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PPP delivery models for maintenance and rehabilitation of communal street networks in Switzerland

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ABSTRACT: To ensure national locational advantages in the globalized competitive environment, regional governments must guarantee the high quality of their infrastructures. In times of sinking public income, local authorities feel pressured to work more efficiently. Carrying out public duties in the form of a public-private partnership can be seen as a possible initiative towards increasing efficiency. A process model of a Public Private Partnership (PPP) will be developed for the maintenance of a communal street network that governs process progression, the tasks and responsibilities of the participants, the distribution of risks as well as the payment mechanisms, from initiation up to completion of the contract. The process model is aiming to reduce the complexity and uncertainty of such partnerships for the public authorities and private service providers. A precondition for the award of public works to private industry is a guarantee of value for money whilst still maintaining defined quality standards, the safety of the users and also ensuring operational availability. The aim of the process model is to enable Swiss local authorities to structure the sequence of events, to complete the tasks during the correct phase as well as to develop and be able to use the targets and values for PPP cooperation without conflict.

1 INTRODUCTION

1.1 *Initial situation*

Regional governments and city administrations in developed countries, such as Switzerland, are faced with a dual challenge.

On the one hand, they are under tension within stressed budgets that only partially permit the completion of their public service duties to high levels of quality.

On the other hand, they are under significant competitive pressure in globalized major business regions to provide locational advantages for their industry. Today the regions must fight for their locational advantage with an attractive service and cost structure and impress with the high quality of their supply, waste management and communications infrastructure.

This is particularly relevant with regard to the high quality of the street network and minimizing the costs. For this reason, public politics demands improvements in the efficiency of the public services. As in other countries, science and industry are developing new types of partnership cooperation between public service and private industry to align the potential success of the public providers of infrastructures and their public welfare aims with private industry and their provision of commercially viable service.

1.2 *Alternative environment for the provision of infrastructures*

In general, a wide spectrum of possible procedures for the provision of infrastructures is open to regional authority.

The alternative environment for the provision of infrastructures according to Hintze (Hintze 1998) is shown as follows (Fig.1):

Local authorities should choose the most efficient procedure in order to secure their locational advantages.

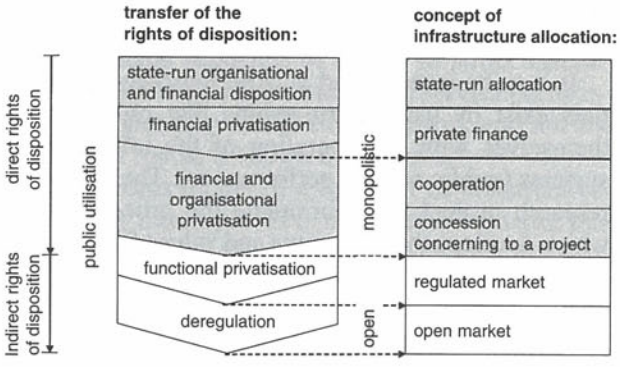

Figure 1. Alternative environment for the provision of infrastructures. (Hintze 1998).

Since the 1990s, significant cost savings in the provision of infrastructures have been achieved in the UK under the Private Finance Initiative (PFI) (up to 17%, HM Treasury 2000) by providing these in a partnership of public sector and private industry. Further cooperation is being encouraged under the current Public Private Partnership Initiative (e.g. Ministry of Defense (UK) 2004).

The first use of Public Private Partnerships is uniformly documented as being in the 1940s in Pittsburgh (Gabler 1997).

As a rule, the main aim of such a partnership is making private capital available to realize public infrastructure projects. The partnership usually therefore involves the purchase and the operation of the infrastructure equipment (acc. to Allen, G. 2001).

1.3 *Public Private Partnership in Switzerland*

This potential is rarely used at the moment in Switzerland. Therefore, the operation of street maintenance within a Partnership between public sector and private industry will be demonstrated in the research project entitled "Communal street networks in Switzerland: new types of PPP cooperation for their maintenance".

This demonstration shows:

- The PPP process model
- Tender and competition procedure
- Virtual pricing model
- Structure of the cooperation of the participants.

The aim of the research project is to reduce the complexity and uncertainty of such public private partnerships which are generated by the long duration of collaborations and the variation of the tasks during the contract period.

The knowledge that has to be generated, which is innovative from an international point of view, and thereby the research to be done, consists of the type of task fulfillment, the works for the provision of an optimized street network through operational and constructional maintenance of the street network (value retention), which does not include the creation of new roads (value addition).

It is to be investigated whether cost-saving potentials exist by using partnerships that only concern themselves with the operation of the infrastructure systems (public service performance). The aim of the research project is to formulate the process model, which develops the same aims and values for the cooperation of the partners, so that the implementation right up to the performance of work can take place with the minimum of conflict and confrontation. In addition, the research project is intent on systemizing PPP cooperation procedures that – at least in German-speaking countries – should be definitive.

2 MAIN PART

2.1 *Research methodology*

Constructivism is used to obtain scientific knowledge when answering questions of commercial management. The constructive research paradigm is very productive because it constructs social systems on the basis of input-output-relationships to attain a desired result (see also Le Moigne 1995 and von Glaserfeld 1987).

Triangulation is used to ensure validity and reliability.

In the first stage of the research project, the PPP delivery model is developed in a constructive-deductive way.

The next step involves embedding the deductively produced model in the theoretic frame of relevance to ensure objectivity. The Principal-Agent theory and the Structuration Theory form the theoretic frame of relevance for this research work.

The Principal-Agent theory (Jensen & Meckling 1976) is the theoretic basis for the optimum creation of contractual inspiration mechanisms as protection against opportunistic behavior when the private partner as contract client (Agent) has an information advantage over the public sector as issuer of the contract.

The Structuration Theory (Giddens 1984) serves to explain the formation of social structures such as, for example, partnerships or negotiations. From the many applications of the structuration theory in the organizational sciences, the recursivity of strategy and structure as well as the interorganizational networks are relevant for this research work.

Further scientific support for the model comes through a qualitative, empirical analysis through a realizability test that will be carried out by ten local authorities participating in the project.

Conclusion of the triangulation forms the synthesis of the theory-led, logically deductive model and the empirics in the form of a logically deductive analysis with regard to the intended resource-target relationship.

2.2 *Definition and structuring of PPP*

In the first step towards logical formulation of the PPP process model, the partnership cooperation must be defined.

According to the comprehensive and precise definition provided by HM Treasury (HM Treasury 2000), the term "Public Private Partnership" for the introduction of the PPP topic in Switzerland is defined as follows:

"Public Private Partnership describes a contractually formalized partnership interaction between public sector and private industry. The character of the process, which forms the partnership aspect thereof, is such that the complementary, possibly also diverging aims

of both partners can only be reached through a cooperation, i.e. only together and not without the participation of the other partner. The aims of the cooperation are, for the part of the public sector, the activation of private capital and/or know-how to relieve the strain on public budgets and/or to increase the efficiency of public works and, for the part of private business, to generate profits through the implementation of new areas of business and contracts, and thereby to provide a long-term guarantee for the future of the company."

A broad spectrum of possible types of cooperation is available to govern "Public Private Partnership" agreements in which a common goal must be the constitutional prime condition for a partnership. Available literature provides no uniform systemized version. International differences are also found here.

According to Merna & Owen (1998), the categories of a PPP can be divided into the "financially free standing projects", "joint ventures" and "services sold". Grimsey & Lewis (2004) describe the types of PPP as:

- BOT (Build Operate Transfer)
- BOO (Build Own Operate)
- Leasing
- Joint Ventures
- Operations or management contracts
- Cooperative arrangements

and others without systemization.

A typology will be developed for the systemization of PPP models within this research project on the basis of the comprehensive and precise definition from HM Treasury (HM Treasury 2000) and the systemization in contract and cooperation models according to Hintze (Hintze 1998) (Fig. 2).

As well as the constitutional prime condition for a partnership of a common goal, the PPP models with a partnership also differ with regard to the constituent features of a cooperation such as "ownership ratio", "degree of formal institutionalization", "observation of the performance function" as well as "observation of the financing function". The ownership ratios as well as the observation of the financing function dependent upon the contract and organizational models are shown in Fig. 2.

The types of cooperation or also the types of contract and organization differ above all with regard to the degree and the type of cooperation.

Outsourcing models based on contracts show the lowest degree of cooperation. Contract models are based on long-term contracts with increased cooperation aspects. They display a moderate degree of cooperation. The highest level of cooperation is shown in strategic cooperation models in which public-private companies are founded (Fig. 3).

The operator model in its conventional sense (Gabler 1997) is ideal as the contract and organization model for the PPP in street maintenance where

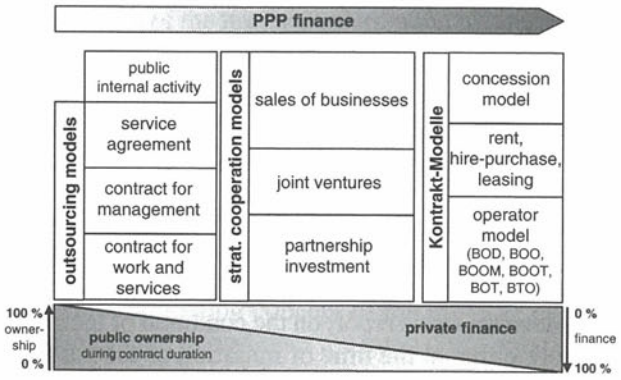

Figure 2. Types of contract and organization of a Public Private Partnership.

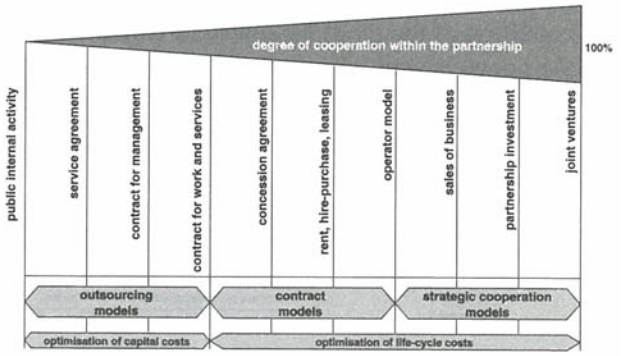

Figure 3. Degree of cooperation of the types of contract and organization of a Public Private Partnership.

the infrastructure is already in place. The street system remains the property of the public sector, which also continues to finance the maintenance work. The private partner is committed in the operator contract to increased cooperation, which forms a medium-level contractual cooperation.

2.3 *Process model*

After choosing the appropriate type of "Operator Model" contract and organization, the process model will be constructive-deductively developed in the second step.

The process sequence of a PPP in street maintenance, which is only concerned with service performance, the operation of the street network and not the building of roads, is shown in Figure 4.

The process model of a PPP can be constructive-deductively developed from the process sequence that is shown in Figure 5.

The process model contains the following phases:

- Concept phase
- Tender phase
- Award phase
- Contract phase.

2.4 *Concept phase*

The concept phase serves first of all to provide the basis for the contract. The basis of each and every cooperation consists of defined framework conditions i.e., a description of the scope of the contract with regard to a classification of the street network according to usage and operational classes as well as a definition of the minimum quality requirements for operational and constructional maintenance.

A detailed status report on the condition of the street network either at the time of initiation of the partnership or handover of the operation of the street network to the private partner belongs furthermore in the definition of the contract scope. The operational and street substance condition analysis is undertaken individually for each class of road; the development of the condition of the roads estimated by interpolation.

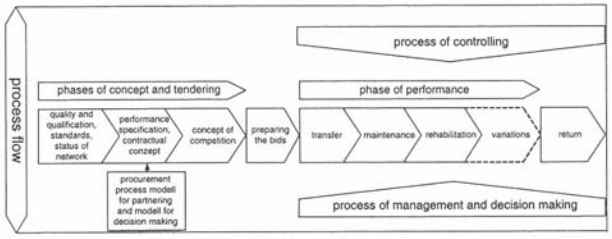

Figure 4. Process sequence of a Public Private Partnership in street maintenance.

Furthermore, the status report at the concept phase includes a general, qualitative observation of the constructional maintenance and repair (qualitative according to life expectation), the identification and classification of the street traffic systems, an estimate of their further development (qualitative according to life expectation) as well as long-term budget prognoses. Using this status report, the quality requirements for operational and constructional maintenance are described as a basis for the contract. In addition, the public sector must define the necessary qualifications of service providers.

On the part of the private company, the provider team must be put together and possible forms of cooperation with other companies and planners to complete the service must be organized in this pre-partnership phase.

2.5 *Tender phase*

The tender procedure runs in two stages; the prequalification phase and the actual tender.

The prequalification requirements of the provider team are divided down as follows (Girmscheid 2004):

- capacity and know-how of the planner
- capacity of the company with regard to staff and equipment/machines
- experience with various maintenance and repair techniques

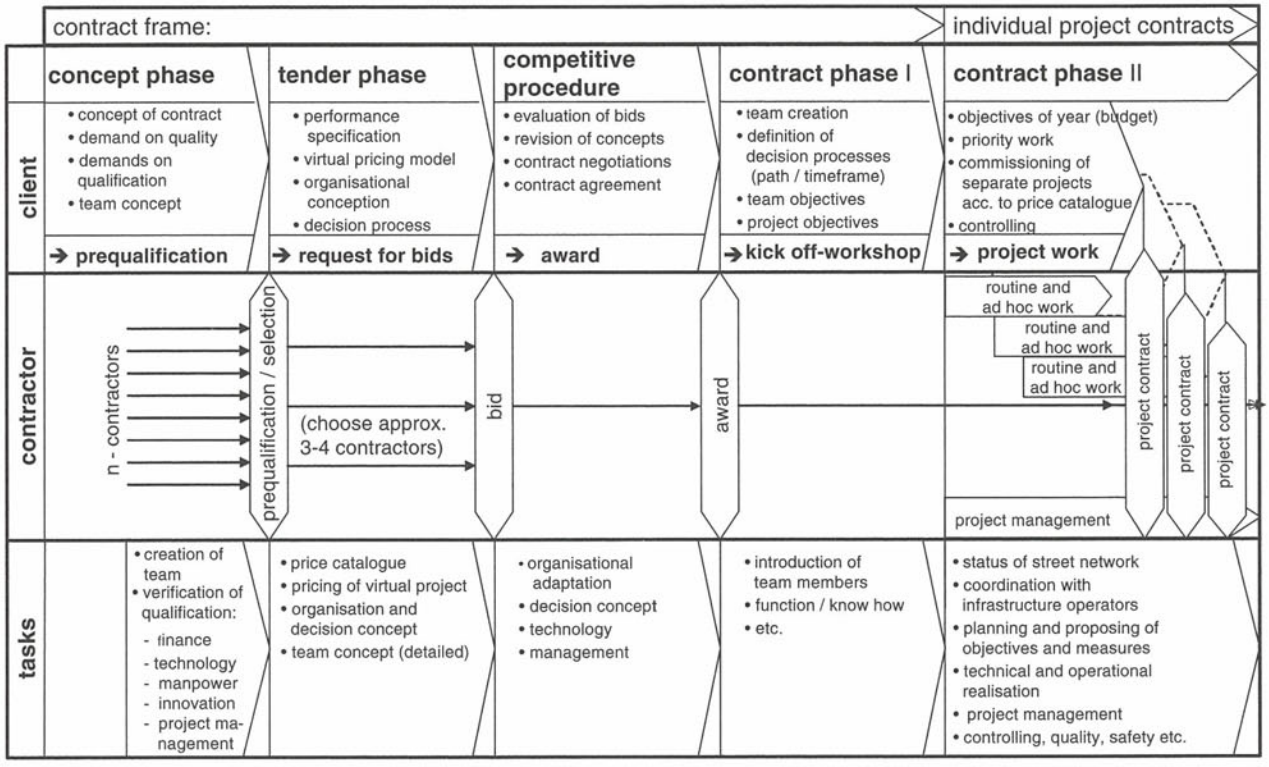

Figure 5. Process model of a Public Private Partnership.

– qualification of the project manager(s) and the work teams and their practical experience
– controlling concept of the cooperation team
– insurance and financial status of the team leading company.

The tender must include the following elements:

– general contractual requirements
– quality requirements and standards and guidelines etc. that are to be observed
– scope of works and works index for the creation of the price list
– concept for status determination of street network
– planning of works and their execution
– implementation of maintenance and repair measures, e.g. local repair measures
– planning of alternatives for maintenance and repair.

The payment concept is based on a combination of flat rates for routine works and flexible amounts for ad hoc works. To ensure cost efficiency, it is essential for the provider to develop a price list to be included in his quotation in which the conditions for ad hoc services are defined for the local authorities before they are utilized.

The price list contains prices for operational and constructional maintenance as well as management estimates. The local authorities can compare them in a virtual pricing model. The design of the pricing model allows a prognosis of the provision of virtual contractual services over a period of, for example, five years to be made, the prices for these services to be inserted and compared with one another. The comparison should take place over a range considering upper and lower limits. The result is obtained from the average. This procedure qualifies a meaningful price for a partnership.

A minimum annual budget for street maintenance can be agreed upon to mutually protect both partners. Within this minimum budget, the contractor must carry out periodic works and performed other tasks, which will be redefined each year by the local authorities. The advantage of this rule for the private partner is the reliable annual budget; the advantage for the local authority is the flexibility in provision of service. If unexpected events demand ad hoc measures, these can be ordered within the scope of the minimum budget, otherwise the agreed annual maintenance works will be carried out.

2.6 *Competitive procedure*

The "customer" within a partnership, as a rule the public sector, makes a qualitative evaluation of the quotations on the basis of the following criteria:

– the concept for organizational structure of the PPP cooperation as well as the concept for the decision process to decide upon and carry out the measures
– concepts of the project, environmental, work safety and quality management
– concept for the internal/external audit of organizational cooperation as laid down in the QM handbook, the decision processes as well as the project, environmental, work safety and quality management processes
– completeness of the price list
– total price of a virtual project
– virtual evaluation concept of the provider over the contractual period with the main cost centers.

The price alone is not the deciding factor when justifying the award of the contract and attaining the highest possible efficiency in the performance of a partnership.

The decision for a particular bid should therefore take place in a systemized and unbiased way on the basis of a cost-benefit analysis using the given weighting that can take, for example, the following aspects into account:

– 65% costs of the virtual project
– 15% organisation/process of decision
– 10% operational availability/users' safety
– 10% quality of street network.

2.7 *Contract phase*

The contract phase is shown divided into establishment phase and routine phase.

2.7.1 *Establishment phase*

If a PPP frame contract is concluded, it should state that

– the local authority and the provider team are partners;
– the local authority decides on the works proposed by the provider team;
– the drawing up of works takes place in a team, which consists of at least one representative each of the local authority and the provider team, and that the provider team is responsible for project management;
– the local authority orders the external audit and quality controls;
– a mediation process must be adhered to in the event of a dispute.

Monthly or quarterly flat rates can be used for the payment concept. Payment will be made according to progress on ad hoc and project contracts. The payments will additionally be influenced by a Bonus-Malus system which gives the private partner additional incentives. So, for example, the local authority can demand rent from the private partner for roads that are blocked or only partially useable during repair, so that the duration of repairs can be minimized.

A performance guarantee of the private partners should be agreed to the value of 5–10% of double the minimum annual turnover.

The duration of a partnership should be at least five to ten years in order to extract the potential of a partnership and to justify the increased costs of the transaction.

The only permissible reason for dissolving the contract should be a lack of trust in the partner in order to promote the long life of a partnership and to optimize the efficiency gains with regard to observation of lifecycles.

The following activities should be agreed upon at the beginning of the contractual period, in the establishment phase of the partnership:

- establishing a steering group consisting of decision-makers from all partners and infrastructure operators
- a Kick-Off workshop lasting 3–4 days after signing of the contract to:
  - permit team members to get to know each other
  - establish the procedures and decision-making processes
  - lay down the procedures and time periods for the solution of disputes
  - reach a common team understanding of the aims of the partnership cooperation
  - define common annual goals for the development of the partnership
- purchase of uniform clothing for the team (jacket with emblem) to identify team members
- establishing work schedules in follow-up workshops.

2.7.2 *Routine phase*

In the routine phase, the public sector controls the activities of the private partner, separately according to constructional and operational maintenance, for the establishment of a condition status report that is carried out by the private partner (contractor) under the supervision of the local authority.

The status condition report of the street network with regard to its constructional maintenance is split into network level and project level. The network level contains the long-term strategic decisions that must be taken, which will be prepared by the PPP company for the public sector. At the project level, specific works and projects are prepared by the contractor, proposed to the steering group and decided upon by the local authority.

The private partner must carry out the status condition analysis at project level and also prioritize and coordinate with other infrastructure operators during the lifetime of the contract in the routine phase.

2.8 *Constructional maintenance*

The status condition report at network level includes continuation of the general qualitative observation of the maintenance and repair (qualitative according to life expectancy), the identification and classification of street traffic systems, an estimate of the development of their condition (qualitative according to life expectancy) as well as long-term budget prognoses from the concept phase. The purpose of the substance status condition report at network level is to establish the annual depreciation of the existing street network.

The status condition report of the private partners for the constructional maintenance at network level includes a quantitative statement of the network quality and the selection of the projects. It takes place as follows:

- Status condition report and evaluation (quantitative current condition)
- Prioritization
- Causes of damage/identification of remedy proposals
- Establishing costs
- Coordination of other affected infrastructure operators
- Short and mid-term budget planning.

The purpose of the status condition report at project level is the generation of the necessary measures.

A fundamental economic concept for the constructional maintenance is that this is kept at 90% of the ideal condition and that 10% is held ready for efficient renewal works with other infrastructure operators.

The works plan for constructional maintenance assumes a rolling works plan for up to five years. This includes the acute and the mid-term works of the various infrastructure operators. Coordinated planning meetings will be held between the infrastructure operators both at short notice and also at regular intervals by the private partner (contractor).

The aim of the rolling works planning for the coordination of the infrastructure operators is to bring together the individual works that must be carried out within a timeslot over many coming years to a common point in time so that the best possible cost optimization can be achieved for all operators. Figure 6 shows the possible maintenance windows.

When coordinating the infrastructure operators, there are various options for optimization of costs, shown in Fig. 5.

Option 1: the maintenance needs of the street have priority. The work on the water and/or drainage pipes will be brought forward.

Option 2: the damage to the street will be repaired quickly and the fundamental renovation works timed to match the renovation of the water supply pipes. Works on the drainage pipes can be brought forward if necessary.

Option 3: work on the street and the water pipes will be put off, if necessary by temporary repairs, and synchronized with those of the water pipes.

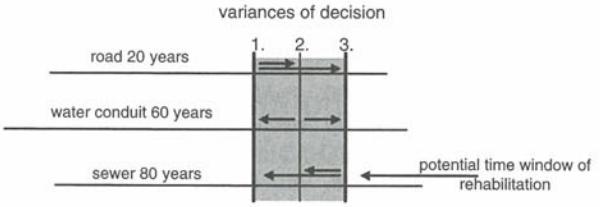

Figure 6. Coordination of the maintenance requirements of the infrastructure operators within a maintenance window.

The coordination of constructional maintenance works between the infrastructure operators provides, on the one hand, for a total optimization of the lifetime of the infrastructure (considering the total costs at the fragmented level of the different operators) and, on the other hand, for coordination of the works with the operator's budget planning so that concrete projects can be decided upon.

A distinction must be made between long-term works that can be planned and ad hoc works, the concrete service breakdowns. The operator of the service interruption remedy resources must meet the cost of these. The responsible infrastructure operator is obliged to inform the other infrastructure operators so that possible concentrated works can be carried out.

2.9 *Operational maintenance*

Prioritized quality standards for the cleanliness and the operational availability of the street network must be defined by the public sector for the condition status report of operational maintenance.

The services to be provided in operational maintenance include ad hoc and periodic works. The ad hoc works have natural causes (snow, rain, etc.), human causes, are planned events (street and town festivals) or unplanned events (accidents, spontaneous events). Periodic works include cleaning, gardening etc.

The control of periodic works takes place at regular time intervals but rather output-oriented according to contractually defined quality standards. In this way the contractually agreed cleanliness standard of the roads can be governed by a cleanliness index. The cleanliness is given a different priority according to the category of the road. Checks of cleanliness take place at irregular intervals by the public sector according to an evaluation manual that has been defined by both partners.

The private partner provides the condition status report and also proposes yearly targets and their budget, performs routine and ad hoc works as well as the contracted works for constructional maintenance. Further tasks of the public partners are the evaluation of the yearly targets, establishing the works to be ordered and the budget as well as checking the work carried out (which can be delegated to engineering companies).

3 CONCLUSION

The results of the research project show a high value in practice in making available recommendations to local authorities in Switzerland to reduce the complexity and uncertainty of the partners involved. The participation of the ten Swiss local authorities in the research project was doubly useful here.

On the one side, such maintenance concepts of local authorities will be generated so that benchmarks can be established to be able to prepare an economic comparison between the public internal activities (public sector comparator (PSC)) and those of a partnership as well as to investigate the potential available for optimization in the management of risks. This is the subject of a separate publication (Dreyer & Girmscheid 2005). The PPP process model shown here on one hand procedurally governs the processes, with regard to their content and their duration. In addition, it provides the fundament of a symbiotic value and target strategy for the participants. Further, the model will be checked by those responsible within the ten participating local authorities with regard to its practicality and a quantitative empiric questionnaire will be carried out amongst the decision-makers covering the necessary criteria for the project frame.

On the other side, the research results flow directly into local government and back to those responsible. This transfer is ensured in practice by the participation of the sponsors (a construction company, a consultant and the Association of Swiss Towns (*Schweizerischer Städteverband*)).

The process model of a PPP for street maintenance can be transferred when designing process progression in other areas and, if necessary, adapted to meet the relevant requirements. This provides material for further research projects.

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