape system components

The following components are distinguished as essential to Simlandscape, so far:

- A. GIS-viewer to visualize and query relevant scenario and area data;
- B. Relational (spatial) database with all kinds of data about planarea (incl. non-spatial data);
- C. Planscenario-editor including a planzone sketch editor, zonetypology-editor and an automatic lay-out-creator;
- D. Library with cadastral typologies, consisting of a database and user-friendly typology-editor;
- E. Parcel-design-editor to design at the level of a (set of) parcel(s)
- F. Realisationscenario-editor to match developed plans
- G. Scenario evaluation tool to compare and value developed scenarios
- H. Game engine
- I. Tangible user interface for extra support of designing plans in a participatory way

Below the components are explained in more detail:

- A. GIS-viewer to visualize and query relevant scenario and area data;

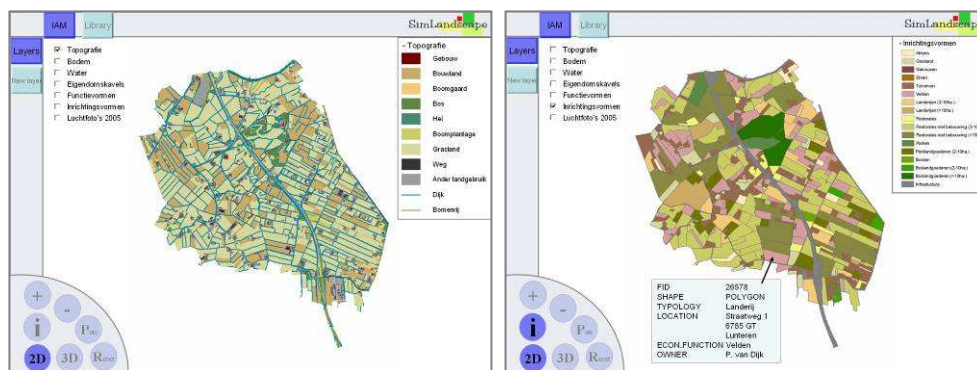


Figure 5: planzones can be visualized and queried up to each desired level

- B. Relational (spatial) database with all kinds of data about planarea (incl. non-spatial data);

Current situation-scenarios and developed scenarios are saved in this database. They can extensively be queried in the GIS-viewer.

In step 2, planscenarios are developed (top-down) in three main substeps:

1. sketching global plan scenarios through planzones
2. compose plan scenario catalogues through choosing cadastral typologies
3. building cadastral scenarios through the automatic lay-out creator

These steps are supported by two related components:

- C. Planscenario-editor including a planzone sketch editor, zonetypology-editor and an automatic lay-out-creator;
- D. Library with cadastral typologies, consisting of a database and user-friendly typology-editor;

The global plan scenarios, the first spatial sketches, are very much design exercises that are common in practice. They are the first exercises aimed at translating general policy objectives into a partially or entirely adjusted area structure.

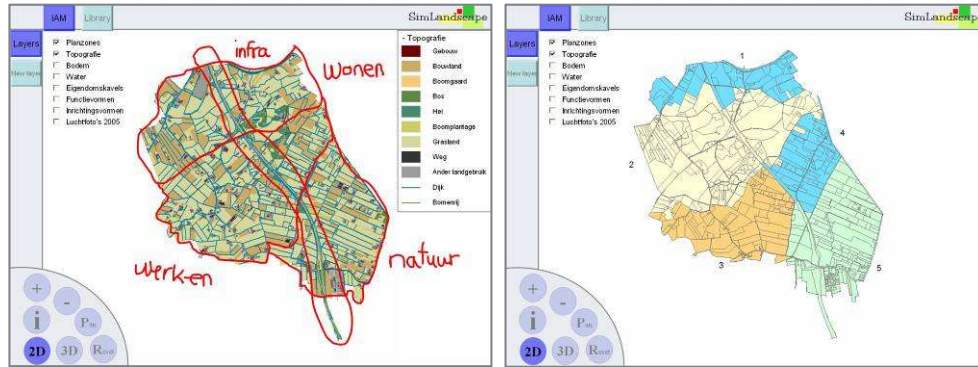


Figure 6: planzones can be sketched, up to each concrete level

Designing cadastral typologies for plan scenario catalogues is an iterative process in which design and research are both necessary. The goal is to obtain building stones for the construction of cadastral plan scenarios that specify the global plan scenarios. Within the zonetypology-editor, cadastral typologies existing in the library can be assembled and assigned to the desired planzone. In the library, new parcel typologies can be created, as well.



Figure 7: in the library with cadastral typologies, existing parcel typologies can be assembled or new typologies can be created in a user-friendly editor

For the design and construction of cadastral plan scenarios specified to lot level, the cadastral assemblage plate is used. Following respective zone programs or parcel typologies are allocated to lots or parcels. This technique can be compared with 'painting' zone designs in which the dye colours are the typologies and the paint box is the program.

In order to re-structure the result of the automatic allocation process and to give the opportunity for owners to design their plans for their property, a parcel-design-editor is developed.

E. Parcel-design-editor to design at the level of a (set of) parcel(s)

Owners in the area will be able to design their ideas in a user-friendly parcel-design editor, where they simply can drag with existing and new layout components within their property. Private project developers get access to either the parcel-design editor, or the parcel typology editor in order to develop their future plans for respectively project ideas with a defined location, or undefined location.

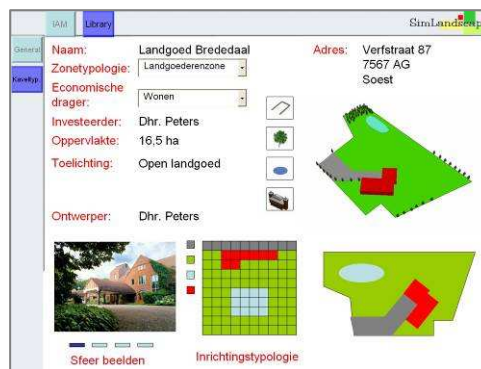


Figure 8: parcel-design editor for arranging lay-out components

F. Realisationscenario-editor to match developed plans

With this tool designed plans of the different stakeholders are matched with each other.

In step 3 of the planning process designed scenarios are evaluated.

G. Scenario evaluation tool to compare and value developed scenarios

Evaluating plans and plan scenarios are important, because of the effects of plans (the benefits and the costs) for society in general and for related study areas in particular. (Alexander and Faludi, 1989) The purpose of plan scenario evaluation is to obtain arguments for decision making in the process of plan scenario development. In component A all kinds of queries concerning content of planscenarios can be executed. In this component stakeholder value evaluation regarding planscenarios and the impact of planscenarios on the actual development of study areas get special attention.

H. Game engine

The game engine of Simlandscape controls the “gaming” process itself. Its main tasks are:

- to coordinate the participatory planning process
- to facilitate communication processes and exchange of information
- enable the integration of the above-mentioned tools using a plugin concept

I. Tangible user interface for extra support of designing plans in a participatory way

A tangible user interface including Simlandscape functionality is developed to support multi-user plan making.

CONCLUSIONS AND FUTURE RESEARCH

This paper presented a novel concept which combines PSS with concepts of gaming. In its analogue version Simlandscape has proven to provide an additional value to participative planning processes by ameliorating communication and exchange of information amongst planners, policy-makers, owners and other interest groups.

By turning it into a computer-based serious gaming concept functionality can be optimized and new functionality added. For example, better control of the process, better assistance to non-experts by the ability of adding intelligence, and offering alternatives to traditional 2D data, that is better understandable to users not used to read maps. Furthermore, external events and influences outside the domain of influence of planners can be inserted in the game. Actors have the opportunity to react on these events and, as such, it might make participatory planning more effective in reaching better collaboration between planners and citizens. Besides this higher feasibility, Simlandscape supports the making of plans which, in potential, are more pro-active towards realization.

At this stage of research the conceptual and functional aspects of Simlandscape have been developed. The coming period, components will be implemented and applied for two case-studies in the Netherlands. One case deals with the process of land consolidation and re-allocation in a rural area in the Netherlands, the other one deals more with the process of making regional structure plans, which are pro-active towards realization. These cases will give focus on how to develop the game. Up till now, mainly the process of making regional structure plans has been specified. Future research focus more now on the potential use of Simlandscape in re-allocation processes, as well. See for more information about the development of the Simlandscape system: www.simlandscape.com.

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