TEACHING AND RESEARCHING SUSTAINABLE URBAN DEVELOPMENT PROCESSES THROUGH SIMULATION

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ABSTRACT

Apart from innovative design and technology, sustainable urban development is about processes through which the actual people involved interact and cooperate to realise that development. Many, often conflicting, interests are at stake and it requires talents and skills to bring the right people together to find common ground and understanding and, hence, to start working towards a common goal. In higher education, students should learn and, preferably, experience how such processes can be initiated and led. The purpose of our research was, therefore, threefold: first, we wanted students to learn how to study this type of collaborative governance processes, using the model by Ansell and Gash as an analytical framework. Second, using the model, two distinct groups of students analysed three cases of transit oriented development. The results of the analysis, in terms of actors involved, their interests, and interventions to start and maintain an alliance, were translated into two serious games. Third, different groups of students played the games in slightly different settings, after which the learning effect was assessed. Results show that playing both games enhances students' knowledge of, and insights in the interests that are at stake and the trade-offs to be made. In addition, players report that they felt involved in the process as well as in the alliance itself. Conclusions are that both creating a simulation game, based on a guided analysis of real-life cases, and playing such a game are powerful methods to learn about processes that are not readily learnt from a textbook. Furthermore, the simulations can be used to research the effect of certain interventions that can – or must – be undertaken by the process facilitator for the alliance to be successful.

Keywords: urban development process, collaborative governance, alliance formation, role playing game, higher education.

1 INTRODUCTION

Sustainable urban development is not just a matter of innovative design and technology. Ultimately, it is the actual people involved that interact and cooperate to realise that development. In any urban development, a large number of stakeholders is usually involved, such as real estate owners, small and medium enterprises (SME's), housing corporations, different departments of local and regional governments, residents, transport services, et cetera. All of these actors have their own objectives and, often conflicting, interests. Yet, these people need to be brought together in some way to get started. It requires talents and skills to do so: find and invite the right people, make them find common ground and understanding and get them to start working towards a common goal. Students in urban development must learn and, preferably, experience how such processes can be initiated and led. A role playing game could bring this about.

Even a cursory glance at the literature reveals that a plethora of role playing games or serious games exist in the realm of (sustainable) urban planning and development. Most of these have been designed to highlight a specific issue, such as energy (e.g. [1]), climate adaptation (e.g. [2], [3]), tourism (e.g. [4]), or mobility (e.g. [5]). Some have a more general character, such as AudaCity [6] and Metropolis [7]. This type of games is known to foster cognitive, normative and relational learning [8].

One of the key characteristics of games is that they have rules about the actors participating, their objectives, their possible actions, and the way in which one gets to actually

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win the game. In reality, though, it is not at all obvious beforehand that all the right stakeholders meet, nor are there explicit rules for their conduct and actions. Students' learning experiences must include choosing which actors to invite – and how to entice them, if necessary – as well as the interventions through which actors are stimulated to form an alliance. In an alliance, participants collaborate to reach a common objective, formulated as a response to a jointly defined set of urgent issues in the area. Developing and playing a role playing game could precisely provide that type of learning experience.

Our aim was threefold. First, we aimed at familiarising students with a model to analyse the process of alliance formation. Second, we had two distinct groups of students study three cases of transit oriented development using this model as an analytical framework, in order to find the most common types of actors involved, their interests, as well as the interventions that were undertaken to start and maintain an alliance. Results were presented in the form of two serious games, designed by the students themselves. Third, different groups of students played both games in slightly different settings, and took a test in order to assess the learning effect.

2 ANALYTICAL FRAMEWORK

Urban development is an extremely complex process: multiple stakeholders negotiate in multiple arenas within multiple policy networks, constituting a seemingly chaotic sequence of interrelated decisions. Each of these may be small and seemingly of little significance, but together they cause a spatial plan to be materialised [9]. The outcome of this process is affected by the way in which authority is shared among different, state and non-state, actors and institutions. Such a multi-level governance system is adequately described by the model of Ansell and Gash [10]. The core of the model is a collaborative process, modelled as a cyclical sequence of face-to-face dialogue, trust building among the actors involved, their commitment to the process, shared understanding among them, and intermediate outcomes they arrive at. This sequence is greatly influenced by three types of boundary conditions. First, the starting conditions, such as asymmetries in power, resources or knowledge and the history of cooperation or conflict among actors; these determine the possible incentives for and constraints on their participation in an alliance. Second, the institutional design, consisting of who can participate, whether there are other arenas where actors can pursue their goals, the rules that apply to the process and its transparency. The third boundary condition is the quality of the alliance's facilitative leadership.

The core purpose of the cycle in this model is for the actors involved to find common ground. Important facilitating factors of common ground were found to be trust, actors' orientation towards reaching consensus, and boundary spanning activity [11]. The latter activity is displayed by so-called 'boundary-spanners', persons who facilitate the communication between the alliance and the organisation to which they themselves belong [12].

In order to also analyse the actual interventions staged by the facilitating leadership, insights from co-creation research were used. Successful co-creation processes, in this case within an alliance, depend on the willingness of the participants, the social capital within the alliance group and a smoothly running organisation. Willingness is found to be based on whether participants were approached because of their competences and skills [13]. In addition to the boundary conditions formulated by Ansell and Gash [10], Rădulescu et al. [14] found a sense of urgency to be conditional for successful co-creation in development projects. Furthermore, their work reveals that the number and diversity of actors either enables or hinders the process. From network management theory, we know that facilitators adapt their strategies to these variables: in larger networks, managers tend to invest in finding

common ground (‘exploring’) and new organisational arrangements (‘arranging’); in networks with more hierarchy, they relied more on a connecting strategy, through e.g. mediation, incentives or activating resources [15].

3 METHODS

Three distinct methods were used: case studies to find the factors that determine success or failure of alliances, the actual construction of the role playing game and the assessment of the learning effect of playing the games.

3.1 Case studies

The first part of this research was a case study [16]. We selected three cases of transit oriented development in Dutch cities, all facilitated by the same advisor; in this way, we would expect to find comparable sets of stakeholders and the same menu of possible interventions to guide the actors towards an alliance.

Students were familiarised with the model of collaborative governance by Ansell and Gash [10]. They were issued documents describing the alliance formation process, readily available on the internet. In addition, they interviewed some of the key actors within each of the cases, including the main facilitator, asking specific questions about the success factors of each case and about the interventions made during the process.

3.2 Game construction

Students were given only limited instruction as to how they had to use the data they had collected and transform these into a role playing game. The group of master students were shown the model of collaborative governance and its applicability to the type of cases at hand. The group of bachelor students were instructed to first conceive an analytical framework, based on the model of collaborative governance and then write a report on each case, containing:

- the spatial situation at the onset of the project studied;
- the actors involved and their main interests and objectives;
- the intervention(s) through which actors were brought together and through which they were to arrive at the issue(s) they commonly felt need their attention;
- the way(s) in which actors were enticed to tackle the issue(s) identified and what the result was of these actions;
- whether the alliance led to continued cooperation between partners and in what way.

Both groups were instructed that their end product should meet the following conditions: it should be a (real or fictitious, but realistic) case, containing at least a description and an image of the area to be developed, the actors involved, their interests, the opportunities each actor sees for developing the area, and possible interventions to stimulate actors to collaborate on concrete issues.

3.3 Assessment of learning effect

After both role playing games were produced, they were tested within the group that conceived the game. In both groups, this led to some elaborations and changes. The finished games were played by a completely new group of 26 students, all third year bachelor students Built Environment. These students were only given the instructions included in the games.

Groups of 4 or 5 students played both games online, as a consequence of corona restrictions, during two consecutive morning sessions that lasted 1½ h each. At the end of each session, we had a classical, online, debriefing of about 15 minutes, during which students could share their (learning) experiences and the lecturer discussed the alliance formation process. Before and after playing the two games, students took a quiz of 2 multiple-choice and 6 open short-answer questions, in order to assess their knowledge about alliance formation in urban development before and after playing the game. The pre- and post-game tests had the same questions, except for the last one, that in the pre-test tested students' knowledge about the objectives of the process facilitator and in the post-test prompted students to illustrate three of the variables in the model of collaborative governance, that was discussed in class as part of the debriefing after the game. All students participated in the pre-test; 50% also participated in the post-test.

4 RESULTS

This section first presents the results of the case studies, in particular the elements that were found to be vital for alliance formation. An impression is also given of the role playing games developed by the students, followed by the most relevant results from the learning effect assessment.

4.1 Case analyses and role playing game elements

From the documents they analysed and the interviews they conducted, both groups of students presented the circumstances and actions that determined the alliance formation process. These could easily be brought in a format that lists the main variables contained in the model of collaborative governance [10]. The result is presented in Fig. 1. Discussing these intermediary results with the students, we jointly identified several vital elements for the role playing game they were going to develop.

Firstly, the right actors should be invited to participate/In all three cases, an analysis was performed of each actor's urgency, ambitions and abilities – or competence – to contribute to the development, further termed 'UAC-analysis'.

Secondly, an alliance may contain local actors as well as actors that are active regionally or nationally. Obviously, in TOD, national and regional public transport companies are important stakeholders. In the Haarlem case, development of the station was important to the Amsterdam metropolitan region (MRA), because it could absorb some of the pressure on the capital itself.

Thirdly, the Haarlem case made clear that a conflict of interest is not necessarily detrimental for an alliance to form, provided guarantees can be given to protect these interests in some way. In this case, the objections by industrial companies in the area against the proposed development as a residential area were circumvented by granting that industrial activity could be continued after the development had taken place for at least 10 years.

Fourthly, in all cases a common goal was readily identified, namely the improvement of public space quality. Each participant in the alliance was in the position to contribute to this goal through relatively small actions like refurbishing the plinth of their building or contributing to an investment in nicer street furniture. These placemaking activities then formed the basis for larger investments, often made possible through external subsidies.

Fifthly, the process facilitator's primary concern in all cases was to entice alliance members to focus on a common problem linked in some way to each individual member's goals and interests. The common problem then puts in motion the cyclical process of dialogue, trust building, commitment, shared understanding and intermediate outcomes.

Variable	Case 1: Bunnik	Case 2: Haarlem	Case 3: Rotterdam
Starting conditions			
Power-resource-knowledge asymmetries	No apparent asymmetries.	Industry stakeholders were able to hamper or block land use change.	No apparent asymmetries.
Incentives for and constraints on participation	Shared discontent about station area quality, but no urgency for large scale development	Stakeholders recognised necessity to improve spatial quality. TOD is important to MRA.	Stakeholders recognised necessity to improve spatial quality and safety.
Prehistory of cooperation or conflict (initial trust level)	None	Industry was cautious about residential area in their vicinity.	Several actors had cooperated in upgrading the station building.
Institutional design			
Participatory inclusiveness	Actors with interest through money, property or competency were invited.	Actors with interest through money, property or competency were invited.	Actors with interest through money, property or competency were invited.
Forum exclusiveness	Neighbouring stations considered for large scale development.	The alliance was 'the only game in town'.	The alliance was 'the only game in town'.
Clear ground rules	Not explicitly researched.	Continuation of industrial activity was guaranteed.	Property owners and tenants were given guarantees in advance.
Process transparency	All participants were well informed after each session.	All participants were well informed after each session.	No predesigned plan; actors' ideas were transparently assessed.
Facilitative leadership			
Facilitative leadership	Independent facilitator, ensuring consensus-building.	Independent facilitator, ensuring consensus-building.	Independent facilitator, ensuring consensus-building.
Collaborative process	Cyclical: Two joint sessions with several work sessions in between.	Cyclical: Two joint sessions with two workshops in between.	Cyclical: Two joint sessions with four work sessions in between.
Face-to-face dialogue	Open, pleasant discussion.	Open, factual and pleasant discussion.	Open, factual and constructive discussion.
Trust building			
Trust building	Actors engaged in small, no-regret solutions.	Actors engaged in designing transformation plan (yet to be financed).	Existing quality improvement plans were tuned. Municipality invested first, other real estate owners followed.
Commitment to process			
Mutual recognition of interdependence	Not explicitly researched.	Extensive exploration of actors' ideas and means; partly conflicting interests.	Extensive exploration of actors' ideas and means; partly conflicting interests. Actors' roles and responsibilities were explicitly recognised.
Shared ownership of process	Establishment of comakers' group.	Establishment of alliance group.	Establishment of alliance group.
Openness to explore mutual gains	Formulation of shared ambition, laid down in short, middle and long term scenarios.	Formulation of shared ambition, laid down in short, middle and long term scenarios and concrete measures.	Formulation of shared ambition, laid down in short and middle term concrete measures.
Shared understanding			
Clear mission	Shared ambition formulated in 3 scenarios.	Shared ambition formulated in 14 concrete measures.	Shared ambition formulated in 10 concrete agreements.
Common problem definition	Common view from the start about urgent issues on short term.	Common view of urgent issues and necessity of political commitment.	Over time, a common view emerged of urgent issues on short term.
Identification of common values	Shared ambition laid down in pact document.	Ambitions laid down in pact document calling for political commitment.	Shared ambition laid down in pact document.
Intermediate outcomes			
Small wins	Small quality improvements in station area.	Placemaking initiatives.	Local investment fund for marketing / branding of the area.
Strategic plans	Development scenarios.	Development scenarios and concrete measures.	Short and middle term actions only.
Joint fact finding	During first meeting.	During first meeting.	Not explicit.

Figure 1: Analysis of three cases of transit oriented development (TOD), following the variables contained in the model of collaborative governance. Colours indicate the degree to which a variable is deemed conducive to alliance formation (green), hampering it (red) or neither (orange). MRA = Amsterdam metropolitan region.

Sixthly, from the interviews it became clear that it is important for all alliance members to firmly stick to their individual role. Therefore, the process facilitator would sometimes ask the question: "what if we abandon the project now altogether; then, what would be the damage to every partner to the alliance?"

4.2 Games constructed

One group developed a role playing game that started with the UAC-analysis by the player that had the role of process facilitator. Urgency, ambitions and competence were included in the role descriptions issued to each of the other players. In the second round of the game, players, as members of the alliance formed in the first round, were to negotiate about the realisation of a bike park facility that would make an end to the chaotic situation caused by randomly parked bikes on the station square. Negotiations must be started about the capacity and type of bike park – underground or at street level – and the way in which it will be financed. The game contained descriptions of both the role of the process facilitator – including tips to start and maintain the dialogue – and the game supervisor, i.e. the lecturer using the game during class.

The other group constructed a combination of a board game and a role playing game, emphasising the actual development of the area by the alliance rather than the formation of the alliance itself. The outcome of the UAC-analysis for each alliance member was given beforehand as part of the role description and at the onset of the game, all players are put in the position of the process facilitator, selecting which actors would be at the table, solely on the basis of each actor's playing card, showing a diagram that depicted the levels of urgency, ambition and competence of that actor. Then, each player can choose one of the selected actors, turn over the actor's card and read its role description. No explicit role was written for the process facilitator, other than de description of the course of the game. During the first round of the game, players can make smaller investments, like adding street furniture or trees, paid for from their initial budgets. In the second round, major investments were possible, involving changes of the assets on the board, but also negotiations among players, since neither of the individual budgets is large enough to allow one individual alliance partner to realise such an investment. Fig. 2 gives an impression of the game, played during an MS Teams session.

4.3 Learning effect

When asked to mention four possible types of actors in transit oriented development, students came up with several plausible answers – which is obvious since these were third year bachelor students with basic knowledge of urban development. Yet, the answers to the post-test were less diverse and the number of times specific actors – developers, SME's and the metropolitan authority – were mentioned increased significantly.

Students were also asked to mention three interests of the station owner in cases of TOD. In the post-test, the quality of the station area was mentioned in 69% of the answers, versus 38% in the pre-test. Also the number of travellers was mentioned more often after playing the games (54%) than before (12%). More general interests, like sustainability and safety, were mentioned in the pre-test, but no longer in the post-test. Other interests, like comfort and accessibility of the station area, were equally mentioned in both tests.

Before playing the games, students mainly indicated residents and travellers as the actors interested in the quality of public space (54% and 58%, respectively); only 35% mentioned

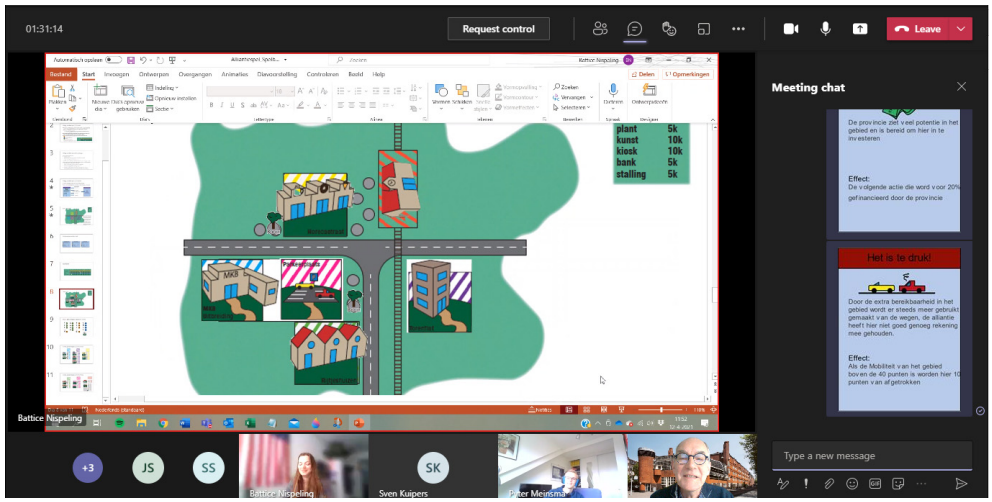

Figure 2: Screen shot of the board game in PowerPoint version for online play.

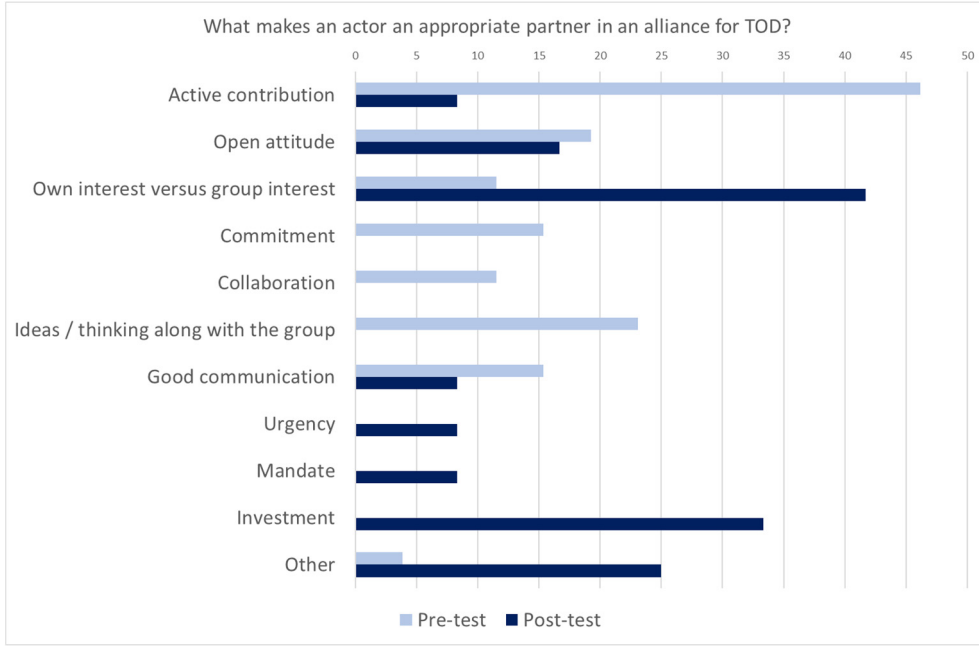

Figure 3: Learning effect with respect to what makes a good alliance partner.

the municipality. After they had played the games, 85% indicated the municipality as well as residents (69%) and travellers (31%). SME's were mentioned more often (54% versus 8% in the pre-test) and 23% indicated the developer as having an interest in public space quality (versus 0% in the pre-test).

In a multiple-choice question about selecting alliance partners by the process facilitator, before playing the games 65% selected an actor analysis as the most appropriate instrument and 11% the UAC-analysis. After playing the games, these numbers were almost reversed, 15% and 69%, respectively. Also, the correct answer to the multiple-choice question about what is meant by 'placemaking' was selected more often in the post-test (77%) than in the pre-test (50%).

Students gave widely varying answers to the question "what makes an actor an appropriate partner in an alliance for transit oriented development?" Answers were clustered and the relative number of times an answer was given was put in a graph, shown in Fig. 3.

After playing the games, students were able to pinpoint the properties of an appropriate alliance partner in terms of balancing their own interests with those of the alliance as a whole, ability to invest, urgency and mandate, rather than more general terms more often used in the answers to the pre-test, like active contribution, commitment, collaboration and the contribution of ideas.

When asked for possible causes for an alliance to fail, students came up with a broad range of – rather obvious – causes, both before and after playing the games. One of those, namely "conflicting interests", stood out, because in the post-test it was mentioned by 58% of the respondents in the post-test and only 19% in the pre-test.

The final question in the pre-test was about the objectives of the process facilitator and the way in which such a person would try to achieve it. Almost all 26 answers contained elements about facilitating cooperation among actors and/or eliciting ideas and ambitions from the alliance members.

In the post-test, the final question was to list at least three occurrences during the games that illustrate one or more of the variables in the model of collaborative governance that was discussed in class after playing the games. Of ten answers given, seven were adequate or more, one was incomplete and two did not answer the question.

During the in class debriefing, students remarked that they had enjoyed playing the games. Some preferred the board game, because they felt it had a defined objective and could be 'won'. Others stated that they had learned most from the negotiations about financing the underground bike park. As to the two groups of students who developed the games, the evidence for learning is self-reported in the reflection documents that were made as part of the assignment. All three master students stated in one way or another that the conceptual model of collaborative governance and its variables helped them formulate a useful analytical framework, which provided insight into the factors that crucially influence a successful alliance. The group of bachelor students, in their written group evaluation, also indicated that they had learned from the group work, but did not specify what exactly the learning effect was.

5 DISCUSSION AND CONCLUSION

Using the model of collaborative governance by Ansell and Gash [10], students were quite able to indicate in each of the cases the vital steps in the process that the alliance went through. Cases were sufficiently documented for students to unearth which actors participated, what their concerns, interests and ambitions were and what the outcome of each alliance process was. Interviews with key actors, particularly with the process facilitator of the three alliances, brought to light relevant do's and don'ts when inviting actors to the alliance, start the alliance formation and keeping actors working towards a common goal. In particular the master level students, who also had some years of experience in the field of urban development, appeared interested in and sensitive to factors that determine an actor's

competence, e.g. the mandate a person has to act in the alliance meetings on behalf of their organisation or the amount of money they could invest.

The games that resulted from these case analyses were found to be useful – after some major alterations that proved necessary upon internal testing – as a tool in our bachelor course on urban development to teach students the important features of alliance formation and, more generally, collaborative governance. As both games were developed starting from different perspectives – one focusing on the initial UAC-analysis, the other a bit more on the actual intermediary outcomes of the alliance process – we had our bachelor students play both games consecutively. These students reported diverse learning effects and, more importantly, the tests that students took before and after playing the games show that their understanding of actors and their interests as well as their insight into the purpose and course of the alliance process had increased.

The assessment of the learning effect with the students that played the games is more objective than the self-reported estimation of learning discussed during the debriefing in class. Results shows that answers to open questions contain more elements that were probably derived from the games. On the other hand, these were third-year students who had already some knowledge of urban development. In addition, taking the pre-test – and maybe even discussing it with fellow students – might also induce some learning.

Although not investigated objectively, there is also a certain self-reported learning effect in the students that performed the case studies and developed the games. This is supported by the fact that the games indeed showed many of the features present in the literature about network management and collaborative governance.

There is ample evidence that playing serious games, including board games and role playing games of the type used in this research, is conducive to learning about social interaction among actors in urban development [8]. Most of these games, though, are often used in a professional situation with specialists from different disciplines or with members of the general public. When used in an educational setting for teaching students, the games have often been designed by the university staff or a professional game developer. To our knowledge, no educational settings have been reported in which the game was developed – rather than just played – by students and the learning effect was assessed. Yet, the observations made in the research presented here are in line with earlier findings during a similar student project [17]. We therefore conclude that creating a simulation game, based on a guided analysis of real-life cases, and playing such a game are both powerful methods to learn about processes that are not readily learnt from a textbook.

In real life, a process of alliance formation in urban development is a one-off. There is never an opportunity to start over the whole process under the same conditions and try a different intervention to initiate or maintain the dialogue. However, in a role playing game, it is possible to experiment through making small changes and find the interventions that best support the building of trust, the finding of common ground, the formulation of common objectives and the collaborative action to reach (intermediary) results.

Several recommendations can be given at this stage. One is to repeat the case study and game development process and objectively determine the learning effect of these activities by letting students take a test before and after. Secondly, the two games should be integrated in order to merge the learning experiences about starting and maintaining the cyclic process off collaborative governance and actually solving any of the commonly defined problems by (negotiating about) necessary investments in the area. Thirdly, the actual learning effect of playing the revised game should be determined in much the same way as was done before, but with larger groups of students. Lastly, we recommend playing the game repeatedly in the

same setting – as much as possible – and experiment with different interventions to find out whether in this way interventions can be found that work best and are truly evidence-based.

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