SPENDING REVIEW MOBILITY

REPORT 2021

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Summary

The Brussels Cabinet of Mobility and Public Works is competent for the administration of road infrastructure in Brussels: 331 km of regional roads, 92 bridges and flyovers and 30 tunnels. 199 million euros is spent yearly on the maintenance of infrastructure and the construction of new projects. Managing infrastructure is a complex task given the relatively big scale of some projects, but even more so in Brussels because of the institutional complexity and the heavy administrative procedures. In addition, there is an ambitious multiannual investment plan for the tunnels and a historic backlog of road maintenance that are threatening to derail the budget.

This spending review was focused on the Brussels road infrastructure managed by the Brussels region. This means regional roads, flyovers, bridges and tunnels. The policies it addresses are maintenance as well as new infrastructure projects, with special attention to the policy instruments that are used and public procurement. The review explores alternative solutions for these issues on the infrastructure policy side and possibilities for lowering costs by exploiting synergies with and or benchmarking against maintenance costs of communal and regional infrastructure.The objective of this review is to improve the efficiency and effectiveness of the road infrastructure policy design and implementation. The central focus of the spending review is identifying actionable policy options addressing the challenges identified above.

The spending review identified policy options for budgetary savings along four lines: prioritization of infrastructure (maintenance) projects, efficient procurement procedures, efficient insourcing of maintenance activities, and efficient use of road infrastructure. These options should all be viewed as options additional to the no policy change scenario. However, the no policy change scenario comprises already a number of policy measures to save costs which recently have been or are currently being executed (see appendix 2 for an overview). Finally, there is one new proposal for cost savings by revising the maximum threshold of electricity use in the tunnels, which could save 0,5-0,7 mln euro yearly.

With respect to *prioritization of infrastructure (maintenance) projects*, we propose to classify the different projects into one of the three main categories using an effectiveness-cost ratio. This ratio uses a weighted average consequence score (effects on mobility, durability, natural and economic environment) per project, divided by the project costs. For bridges, the study measuring the consequence scores has already been carried out. Our proposal is to start a similar study for tunnel maintenance projects, following the same approach as was used for the evaluation of the bridges. The results of this study can be used to prioritize projects in three main categories, namely K_1 (potential risk of collapse, urgent renovation required), K_3(no substantial problem) or K_2 (a structural problem exists, but no action is needed in the short run). K_1 projects should be carried out immediately, and the effectiveness-cost ratio should determine how to prioritize the K_2 projects. At present, there are no big new infrastructure projects in the BCR to be evaluated ex ante. If there were any in the near future, we advise to conduct SCBA and in case non monetisable effects become also relevant, it may be useful to complement the SCBA with an MCA.

With respect to *procurement* some recommendations are :

- To use a standard procurement strategy and drafting process, wich will contribute to a standardized project approach with regards to design, which will significantly improve predictability of project results and risk mitigation ;

- Secondly, adding contractual responsibility of different contractual phases can and will contribute to the alignment of public and private interests and therefore may contribute to a more efficient operation, given the payment mechanism will be adapted accordingly. Including maintenance in infrastructure projects provides an incentive for the contractor to oversee the whole project cycle instead of optimizing only for the lowest construction cost and will provide incentive to reduce the chance of failing of the specific type of infrastructure. This is for example useful in the case of the construction or full renovation of a tunnel ;
- One step further is combining finance in infrastructure projects in order to fill the funding gap; BM may look for additional sources of infrastructure funding besides its own public funding by means of private finance and/or Public-Private Partnerships (DBFM and ESCO-contracts). Before entering in these PPP-contracts, it is important to additionally assess the value for money. Financing will make the project more complex and will add related costs. A public-private-comparator (PPC) will provide insight if these extra cost will be recovered by the extra value for money that the financing option will generate ;
- Strategic stakeholder management, aimed at building trust for the results and consequences of a project by early and adapted communication with the relevant stakeholders, has proven successful for a large number of projects. This approach has led to a more predictable project result for all parties involved, including the contractors, and thus to a reduction of subsequent discussions and related sunk costs and/or need for costly contract variations ;
- An option to create more economies of scale and market power in procurement is increasing cooperation between public entities responsible for tendering. In this respect, it may be useful to refer to what has happened for instance in the sector of higher education in Flanders, where so-called 'Associations' have been established in 2003. The main advantages of establishing such a cooperation are: (1) simplification of procedures, (2) more efficient use of expertise across the members of the Association, (3) creating economies of scale for contracting works and thus increase bargaining power, (4) creating more uniformity towards contractors and (4) legally secure contracting ;
- Finally, a Competitive Dialogue Procurement Process can provide a better alignment of public and private goals, than the classical lowest price open tenders on a written basis. The expectation gap of these kind of procurement processes tend to be quite large. A Competitive Dialogue Process will provide a better alignment of the public and private goals, as a better exchange of information and especially views on the execution of the contract can be achieved, and can be adapted for tender cost to the size of the contract to be procured.

With respect to *efficient insourcing*, there is scope for insourcing of a specified set of activities; opportunities for insourcing exist for small, simple and repetitive tasks related to road maintenance and renovation. As part of this spending review, a preliminary cost-benefit calculation has been made of possible efficiency gains as a result of insourcing a number of activities (see appendix 1 for a list). In a purely budgetary point of view, it would make sense take into account the lower VAT payments resulting from re-insourcing the activities that had previously been outsourced. In this view the only effects that count are the effects on the budget of the BCR. In that case a possible saving for BCR by re-insourcing these activities lies in the order of 4,8-5,4 mln euro, depending on which activities are insourced. The corresponding economic gain at the level of Belgian economy (excluding the lower VAT payments as those imply less government revenues at the central level) is around 3-3,4 mln euro.

Finally, *road pricing* has been put forward by transport economists as a solution to bring demand for transport and supply of capacity in equilibrium. Not only can road pricing become a new source of income, also the burden on the existing infrastructure may be alleviated as demand for traffic is expected to decrease when road pricing will be introduced. The Brussels Coalition Agreement 2019-2024 states that road taxes must be reviewed to enable better use of the car while ensuring that it does not have negative social consequences. Traffic taxation is an instrument that will be used to achieve the objectives set by the Region. To this end, the Government reaffirms its desire to conclude a cooperation agreement between the Regions with a view to the introduction of an intelligent kilometer charge for light vehicles in the metropolitan area or throughout the national territory (*SmartMove* project).

1. Introduction

1.1 Background and scope

The Brussels Cabinet of Mobility and Public Works is competent for the administration of road infrastructure in Brussels: 331 km of regional roads, 92 bridges and flyovers and 30 tunnels. 199 million euros is spent yearly on the maintenance of infrastructure and the construction of new projects.

Managing infrastructure is a complex task given the relatively big scale of some projects, but even more so in Brussels because of the institutional complexity and the heavy administrative procedures. In addition, there is an ambitious multiannual investment plan for the tunnels and a historic backlog of road maintenance that are threatening to derail the budget.

It is clear those policies can be better implemented: more efficiency, better control of costs, better foreseeability. A spending review could be a useful tool to improve efficiency and cost management.

More concretely, the main problems can be summarized as follows :

- Budget problem: for instance, according to the multiannual investment plan for the renovation of the tunnels, the budget will have to structurally increase in the coming years by almost 40%. This raises questions regarding policy design (cost-benefit analysis with regards to policy objectives) ;
- Efficiency problem : questions were raised regarding the efficiency of the implementation of mobility infrastructure policies in terms of
    - type of policy instruments, like fixed price fixed term contracts[1]
    - procurement processes
    - budget planning and monitoring

This spending review was focused on the Brussels road infrastructure managed by the Brussels region. This means regional roads, flyovers, bridges and tunnels. The policies it addresses are maintenance as well as new infrastructure projects, with special attention to the budgetary process of those policies, the policy instruments that are used and public procurement. The review also explores alternative solutions for these issues on the infrastructure policy side and possibilities for lowering costs by exploiting synergies with and or benchmarking against maintenance costs of communal and regional infrastructure.

Scope in term of budgets involved :

- Infrastructure spending : 199 million euros
    - Tunnels: 107 million euros
    - Road maintenance: 50 million euros
    - New infrastructure projects: 42 million euros
- Fixed-price annual contracts: 201,8 million euros
  (inc. 22 million euros for tunnels, 50 million euros for road maintenance and 28,8 million euros for new projects)
- 76% of the total budget of the Regional Ministry of Mobility, Brussel Mobiliteit (“BM”)
- 23% of the total budget for mobility and public transportation of Brussels Capital Region.

[1] Fixed price contracts are a type of framework contract for the execution of public works valid for a given period. It is probable that the way fixed price contracts are used is not the most optimal method.

In the following years this budget is expected to rise significantly. For example, the budget dedicated to the tunnels is expected to grow with 37% to reach 147 million euros in 2021.

1.2 Objective of the review

The objective of this review is to improve the efficiency and effectiveness of the road infrastructure policy design and implementation. The central focus of the spending review is identifying actionable policy options addressing the challenges identified above.

It should be noted that in order to successfully coordinate the many aspects of asset management the implementation of a system of direction and control (a management system) is key. This management system needs to create a combination of specific interacting elements that provide direction, alignment, coordination, control and most important continual improvement in the effective management of assets. The combined effect of these elements will deliver performance and assurance of a 'competent' level of asset management according to the international standard ISO 55000 and 55001. The implementation of an asset management system is not part of the scope of this document, however it is considered a missed opportunity not to address that an asset management system incorporates de following aspects of asset management decision-making: capital investment, operations and maintenance, lifecycle cost and value optimisation, resourcing strategy and optimisation, shutdowns and outage strategy and optimisation, ageing assets strategy.

1.3 Methodology

Administration and experts applied various methods in this review to arrive at this report. In general, a mix of desk research of relevant (academic) literature, policy documents and other relevant data and document provided by BM, interviews and workshops with the experts of BM was used. The prioritization of the maintenance projects was based on a cost-effectiveness analysis (see section 2 for a description).

1.4 Structure of the report

The report is structured in two main sections. Chapter 2 of the report describes the current situation and problems on four dimensions: prioritization of infrastructure maintenance projects, procurement procedures, in- and outsourcing of works and the balance of supply and demand for infrastructure. Chapter 3 describes policy options on these four dimensions and their pros and cons, and if possible quantifies possible efficiency gains.

2. Identifying possible efficiency gains in maintenance projects

Four main routes toward more efficiency in the maintenance projects were identified and explored. In the first place we have looked at possibilities to improve the prioritization of infrastructure (roads and tunnels) maintenance projects (2.1). Secondly we explored possible efficiency gains by changes in the procurement of these projects (2.2), and thirdly possible efficiency gains by insourcing of activities were explored (2.3). Finally we analyze road pricing as a way to increase the efficiency of road usage and a possible source of income.

2.1 Improving prioritization of maintenance projects

The projects that Brussels Capital Region (BCR) currently has to finance can be classified into three main categories: (A) renovation of tunnels, (B) renovation of roads and (C) new infrastructure projects. At present the gap between the infrastructure needs (particularly in terms of renovation and maintenance) and the available funds (i.e. the budget) is becoming increasingly large. Hence, it is becoming of utmost importance to define clear priorities as to the projects to which budgets should be allocated first. In addition, it may be useful to think about new sources of income or explore alternative solutions to infrastructure financing so as to increase the amount of funds available to better match the infrastructure needs of the BCR in the future.

Evaluation methods for projects

Several methods for the evaluation of projects exist. These have been described in a large body of literature and have been applied in many practical case studies. In *Social Cost-Benefit Analysis (SCBA)* all effects (in terms of increases or decreases in utility levels) are taken into account, irrespective of the actor in society to whom these effects accrue. Benefits and costs are valued in money terms, based on 'consumer willingness to pay' (WTP). The difference between benefits and costs (i.e., the net benefits) can be seen as the contribution to societal welfare (i.e., indicative of efficiency).

In *Cost-Effectiveness Analysis* (CEA) project alternatives are evaluated in terms of their effectiveness in achieving a predefined policy goal as well as in terms of their budgetary cost-efficiency in achieving that objective. The political objective itself is not submitted to a formal evaluation, rather CEA takes the political objective as given and selects the project alternative that enables achieving this objective at the lowest budgetary cost possible.

When the effectiveness of the political objective cannot be measured using one single criterion or when multiple effects need to be taken into account and evaluated, *multi-criteria analysis (MCA)* can be used. MCA structures a complex decision-making problem by evaluating a number of project alternatives in terms of their contribution to a set of criteria. These criteria can be expressed in various heterogeneous units and do not need to be expressed in money terms. The criteria are derived directly from the policy makers' objectives and do not result from consumers' WTP. When multiple stakeholders become relevant in the decision-making context, the set of criteria can be structured in such a way that one can measure to what extent a project alternative contributes to stakeholder objectives (as measured by stakeholder criteria), as in 'multi-actor multi-criteria analysis' (MAMCA). For projects that constitute a so-called 'swollen middle' whereby a large part of the effects can be evaluated in money terms, but where a number of non-monetisable effects are also relevant, the MCA can take the form of an 'eclectic MCA', which integrates the monetisable effects measured in a SCBA and the non-monetisable effects into a single MCA.

A decision-making problem, whether addressed using, MCA, SCBA or CEA, can be formulated as a *selection problem* where one alternative (or a shortlist of alternatives) has to be selected from a large set of alternatives, or as a *classification problem* where alternatives have to be assigned to a number of a priori defined classes (e.g., those that pass; those that fail; and those needing further analysis), or as a complete *ranking problem* where the entire set of alternatives has to be ranked from the best to the worst alternative. In B. Roy's (1985, 1996) terminology, these are referred to respectively as an 'α, β-, or χ-problématique'. Later on B. Roy added a fourth type, namely the 'δ-problématique' whereby the consequences of the alternatives are just described in a formalised and systematic manner (i.e., using criteria) and presented as such to the decision maker.

More information on the different evaluation methodologies described above can be found in the literature, e.g., Boardman et al. (2011) for SCBA, Levin (1983) for CEA and Belton and Stewart (2002) or Pomerol and Barba Romero (2000) for MCA as well as in De Brucker et. al. (1998) or De Brucker et al. (2011) for a general overview of SCBA and MCA.

The research paper (book chapter) by Macharis, De Brucker and Van Raemdonck (2018) contains a short overview of the methods together with a decision tree guiding policy makers and analysts to decide which methods to use in which specific decision-making context.

Evaluation method for prioritizing maintenance projects

The tunnels in the BCR were built by the federal government about half a century ago to accommodate the increasing mobility needs at that time. In the nineties they were transferred to the regions and in the case of Brussels to the BCR. At present, these tunnels attract a lot of traffic, cause a lot of congestion and are in need of structural renovation.

The opportunity to close some of the tunnels was not taken as a hypothesis because we start from the current situation, i.e., the 'is-situation' whereby possible major policy changes that may occur in the future (so as to move to an 'ought situation') are not taken into account yet. Moreover, there are no studies on the overall impact of such a decision yet. The tunnels were built half a century ago and need to be renovated. Hence, their fundamental desirability (e.g., based on SCBA) was not called into question in the present spending review. However, the option to close some of the tunnels could be part of the implementation of the so-called Good Move plan (aimed at drastically reducing the number of cars in the city) but requires further studies to determine which tunnels would remain useful in the context of such a change in structural policy. In that case, SCBA could play a role in the phase of analysis as part of a much broader decision-making methodology to determine which tunnels would still remain useful within such a structural policy change.

A key reason why conducting a full-fledged SCBA is not the most urgent policy line to be followed at present, is related to the fact that SCBA is based on consumer WTP, which will at present be very high and yield SCBA results that are almost certain to be positive. The tunnels, which were built half a century ago, have induced structural changes in the travel behaviour of commuters (coming from peripheral zones, both from outside the BCR or from within). As a consequence of easy and fast mobility between the peripheral zones of the region on the one hand and the city centre on the other hand, many commuters decided in the past to live in the peripheral zones and to travel by car to the city centre. These people have invested in real estate in the peripheral zones and have built up a social network there. Hence, confronted with a hypothetical or potential closure of the tunnels, these people will exhibit a large WTP for renovating the tunnels, when measured for a SCBA. This aspect is especially important regarding Brussels residents in the peripheral zones of the Region. The time savings analysts will find in such a SCBA will be very high, as the present commuters will – in the short or medium run – not have many other opportunities than to continue travelling by car and

avoiding to use the tunnels (i.e. using the surface roads and normal level crossings). By way of metaphor one could say that these commuters are affected by a so-called 'hold-up' problem. Shifts to public transport or moving closer to the place of work (or looking for jobs closer to the place of living) will not occur in the short run (or only to a limited extent). In fact, path dependence and lock-in have occurred.[2]

For these reasons, the fundamental desirability of renovating the tunnels is not called into question in this study. Moreover because budgets for renovation are limited, it is advisable to carry out a type of Cost-Effectiveness Analysis (CEA), or when the effectiveness criteria become multiple, a type of Multi-Criteria Analysis (MCA).[3]

Hence, we propose the following methodology for the renovation of the tunnels in the BCR.

In a first round, a classification of renovation projects needs to be made. Here, renovation projects will be classified into three Categories (K_1, K_2, K_3) as proposed in the β-problem formulation type (β-problématique) of B. Roy (1985, 1996).

- K_1 comprises those projects (i.e., tunnels) where a potential risk of collapse exists in the short run and where renovation is urgent.
- K_3 comprises those tunnels where there is no substantial problem in the short or medium run and where no action in the short or medium run is necessary.
- K_2 (i.e., the middle category) comprises all the other tunnels, i.e., those where a structural problem exists and where renovation is necessary at least in the medium run, but where there is no risk of collapse in the short run.

A brainstorming meeting with experts will be necessary to derive the criteria to classify the projects in one of these three categories. Given such classification, for each project in a particular category a full information card ('projectfiche') will be needed that describes the project, its cost and the scores on the relevant criteria (e.g. number of cars passing through the tunnel per day or per year).

In a second round, a complete ranking of projects included in K_2 will need to be performed. For establishing this ranking, we propose to use CEA. For the purpose of this CEA, one effectiveness measure will need to be defined. Alternatively, if multiple effectiveness measures become relevant, the CEA can evolve into an MCA.

Based on CEA, the projects will be ranked based on an effectiveness-cost ratio (ECR), as shown in (1) :

$$ECR = \frac{\text{Effectiveness}}{Cost} \qquad (1)$$

In order to derive the actual Effectiveness measure, a discussion with experts (engineers, economists, environmentalists etc) will need to be organized, but one criterion that we already have in mind to be used for this purpose is :

- C_1 : the number of cars passing through the tunnel

[2] 'Path dependence' and 'lock-in' occur when past decisions (or courses of action) still constrain the set of feasible alternatives in the context of a present decision (or action) even though the past decisions may no longer be relevant now. Past events may have triggered particular courses of action that, once introduced, can be almost impossible to reverse. In short: 'history matters'.

[3] B. Roy (1986) followed a similar approach for the renovation of Paris metro stations. Since the issue was more complex there (metro stations have more functions and different types of users), the ranking was performed using MCA (B. Roy, M. Présent, D. Silhol, 1986, A programming method for determining which Paris metro stations should be renovated, *European Journal of Operational Research*, 24(1986):318-334).

Additionally, the level of inconvenience caused by having traffic using the level roads (in case a tunnel needs to be closed for a longer period of time) must also be taken into account as a second criterion (C_2).

Beyond the two above elements, a structured brainstorming meeting with experts will be necessary to shed light on the most adequate set of criteria to be used for ranking purposes, and to determine whether it will be possible to capture the relevant information in the format of a single criterion or whether multiple criteria will be needed.

In case particular projects (within K_2 or even within K_1) would be so large that they would require a very large share of the available budget, it might be necessary to treat these projects as a separate category. The decision whether to implement such projects would then be addressed separately, e.g., by investigating the feasibility of a Public-Private Partnership construction.

In more general terms, given the possibly large gap between the costs of renovating and maintaining tunnels and the available budget for such work, it may be useful to contemplate solutions that can result in additional sources of income. Road pricing has been put forward as a structural and sustainable solution by many transport economists. Road pricing can be designed in such a way that it is fiscally neutral (i.e., so that the sum of the variable fees paid by users do not exceed the sum of the fixed retributions paid by car drivers at present). Alternatively, road pricing can also be designed so that it generates extra income for the road authority (regional government). The latter will be the case when the income from variable fees that car drivers will have to pay exceeds the level of the present fixed retribution, e.g., because the extra comfort offered to car drivers (reduction of congestion and travel times) makes them willing to pay more overall.

Politically, the introduction of road pricing is not straightforward in Belgium at this point in time. However, on the regional level –and in particular in the BCR– the political context (and the economic needs) may be different from the rest of the country. The introduction of road pricing could be linked to the necessary renovation of the tunnels, thereby generating a positive psychological effect. In fact, road pricing in Brussels could be strategically positioned as ‘a tunnel contribution’ or a ‘tunnel tax’. This would make it much easier to meet socio-political acceptance, especially given that in many other jurisdictions a fee must be paid when using large tunnels or bridges (and even in Belgium this is the case for the Liefkenshoektunnel under the river Scheldt North of Antwerp).

Methodological approach for the renovation and maintenance of roads in the BCR

The methodology can be similar to the renovation and maintenance of tunnels (see section 2.2).

Methodological approach for the implementation of new projects in the BCR

To address the efficiency of new projects, if there are any, it will be necessary to conduct SCBA. This means that all relevant effects need to be valued in money terms. In case non monetisable effects also become relevant, it may be useful to complement the SCBA with an MCA. In the MCA, the effects can be expressed in physical terms or even in qualitative terms. Such an ‘eclectic’ MCA makes it also possible to include strategic objectives considered relevant by policymakers.

When stakeholder resistance to particular projects is expected to be significant, it may be useful to structure the MCA so that the extent to which project alternatives do contribute to stakeholder objectives, can be measured. Based on this information, project alternatives can be redesigned so that they would fit better with stakeholder needs; this may increase the chances of successful implementation of these projects.

In case the implementation of a new project would have a substantial impact on the operating or maintenance cost of an existing project, such interaction effect between both projects would need to be addressed.

2.2 Procurement procedures in the Brussels Capital Region

Due to the nature of the needs of the MAINTAIN service, almost all maintenance activities are procured in framework agreements, sometimes subdivided into lots, sometimes open to municipalities and areas of police. A list of the contracts in progress in 2021 is attached in the last table in appendix 1, showing the type of contract (works, supplies or services), the description, the annual budget (€ incl. VAT) and whether it has been established in the form of an framework agreement or not. In sum, a worth of around € 90 mln in maintenance projects is procured by MAINTAIN on a yearly basis, almost all within framework contracts.

Framework agreements

As general rule BM uses framework agreements for design, (traffic) studies and all maintenance activities.

Article 2.35 ° of the law of June 17, 2016 on public contracts, specifies the definition of a framework agreement; the agreement between one or more contracting parties and one or more economic operators aiming to establish the terms governing the contracts to be awarded during a given period, in particular as regards the prices and the quantities envisaged.

The framework contracts are being tendered in an open European tender on the basis of lowest price or relevant set of prices.

A framework agreement is therefore a public contract which can be envisaged in two stages :

1. The signing of the framework agreement which results in a "preselection" of one or more companies (economic operators) most able to meet the need. This "preselection" goes beyond the simple application since it concerns the application and the offer ;
2. The contracting authority then places orders with or without a new formal tender (depending on whether the framework agreement results in the selection of several or a single economic operator) by issuing a purchase order or subsequent contract.

The framework agreement allows the contracting authority to manage its orders according to its needs when it does not know at the time of the market launch the extent and frequency of occurrence of its needs. We therefore have a range of prices to meet any need linked to a defined type of service and over a given time (in principle, a framework agreement has a maximum duration of 4 years).

BM sees as main advantages of framework agreements the flexibility and speed, and the administrative simplicity once the framework agreement is in place :

1. Flexibility :
    - More flexibility - speed of ordering and therefore absolutely necessary interventions in a dense region ;
    - More budgetary flexibility ;
    - Possibility of delaying or canceling the execution of an order not yet made in order to take into account unforeseen events or the coordination needs of the sites, without being liable for compensation ;
    - Imposition in the specifications of a non-exclusivity, it is therefore possible for the adjudicator to appeal to it or not.

2. Administrative simplification :
    - The adjudication procedure does not have to be repeated for each order ;
    - Reduced risk of recourse ;
    - Easier budget management.
3. More comprehensive monitoring of needs and economic management :
    - Monitoring of needs from year to year.
4. Saving of time by achieving a single large market instead of several specific smaller markets :
    - Recurring market, so we can base ourselves on previous markets for monitoring needs and unit prices ;
    - Less risk of recourse because this type of recurring contract is well mastered and the most important award criterion is the price ;
    - Dealing with unforeseen events such as covid and limiting the claims that some companies may require since the PA has no obligation to order ;
    - Possibility of integrating damage (damage caused by road users and bad weather) ;
    - Assumed quantities therefore no fixed quantities (the quantities listed are based on an analysis of needs in our previous markets); the quantities paid will be those actually implemented and therefore the non-payment of the 10% compensation in the event of a non-ordering of a bill of quantities ;
    - Contract renewable up to 4 years therefore cancellable if deviation or if the third party does not give satisfaction without having to negotiate the end of a contract (as long as the minimum amount of orders has been ordered, no compensation is due) ;
    - Budget control with the establishment of minimum and maximum amounts (specificity of BM) not to be exceeded but which allows only the minimum amount to be committed and not the amount of the offer (which is close to the maximum amount) ;
    - Possibility of amendments.

Disadvantages

- Unit prices set for 4 years but we are only committed for a minimum amount, so we do not have the obligation to go to the end of the market if we notice any deviations and that without compensation ;
- More complex drafting of this type of contract with very large quantities / inventories. There may be a risk of being forgotten when they are not recurring and must be upgraded via endorsements ;
- Unit prices of certain items could be inflated when bidders know our needs -> careful analysis of offers and unit prices but we have the experience ;
- The irreducible costs, which are normally spread over all positions, can only be set on certain more remunerative positions, so care must be taken in the breakdown of these and in the comparison of unit prices ;
- Large markets therefore often in Europe where the constraints are more important ;
- Less competition for large, complex markets (because they are multidisciplinary).

Special contracts

Large renovations and new projects are mainly tendered out by an open process on the basis of lowest price. The project's design and execution methods are largely prescribed by the principal. The responsibilities of the contractor are limited to executing the works, suggest optimizations and/or issue warnings on the basis of design errors.

Advantages

When making decisions on early contractor involvement (design) the specific situation on the possibilities of appeal against permits has to be taken into account. There is no stepped approach with regards to the decision making process of permits. This results in larger risk than in a lot of European countries with regards to the permit risks, putting limitations on early contractor involvement.

Furthermore, as stated below, within the project, a lot of different stakeholders have to be taken into account. The stakeholders mostly want to know in detail which type of design and materials will be used for the project. This requires a rather detailed design.

The given contract type provides give the opportunity to get a permission and/or project consent on the basis of the detailed end result, thus limiting the risk that during a design and build phase with a contractor variations have to be negotiated resulting from additional requirements from the permit-process.

Disadvantages

In practice this procurement method often results in strategic behavior by the bidders. The bidders will hand in low bids, on the basis of the expectation of gaining revenues claims and variations. These claims and variations resulting from flaws in the contract, specifications or expected occurrence of risks.

These claims and variations will have to be discussed while executing the works, leading to cost overruns and delays. As these variations and claims are necessary for the contractors profit they cannot be avoided.

Furthermore this type of contract needs strict supervision in order to avoid the contractor cutting corners; sometimes not even just to make more profit, but simply in order to make up for the fact that they had to hand in a competitive price to win. In any case the contract itself doesn't inherently stimulate the contractor to deliver the best result for the principal.

Contracting authorities

In Belgium different regional governments are responsible for the construction and maintenance of regional roads and other infrastructures (Flanders, Wallonia, Brussels). Local infrastructure falls under the competence of the municipalities. As a consequence, each single government has its own procurement procedures and also technical standards differ from one region to another.

For the Brussels region the wishes of 19 communities have to be taken into account. For a regular project this implies at least 3-5 communities. These communities retain full sovereignty. This implies that works only can be carried out when the communities are fully in agreement. The region doesn't have full power of attorney in this respect, which means they cannot overrule the communities.

For instance, the three regions each use their own typical Specifications (Fr.: '*cahier des charges*') for road works (*Standaard Bestek SB 250* for the Flemish region, the *Cahier des Charges Type CCT 2015* for the Brussels region and the *Cahier des Charges Type Qualiroutes 2021* for the Walloon region). This means that companies who participate in a tender have to comply with a variety of standards. This diversity acts as a cost-driver for the companies participating in such tendering procedures. Standardisation of these procedures and standards would increase efficiency and lower cost.

The Brussel contracting context has to account for a rather large number of contextual risks. A large number of interfaces have to be managed, with other contracting authorities.

Another aspect to take into account is the large political and economic diversity of the communities, which makes it difficult to accommodate the requirements of all stakeholders.

The 'Ordonnance coordination des chantiers' had as a goal to prevent breaking up the soil of the public space too frequently for different types of repairs or realization works. It limits the possibility to work in certain locations as it requires projects to plan ahead for 5 years in order to fit in the coordination plan.

On the other hand, the public entities responsible for launching the tendering procedures (i.e., the regional governments as well as the municipalities), each have to set up their own specific tendering departments and invest in the acquirement of specific know-how. For example, each public entity (region or municipality) controls the tendering procedures for the renovation of the roads that are part of the network they are responsible for, and sometimes this is even done through separate specific economic actors, like Sofico for the Walloon region. Sofico is a separate actor that does not belong to the Walloon region. Not only does this increase the overall administrative cost of these entities, but it also makes that the available know-how is much more dispersed and fragmented. Moreover, it limits the bargaining power at the government side, as demand in the tendering procedures is fragmented and sub-scale, thus increasing the relative bargaining power of the supply side.

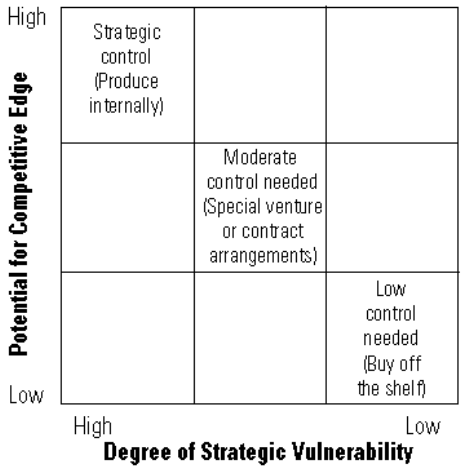
2.3 Outsourcing decisions in the Brussels Capital Region

The literature on whether outsourcing is an advisable solution in strategic management or not is quite rich. The basics of this literature goes back to Nobel-prize winner Ronald Coase's seminal publication (1937) on transaction costs. Transaction costs refer to the total costs of participating in a market, and includes the cost of identifying the input needed, contacting the providers of these input and negotiating with them, deciding which provider to choose, concluding contracts with one or more providers, monitoring whether contracts are carried out correctly, after-sales communication, resolving disputes during the contract, if necessary enforcing the execution of the contracts (sometimes even through legal action), and sometimes also the cost of changing plans and renegotiating contracts. For complex transactions (e.g. those that cannot be easily defined or captured into a contract), transaction costs are usually higher compared to standard or routine transactions.

According to Coase (1937) companies will tend to follow a cost-benefit approach to outsourcing, i.e., they will outsource their activities when the transaction costs associated with outsourcing them are lower than the cost savings (e.g. those due to economies of scale) resulting from outsourcing them.

In addition to this so-called 'tactical approach' (based on a cost-benefit analysis) as described above, other authors like Diromualdo and Gurbaxani (1998) and Quinn and Hilmer (1994) have identified a number of strategic reasons that may drive companies to outsource their activities. These strategic reasons may be clustered according to two dimensions, namely (1) the potential for achieving a competitive edge by performing an activity internally and (2) the degree of strategic vulnerability when activities are being outsourced. These two dimensions, which are also described at large in Houthoofd's (2011) book, can be illustrated as shown in Figure 2.

Fig. 2. : Competitive advantage vs. strategic vulnerability related to outsourcing decisions (Quinn and Hilmer, 1994)



When the potential for a competitive edge by performing an activity internally is high and at the same time there is a high potential for vulnerability when activities are being outsourced, then it is better for the company to produce these activities internally (as shown by the upper left square in Fig. 2).

When activities create little opportunities for competitive edge when performed internally and at the same time the degree of vulnerability when such activities are being outsourced is low, then outsourcing may be an effective solution. In between, there is a continuous range of activities requiring different degrees of control and strategic flexibility (as shown by the lower right square in Fig. 2).

Companies can achieve a maintainable competitive edge on a continuing basis when they can perform an activity internally cheaper, better or in a more timely fashion. In such cases, it is also advisable to keep these activities in-house. Another element that determines whether one should outsource activities rather than keep them in-house is related to managing demand variability and overcapacity. Even in case of fluctuating demand, a company may want to maintain the internal production capacity of the company at relatively constant levels so as to optimise costs. However, in order to address sudden and temporary increases in demand, outsourcing can be used as an effective 'surge strategy'.

Strategic vulnerability can arise from several sources. A major cause for vulnerability is among other things related to the concentration and the scale of the suppliers. When the number of suppliers is high and they have an adequate scale and market standards and terms are mature, then insourcing is unlikely to increase efficiency. However, when the number of suppliers is low, they may have substantial market power over buyers. Also, when suppliers are weak, they may be unable to provide innovative products. In such cases, it may be advisable to keep these activities in-house.

Recently a study coordinated by BSI (Brussels Study Institute) (BSI, s.d.) has been conducted on the insourcing of low-skilled labour in the Brussels civil service. This study also builds upon a number of good practices from abroad (in the Netherlands and the UK), such as street and estate cleaning services (Southwark, UK), grounds maintenance service (Maidstone, UK) and *Rijksschoonmaakorganisatie* (i.e. a dedicated government entity for cleaning services in government buildings in the Netherlands). Such dedicated government entities have proven to be able to achieve comparable strategic advantages (like economies of scale) than those that formed the basis for the outsourcing decision in the past.

Box 1 Insourcing of cleaning services in the Netherlands

The National Cleaning Organization (Rijksschoonmaakorganisatie - RSO) was launched in the Netherlands on 1 January 2016. The aim was the (step-by-step) insourcing of the cleaning of government buildings. Initially, the organization provided cleaning services to a limited number of government organizations, but as the previously concluded contracts with private cleaning companies for the various government organizations expired, the services were gradually expanded.

With the establishment of the RSO, the intention from the coalition agreement of the then cabinet was implemented to improve the weak position of employees in facility services. “With this, the central government wants to send out a signal that cleaning employees make an important contribution to the proper functioning of the government organization. This includes healthy working conditions, prospects for job security, development opportunities and good working conditions, such as continued payment of wages during illness, travel allowance and combining work and care. ” (Ministry of Internal Affairs, 2014)

The central objective was therefore explicitly not to achieve cost savings. A business case was calculated under a number of different assumptions to visualize the budgetary effects of the plan. This calculation showed that, given the choices made by the Cabinet with regard to the percentage 'social return', the adjustment of the terms of employment and the applied risk premium, a virtually budget neutral business case resulted for the departments when insourcing the cleaning activities (KPMG, 2014). However, the VAT receipts lost by central government were allocated to the business case, and hence the business case was not neutral at the aggregated level of central government. The one-off transition costs were also not included.

Cleaning companies have brought proceedings against the government to test whether the outsourcing was not in conflict with European procurement directives or competition rules. The court found that there was no conflict with the procurement directive because all the authorities involved (the RSO, the ministries and other government agencies) belong to the same public legal entity (the State of the Netherlands). In this context, the court also refers to the procurement directive 2014/24 / EU, which states that member states are not obliged to outsource services that they want to organize themselves. Nor is there any conflict with competition or state aid law because the RSO does not provide services to third parties and thus does not engage in an economic activity.

As regards the BCR, a number of cases have been studied such as Actiris, Brussels Regional Public Service (including Brussels Mobility) and *Bruxelles Environnement*. A number of managers from these services were interviewed. It turned out that the balance of the past experiences regarding outsourcing was not always positive. The reasons that led to the decision to outsource activities such as maintenance of roads were related to the fact that both the size as well as the allocation possibilities of the budget did not make it possible to put together an internal team that is big enough to perform the maintenance of the roads internally. As a consequence, the management was pushed towards outsourcing for structural or political reasons. Another reason why outsourcing became necessary was that it was difficult to find adequate staff for the maintenance of roads. This is related to the rigidities of recruitment procedures in the public sector, especially for low-skilled labour. For instance the (compulsory) practice of the so-called ‘first job agreements’ (Du.: ‘*startbaanovereenkomsten*’, Fr.: ‘*convention de premier contrat*’) hinders sustainable long-term employment and integration of these workers into the public service. Such a situation is not conducive to worker’s motivation. Another reason is that recruitment procedures in the public sector are rather lengthy and not flexible enough. For instance, the requirement that workers have

achieved at least secondary school (i.e., high school) education is seen as an unnecessary obstacle for flexible recruitment in the public sector.

2.4 Balancing supply and demand for infrastructure

In order to address the huge investment challenges in the medium term, it is advisable to look also for new sources of income or explore alternative solutions to infrastructure financing. Road pricing has been put forward by many transport economists as a viable solution to bring demand for transport and supply of capacity back in equilibrium. Not only can road pricing become a new source of income, also the burden on the existing infrastructure may be alleviated as demand for traffic is expected to decrease when road pricing will be introduced.

Nevertheless the details of the road pricing schemes to be introduced need to be studied in more detail, as social corrections for people with low-income may be necessary.

It is advisable to coordinate the road pricing as a policy with the other regions within Belgium as the interactions with the other regions are quite substantial (from a fiscal point of view). However, the political preferences on road pricing differ between the regions. Nevertheless, in the BCR, public as well as political support for road pricing may be higher in comparison to the other regions within Belgium, because the levels of congestion and air pollution are higher in the BCR. Hence, it may be possible for the BCR to gain a first-mover advantage.

3. Policy options

This section describes policy options to achieve budgetary savings in the four categories introduced in the section 2. These options should be viewed as options additional to the no policy change scenario. However, the no policy change scenario comprises already a number of policy measures to save costs which recently have been or are currently being executed (see appendix 2 for an overview). Finally, there is one new proposal for cost savings by revising the maximum threshold of electricity use in the tunnels, which could save 0,5-0,7 mln euro yearly. In this section we describe policy options for efficient prioritization (3.1), efficient procurement (3.2 and 3.3), efficient insourcing (3.4) and road pricing (3.5).

3.2 Efficient prioritization of maintenance projects

Efficiency gains can be achieved by prioritizing the maintenance projects. In order to classify the different projects into one of the three main categories defined in the previous chapter, namely K_1 (potential risk of collapse, urgent renovation required), K_3(no substantial problem) or K_2 (a structural problem exists, but no action is needed in the short run) a set of criteria needs to be derived by experts.

In this respect, a rather detailed technical study (*Assistance à maître d'ouvrage pour la mise en œuvre du plan pluriannuel d'investissements sur les ponts et viaducs gérés par Bruxelles-Mobilité*) has already been performed by the Engineering Group Greisch Tractebel (2020) in the past. The first phase of this study was aimed at prioritizing the works to be conducted from a purely technical point of view. To this end, two dimensions with separate categories of criteria have been identified, namely '*le niveau de condition*' (the level of the condition) and '*le niveau de conséquence*' (the level of the consequences). The former group (the level of the condition) measures the state of health of the infrastructure (as a function of its degradation and the defects found). Here, nine components (Fr.:'*éléments constitutifs'*) of the infrastructure are identified (like e.g., restraint devices, watertightedness and pavement, expansion joints, supporting structure, piles, etc.) and these are scored on a six-point scale (ranging from A to F). Based on the scores for the components a global score is calculated for the infrastructure as a whole, measured on a scale ranging from A to F.

The latter group (the level of the consequences) measures the effects for the local environment in case the infrastructure would be unavailable or (temporary) closed because one particular element of the infrastructure would be defective. This group comprises several criteria (which are weighted), such as mobility-related criteria, durability-related criteria, as well as criteria related to the environment (not only natural environment, but also economic environment). The final score for the level of the consequences was originally measured on a scale ranging from 0 to 100, but was subsequently recoded into six main categories which are shown in the first column of Figure 1 (e.g. a score between 0 and 16.67 was recoded into category N°6, i.e., lowest priority, but a score between 83.34 and 100 was recoded into category N°1, i.e., highest priority). Regarding the mobility-related criteria, it is important to note that the flux of traffic is evaluated by means of broad categories (e.g., 100% when the bridge crosses a motorway, 66,7% when the bridge crosses a road or inner ring road, 33,3% for a footbridge, 10% for local roads, etc.).

The categories of criteria used within these dimensions are purely technical and only related to intrinsic criteria of the works (Fr.: '*ouvrages*') to be completed. The criterion cost is not part of this list of criteria.

Based on the two dimensions explained above, a cross prioritisation matrix has been developed as shown in Fig. 1.

Fig. 1: Prioritisation matrix

Source: Greisch-Tractebel (2020), p. 19.

The numbers (from 1 to 36) within the cells of the prioritization matrix (Fig. 1) represent the ranking, which is based on the two dimensions of this matrix (horizontally: global level of the condition, vertically: global level of the consequence). These rankings are then again recoded into six broad categories signaled by different types of colours in Fig. 1. These colours then represent the degree of urgency.

For the purpose of this study, which is among other things to integrate the cost aspect into the evaluation, we contend that the different levels of urgency as shown in Fig. 1 can be used to categorise the projects in one of the three main categories K_1, K_3 and K_2 defined for the purpose of this study. The cells with dark red colour would correspond to K_1 (urgent renovation is required for those infrastructures).

The cells with blue colour would correspond to K_3 (no substantial problem, only structural maintenance should be continued). And the cells with normal red, pink, yellow, as well as those with green colour would correspond to K_2 (a structural problem exists, but no action is needed in the short run), whereby the highest priority needs to be given to the normal red cells and then to the pink, yellow and green cells.

In order to introduce the cost aspect into the evaluation methodology, we propose the following approach. As regards category K_1, the urgency of the intervention is such that the cost aspect should not play an important role here. Here, we propose to implement the projects solely according to their degree of urgency. Also regarding K_3 the cost aspect is not relevant, as these projects do not need to be implemented in the short or medium run, only structural maintenance is necessary.

It is precisely in the category K_2 that the cost aspect should play an important role. Here, according to the cost-effectiveness approach outlined in section 2.1, we propose to rank the projects according to their effectiveness-cost ratio (ECR) (section 2.1, formula 1). The cost corresponds to the budgetary cost. The level of effectiveness can be derived from the 'weighted average consequence score' (*'moyenne pondérée de la score de consequence'*). Hence formula (1) can be rewritten as :

$$ECR = \frac{\text{Weighted average consequence score}}{Cost} \qquad (1)$$

The rationale for taking the weighted average consequence score (WACS) (as measured on its original scale, i.e., from 0 to 100) as the final effectiveness measure within K_2 is that the WACS is the result of a multi-criteria evaluation of the effects of the infrastructure (or infrastructure parts) on a list of 16 weighted criteria that fall into three main categories (mobility, durability, natural and economic environment) (Greisch-Tractebel, 2020, p. 11). The natural environment includes also the external effects. Whereas the scores presented in Fig. 1 are indeed ordinal scores representing a rank order or degree of urgency, the original scores (from 0 to 100) constructed by Greisch-Tractebel (and from which the ordinal scores were derived) are in essence a metric scale. This means that meaningful ratio comparisons (needed for constructing the ECR in formula 1) can be derived from this original scale. However, a cautionary note regarding the use of the WACS in the ECR may be made here, namely that – although the WACS is a metric scale – Greisch-Tractebel may have constructed it primarily in view of transforming it into an ordinal score in a subsequent phase. Hence, when applying the ECR, it is important to check always the internal consistency of the results obtained.

Anyhow, the level of the condition (Fr.: *niveau de condition*) does not play a role here as the projects ranked within K_2 do not pose a specific problem in terms of their condition (or urgency). The level of the condition is the major decisive element to rank the projects into K_1, K_2 or K_3 and infrastructures where the level of the condition does pose a problem are ranked anyhow in K_1 (where urgent intervention is necessary).

Application of the prioritization methodology for the renovation of tunnels

Regarding the renovation of tunnels, we cannot rely on a similar detailed technical study like this was the case for the renovation of roads (Greisch-Tractebel, 2020) which made it possible to estimate the level of condition of the infrastructure (i.e. the state of health) as well as the level of the consequences (on its environment).

In order to perform a cost-effectiveness analysis also for the renovation of the tunnels, we propose to initiate a similar technical study in the short or medium run. The approach followed for the evaluation of the bridges can to some extent be replicated for the evaluation of the tunnels.

A short brainstorming session with engineers has already revealed that a decision whether to renovate a tunnel or not, should be based on an evaluation of the separate subsystems of the tunnel system. For this purpose, four subsystems can be identified :

(1) Civil engineering (Fr.: *génie civil*)
(2) Lighting system (Fr.: *éclairage*)
(3) Ventilation (Fr.: *ventilation*)
(4) Electrical installations (Fr.: *installations électriques*)

As regards tunnels that are longer than 300 m, engineers argued that the evaluation should anyhow be based on the separate tunnel systems. Regarding tunnels up to 300 m, it may be possible to perform the evaluation at the level of the tunnel as whole.

Based on the results of such a detailed technical study, it should be possible to categorise infrastructures into the same three categories (as was done in section 3.1 for the bridges), namely K_1, K_2 and K_3. The dimension level of the condition should be the decisive element to categorise an infrastructure into one of these three categories, but for infrastructures categorised within K_2, the level of the consequence can be used as the effectiveness measure (i.e. the nominator in the ECR formula) and the budgetary cost can be used as the denominator in the ECR.

Application of methodology for new infrastructure projects

At present, there are no big new infrastructure projects in the BCR to be evaluated ex ante. If there were any in the near future, we advise to conduct SCBA and in case non monetisable effects become also relevant, it may be useful to complement the SCBA with an MCA. Such an 'eclectic' MCA will also make it also possible to include strategic objectives considered relevant by policymakers.

Final remarks

The approach presented in this paper implies indeed the use of multiple methodologies, namely CEA (which evolves into MCA) for the prioritisation of renovation projects, and SCBA for new projects. However, this is a pragmatic solution aimed at saving time and money by using 'heavier' tools (like SCBA) for new large projects and using lighter tools (with less demands in terms of data and resources like CEA and MCA) for renovation projects, where the fundamental desirability is not called into question.

Although the CEA (and MCA) methodology have often been used in the fields of health, education and defense (mainly fields where the fundamental desirability of intervention is seldom called into question), its applicability is not limited to these fields. MCA has in the past also been used by eminent operational researchers like B. Roy et al. (1986) for the prioritisation of renovation projects in the Paris metro stations. In addition, using multiple methodologies for different projects or in different stages of a decision-making process is also recognised in academic literature (Bowen, 1988; De Brucker, Macharis and Verbeke, 2013). According to Bowen (1988), specific aspects of one methodology can be used within the process laid down by the other as long as the transfer between methodologies takes place at 'key moments' in the decision-making process.

If the political objective would be to examine which infrastructure should remain open and which should be closed, then SCBA could be used for that purpose. Ranking renovation projects based on the B-C score is also possible, but performing SCBA only for this purpose will cost much time and money. Our approach which relies in part also on CEA and MCA is not only more pragmatic (i.e., geared towards the practical needs and it consumes less time and budgets), but it is also at the same time strategic and sufficiently operational to advance in this field.

3.3 Procurement strategy

It is important to prepare a procurement strategy for each tender. The procurement strategy provides an organized approach to the most important strategical and tactical decisions for each tender, including :

- Scoping of the project/contract ;
- Necessary market information ;
- Choice of type and setup of the procurement process ;
- Choise of the type of contract ;
- Main risks relevant for tendering choices ;
- Main planning of tender preparation and execution ;
- The necessary project team.

Evidently the level of detail and effort put in the strategy will differ according to the importance and risks of the tender at hand.

Using a standard procurement strategy and drafting process will provide the following opportunities :

- The framework will contribute to a higher predictability of the Region, potentially inspiring other government authorities ;
  e.g. : when implementing the Design and Construct-contract, Rijkswaterstaat used a standard regime for the legal and technical requirements. The standard-contract has been created in close cooperation with relevant market parties. At this time the Rijkswaterstaat-model-contract is widely used by other government authorities and is easily understood ;
- The standard-procurement strategy can result in a standardized project approach with regards to design, which is of great assistance with the project coordination with other local government authorities. They will recognize it and after one or more successful examples will accept it ;
- As the standardized contract is used for a large amount of comparable projects, the expectation gap mentioned in paragraph 3.3 will be reduced ;
- The standardized approach will significantly improve predictability of project results and risk mitigation.

Aligning public and private interest in contracts

Introduction

Cost overruns occur in 86% of the public infrastructure projects worldwide and have been the center of a lot of studies.[4] It turns out that in 70% of the cases, the cause of cost overruns can be found in the non- alignment of the pre-construction phase to the construction phase.[5]

Build-only type contracts will emphasize this effect, as the pre-construction design has been executed by a different organization than the construction itself[6]. To this mix can be added that this type of procurement provides for a relatively poor alignment of public and private interests. The private party is mainly triggered to the following behavior :

- Keep defects in the specifications hidden during procurement and counting in the potential resulting claims in order to be able to provide the lowest price;

- Optimising on the basis of lowest costs, instead of best quality for the principal.

This has resulted in efforts to contractually re-align phasing and interests. In the following paragraphs a short description is given how this can be accomplished[7].

Types of alignment

As the coordination between pre-construction phase and construction phase is the bottle-neck for the traditional Build-contracts, this will be the first step in order to align responsibilities, incentives and results.

More specific: adding contractual responsibility of different contractual phases can and will have effect on the alignment of public and private interests and therefore may contribute to a more efficient operation, given the payment mechanism will be adapted accordingly.

[4] Cantarelli, C.C., Flyvbjerg, B., Molin, E.J.E., van Wee, B. (2010). Cost overruns in large-scale transport infrastructure projects: explanations and their theoretical embeddedness. European Journal of Transport and Infrastructure Research, 10 (1), pp. 5-18.

[5] Cantarelli, C.C., Molin, E.J.E., van Wee, B., Flyvbjerg, B. (2012). Characteristics of cost overruns for Dutch transport infrastructure projects and the importance of the decision to build and project phases. Transportation Policy 22, pp. 49-56.

[6] McGraw Hill, Smart Market Report 2014.

[7] This description is based on the assessment framework that is used for the Flood Protection Programma in the Netherlands (Afweegkader Geïntegreerde Contractvormen).

Project phases

To this effect we differ the following project phases and incentives :

- Plan ;
- Design ;
- Engineer ;
- Build ;
- Maintain ;
- Operate ;
- Finance.

Plan

The planning process and permits determine for a large part the design decisions. Furthermore design choices made in the planning process mostly cannot be revisited due to the large negative effect on the project planning.

Pro :

- By integrating planning responsibility the contractor cannot file claims for un-executable permits; Including planning provides opportunity for added value as design can take into account the producibility of the works ;
- Potentially provides room for innovation.

Con :

- Eventual delays in the planning process have effect on the contractual relation with the contractor and may even lead to claims ;
- At the start of the contract scope variation must be accounted for in the contract ;
- Not every government agency and/or contractor will be able to cope with the needed cooperation with this early contractor involvement ;
- Depending on the permits needed the Belgian planning processes will probably be prohibitive for using this type of contract.

Engineering/Design

Requiring a function instead of a designed product gives the contractor the responsibility to design and build a product that fulfills the requested functions. This reduces the opportunities for the market parties to rely on errors in the technical specification during Tendering.

Pro :

- By combining the design and build-knowledge, more value for money can be achieved as the solution can be tailored to the relevant working methods and equipment of the contractor.
- Options for strategic bidding are significantly reduced.

Con :

- During the tender the competitors will already design the project to a significant level of detail in order to be able to provide a price. This requires proper and correct information to be present during tender. Inadequate information will lead to variation and claims ;
- At the start of the contract stakeholders cannot be given information on the final detailed designs, as these will be finalized by the contractor during contract execution. Additional stakeholder requirements may lead to variations and claims ;
- It is important to provide the contractor with all relevant information in order to be able to present a solid fixed price during tender and thus avoid claims ;
- All in all this incentive will require a clear vision on the amount of design freedom given to the contractor. This is a balancing act directly impacting the value for money that can be achieved by this incentive. If freedom unintendedly given can lead to variations, unitedly withheld freedom may hamper optimal value for money.

Maintain

Although the design and construct-approach provides advantages of the Building-only contracts, it still only incentivizes the design and building phase, and therefore reducing the CAPEX of projects. Although during the tender life cycle optimization can be encouraged, a Design and Build-contract doesn't inherently provide for life cycle optimization. This is where the addition of the Maintain-scope can come in, provided the contractor will be made responsible for at least providing availability of the infrastructure.

In Brussels one DBM-contract has been closed for the tunnel Leopold II (€ 205 mio). Given the length and complexity of the tunnel it was decided politically that it better was contracted by means of a DBFM contract (2012). The project was put on hold until the tunnel crisis in 2014. In order to avoid complexity the F-part of the DBFM-contract was left out and in 2016 a DBM-contract closed.

Pro :

- Including maintenance provides an incentive for the contractor to oversee the whole project cycle instead of optimizing only for the lowest construction cost ;
- In case of a complex project the integral responsibility will provide incentive to reduce the chance of failing of the specific type of infrastructure. This is for example useful in the case of the construction or full renovation of a tunnel.

Prerequisites :

- In order to make the incentive work properly the following relevant conditions are met :
    - The infrastructure is new or in need of full renovation, as to an optimization of building and maintenance can be achieved, and discussion on the actual state of the infrastructure can be limited as it will be taken care of by the contractor anyway ;
    - The infrastructure can operate more or less independently such that having a different maintenance partner has limited effect on the remaining infrastructure ;
    - Proper performance indicators can be formulated and observed.

Finance

Alternate solutions to project financing

To help fill the funding gap faced for the infrastructure projects, BM may look for additional sources of infrastructure funding besides its own public funding by means of private finance and/or Public-Private Partnerships.

Not all projects are an ideal fit for this kind of financing. When deciding on the right kind of financing to pursue for a particular project, the criteria generally have to do with profits, size, and risk. However, projects that fit the general profile of project finance may not find the needed capital.

One of the primary advantages of project financing is that it provides for off-balance-sheet financing of the project, which will not affect the credit of the shareholders or the government contracting authority, and shifts some of the project risk to the lenders in exchange for which the lenders obtain a higher margin than for normal corporate lending.

Adding the financing of a project can be done as an enabler for the project because of the following reasons :

- In case of a positive business case for a project: incentive to optimally make use of the business case and optimal service. This can be the case in a toll- concession ;
- To provide an incentive for the delivery of optimal availability of infrastructure ;
- In order to bring forward investments that budgetwise would be done later. This can for example be the case with investments in more energy efficient LED street lighting. The principal provides the available budget for street lighting. The contractor has the obligation to provide the availably of a certain amount of light (lumen) on the street, without specifying the exact technical means to achieve it. The contractor finances the investment in LED and/or more innovative lighting solutions (such SMART-city solutions). This investment will be repaid with the energy savings triggered by the more energy efficient lighting, thus causing a win-win. The public can benefit way earlier from modern lighting, without extra cost.

Before choosing a solution needing financing and thus entering in the realm of PPP-contracts, it is important to additionally assess the value for money. Financing will make the project more complex and will add related costs. A public-private-comparator (PPC) will provide insight if these extra cost will be recovered by the extra value for money that the financing option will generate.

Aligning public-public interests

When discussing the different contract types, it has become obvious that the public-public alignment of interest is important to be able to achieve the full potential of the incentives mentioned above.

As these type of contracts new for the stakeholders of the several projects, it is not sef-ovbious that the prerequisites for a successful application will be automatically met.

Stakeholder Engagement

Understanding the requirements and expectations of stakeholders who can have an impact on the asset management activities of BM is a critically important activity. Stakeholder engagement includes the activities of identifying, communicating and interacting with stakeholders. For some organisations this is becoming an increasingly formalised area of business.

Organisations typically engage with their stakeholders to :

- establish which aspects of their activities matter most to them ;
- understand their risk appetite ; and
- understand their willingness to pay for products and services.

This is an important input to the strategic planning processes and developing the asset management strategy and asset management objectives. It can help BM to improve decision-making and accountability, and can be used to articulate different scenarios within BM's asset management plan(s) to understand and reflect stakeholder priorities and select those scenarios that most closely meet their aspirations.

Each stakeholder can have an impact on how BM performs. Influencing stakeholders can lead to positive outcomes; aligning goals, influencing legislation and regulation, shortening supply chains or improving products. Stakeholders themselves can also have adverse impacts on the organisation in many ways, including: introducing defective equipment (supply chain); withholding a license to operate or imposing improvement actions (regulators); affecting operations through industrial action (labour organisations); reducing the operating budget (finance providers); and reducing the demand for the product (customers).

The relationships with each external stakeholder reflect their interactions with BM. These interactions are measurable and can be used to monitor performance. The quality of these stakeholder relations determines how these stakeholders interact with an organisation and how well they support the asset management strategy and objectives. Effective external stakeholder engagement supports BM's ability to manage assets effectively, efficiently, and reliably. It may also be necessary to understand and manage conflicting expectations and requirements between groups of stakeholders.

By definition, many of these stakeholders are outside the direct control of BM's organisation. However, stakeholder engagement is influenced by what BM does internally to align the outcomes of these interactions with BM's strategic objectives. Organisations can change processes, introduce and enforce policies and procedures, develop incentives to drive employee behaviour to align with a vision of how BM wants external stakeholders to perceive it. Measuring the delivery of this vision provides visibility and a drive to do business differently redefining how BM relates to its external stakeholders.

This underlines the importance of up front stakeholder engagement.

Strategic Stakeholder Management

In this respect a process called 'Strategisch Omgevings Management' (strategic stakeholder management) has been developed on the mutual gains approach of Fisher, Ury and Patton and has proven successful for a large number of projects.[8]

Core of the approach is based on building trust for the results and consequences of a project by early and adapted communication with the relevant stakeholders, putting transparency and consequently and sincerely putting the interests of the stakeholder at the core of the discussions.

[8] A comprehensive description and practical manual of SOM (in Dutch) can be found in Marc Wesselink, handbook Strategisch Omgevingsmanagement. This approach has been used by large projects such as the Enlargement of the port of Rotterdam, the PPP-projects in the Netherlands, but also for the smaller projectes within the flood protection programme. Although the examples mentioned in the book refer to building-projects, the approach holds true also for a portfolio of maintenance projects.

The stepped approach consists of the following :

- Preparation :
    - Clarifying for yourself results, and - more important - the goals (why do I need this?) ;
    - Mapping the stakeholders and the relevant issues and needs of these stakeholders.

Analysing :

- Determine the strategy per stakeholder :
    - Engaging in the dialogue with the stakeholders according to the strategy ;
    - Adapting strategy on the basis of this dialogue.
- Executing :

  Negotiating the actual requirements on the basis of the issues and needs.
- Monitoring :

  In this step the result of the negotiations is put down in SMART and written arrangements.

  This is the most important step, that unfortunately is often forgotten, leading to misunderstandings and loss of trust.

Bear in mind that, depending on the complexity and longevity of the project, it can be that these steps will have to be repeated multiple times as the projects will be detailed further. For larger projects you will see three main types of rounds :

- Agreement on intentions and principles ;
- Agreement on cooperation in the preparation of the project ;
- Agreement on the execution and transfer of the project.

In the mentioned projects this approach has led to a more predictable project result for all parties involved, including the contractors, and thus to a reduction of subsequent discussions and related sunk costs and/or need for costly contract variations.

3.4 Efficient procurement procedures

Economies of scale

Creating more economies of scale in procurement could be organized by fostering cooperation between the public entities responsible for tendering. In this respect, it may be useful to refer to what has happened for instance in the sector of higher education in Flanders, where so-called 'Associations' have been established in 2003. Following a Flemish decree, such associations were founded by each single university in Flanders with the aim to foster the cooperation with a number of university colleges (Du.: '*hogescholen*') in their region or within their educational network. In the beginning (2003) these associations focused on the process of embedding the bachelor and master programmes organised by the university colleges in scientific research (Du.: '*academiseringsproces*'). As from 2010 the Associations also focused on the transfer of the academic programmes (including their students and staff) of the university colleges to the universities. As this process has been finalised by 2013, the associations have now changed their focus and mainly act now as a structural forum for standardising a number of procedures, including procurement procedures, and centralise and exchange know-how regarding these. Important procurement dossiers such Associations have to deal with include e.g., construction or renovation of new buildings, acquisition of software,

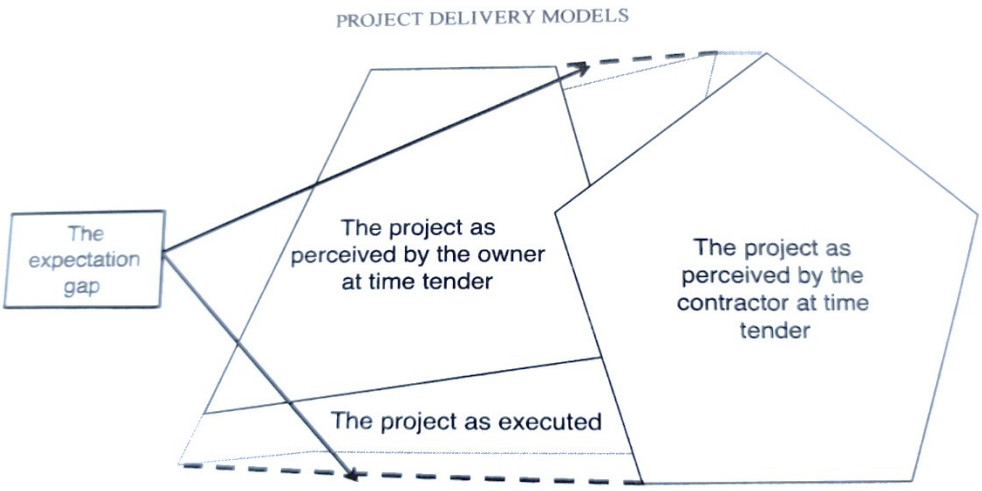
acquisition of insurance products (e.g. insurance against accidents at work, hospitalisation insurance, student mobility insurance, etc.).

The main advantages of establishing such an Association are related to : (1) simplification of procedures, (2) more efficient use of expertise across the members of the Association, (3) creating economies of scale for contracting works and thus increase bargaining power, (4) creating more uniformity towards contractors and (4) legally secure contracting. Within the Association one central partner (namely the University) acts as the contracting authority, but the implementation of the contract and supervision of the works may fall under the competence of the other members participating in the Association (namely the University colleges, or in Du.: '*hogescholen*').

Similar benefits could be generated if such a structure were also created for the procurement of public works in Belgium. Although the structure does not need to be completely similar to the structure described above (and more power could be given to the members instead of to the Association), substantial benefits could be generated by setting up a similar Association structure. Such a structure should then be geared towards the uniformisation and standardisation of procedures as well as the exchange of know-how in the field of infrastructure works.

Provide better understanding of the request for proposal

A well-known cause for contractual discussions and claims is the expectations gap[9].



When exchanging project information and requirements, the tenderer has to interpret the provided written information. Due to differences in background, objectives and strategic positions, this interpretation will probably differ from the expectations of the principal.

The classical lowest price open tenders are conducted purely on a written basis. Due to the limited opportunities to exchange information and the added tactical attitude of the parties involved (both on the side of the principal as on the side of the tenderer). The expectation gap of these kind of procurement processes tend to be quite large. This means that during the execution of the project these expectations have to be aligned, most probably leading to contract variations and claims.

In general a Competitive Dialogue Process will provide a better alignment of the public and private goals, as a better exchange of information and especially views on the execution of the contract can be achieved : the principal can better optimize the requirements on the basis of the potential

[9] Arent van Wassenaar, A Practical Guide to Successful Construction Projects.

solutions of the market parties and the market parties can make offer decision on the basis of verification instead of assumptions.

In general, a competitive dialogue process is considered complex and costly. The process can however be adapted to smaller projects and tenders, by e.g. :

- Simplifying the short listing of tenderers ;
- Limiting the topics open for dialogue ;
- Limiting the number of dialogue rounds ;
- Simplifying the evaluation criteria.

Suggestion

The table below provides suggestions for contract types that can be considered for relevant activities/infrastructure types. This doesn't imply that these type of contracts must be applied in order to achieve more value for money. It is intended as an incentive to at least study the opportunities of these type of contracts for the given activity to be procured. The description of the contracts refers to project phases and incentives in paragraph 3.3.2.

Infra / Activities	Contract type	Procurement method
Regular maintenance main connections	Framework contracts = Contrat cadre Consider performance based contracting, in order to involve the contractor in the consequences of the delivered quality and impact on mobility.	Open tender. Consider taking qualitative evaluation into account such as: - facilitating coordination with the principal / partnering; - flexibility / capacity insurance;
Construction and/or Major maintenance of main connections	Design and Build Consider: life cycle optimization by including maintenance. This will imply a strategic consideration of the network of main connections	Restricted procedure with qualitative evaluation such as: - Quality assurance; - Risk management - Avoiding nuisance; - Sustainability
Maintenance and/or construction of Local roads and streets	Framework contract / Realization only	
Bridges/Viaducts	Design, Build	Consider taking qualitative evaluation into account such as architectural elements and life cycle considerations.
Tunnelrenovation	Design, Build, Maintain for reasons of integration of systems and life cycle optimization.	Competitive dialogue
Furnishings of Public Spaces	Framework contract	Open tender: consider taking qualitative evaluationinto account such as supply assurance
Underground infrastructure (cables/sewers)	Framework contract	
Renovation construction underground infrastructure	Realization only if executed as separate project.	Open tender: consider qualitative criteria such as execution method, stakeholder nuisance.
Public lighting	Depending on objectives consider innovative financing.	Competitive Dialogue on the basis of solution and business case.

3.5 Efficient insourcing

The analysis in the previous chapter indicates that for certain activities efficiency gains might be possible by insourcing specific activities. According to the BSI study (s.d.), managers from Brussels Mobility contend that opportunities for insourcing exist for small, simple and repetitive tasks related to road maintenance and renovation. As part of this spending review, a preliminary quick-scan cost-benefit calculation has been made of possible efficiency gains as a result of insourcing a number of activities.

A general principal in any social cost-benefit analysis is that a distinction needs to be made between a budgetary point of view and an economic point of view. This distinction is particularly relevant when tax implications (e.g., value-added tax, i.e., VAT) need to be addressed. In the budgetary point of view only the effects on the budget of a specific company or (government) agency are taken into account. Hence, uncompensated effects on the budget of other agencies or companies are ignored. For instance, when the implementation of a specific project (or here a decision to outsource or insource specific activities) implies that the expenditures or the income of other agencies will increase or decrease, then this effect is not taken into account in the budgetary view. This is of course not the case when the former agency has to actually compensate the latter agency (in case of a cost) or when the former agency is compensated by the latter (in case of a benefit).

The economic point of view, on the other hand, takes the full resource cost of a project into account, i.e., the cost that is associated with the use of scarce production factors (labour, capital, land or nature), irrespective of the actor in society who has to bear this cost or to whom the benefits accrue. A general rule in the economic point of view is that savings on taxes should not be counted as a benefit in the project, because they do not correspond to savings on resources. Similarly increases in taxes to be paid due to the implementation of a project are not taken into account as a cost either because they do not correspond to the use of additional scarce production factors. In fact, the taxes collected are used by government to pay for expenditures on public goods and other goods provided for by government. If as a consequence of the implementation of a project a company or a (government) agency saves on taxes to be paid to the (central) government, then this (central) government will have to raise taxes elsewhere in the economy if it wants to continue providing the same level of public service as before. The only exception where savings on taxes actually constitute a benefit in the economic view is when the tax is levied to compensate for an external effect created by the project (which is for instance the case for so-called pigouvian taxes or CO2 emission taxes) and only as far as the external effect is actually reduced simultaneously with the reduction in the tax paid.

In the case of a project that takes the form of a policy decision whether to outsource particular activities or not in a decentralised government context (like the BCR), the distinction between the budgetary and the economic point of view has two important implications, namely with regard to value-added tax and social security contributions.

Salaries paid by a private company to its own members of staff for activities conducted internally within the company are of course not subject to VAT. Rather, these salaries (together with the interests and profits) are part of the value added created by the company, which will be subject to VAT anyhow when the final output will be sold. In a private company, decisions to outsource activities do not have adverse VAT implications, because VAT paid on the purchase of input from suppliers is deducted from the VAT received from customers that the company has to transfer to government when its output is sold to these customers. In fact VAT is neutral to so-called integration or disintegration movements within the supply chain.

However, in the case of goods provided for by a government agency the output is either offered to the public for free (e.g. the use of local roads, primary and secondary education) or when a retribution needs to be paid, these are usually not subject to VAT (e.g. medical care, higher education, kilometer charge for trucks in Flanders and Brussels).[10] In addition, VAT paid by a government agency on the purchase of input (e.g. construction material, office material and even payments to a subcontractor) cannot be recovered by the government agency because the agency is

[10] In the Walloon region, however, kilometre charges for trucks are subject to VAT because the toll is collected by a separate agency called Sofico (*Société wallonne de financement complémentaire des infrastructures*, i.e., the Walloon Infrastructure Financing Company), which is distinct from the Walloon government.

not subject to the VAT system at all. In fact, the reverse side of the medal of a company or agency's output not being liable to VAT, is that the VAT paid by that company on its input cannot be claimed back either. In fact, for VAT purposes such a company or agency is considered as a final consumer instead of an intermediate one.

The consequence of this particular situation is that outsourcing decisions in a government agency do have adverse VAT effects for the budget of that particular agency. In case there is only one layer of government (e.g. a central state), then these adverse effects cancel each other out because such a government recovers with the one hand the extra VAT it has paid with the other and finally put it in another pocket of the same trousers. However, in case of decentralised governments whereby the entity paying the VAT is different from the entity receiving the VAT, adverse effects for the budgets of these agencies may persist. In fact, by outsourcing activities decentralised governments in Belgium boost the federal government's budget.

When a pure budgetary point of view is taken and the analysis is conducted purely from the point of view of a single decentralised government agency (in this case BM within the BCR), it may be relevant to take these effects into account or at least not to ignore them.

However, from an economic point of view this way of reasoning does not make sense. The savings on VAT do not correspond to savings on scarce production factors, they just constitute a shifting of funds between different government agencies or government layers (or proverbially 'unclothing Peter to clothe Paul'). In our cost-benefit analysis we will, therefore, take the economic point of view. We will, however, also show the results that may come up from a budgetary point of view.

Another issue that arises when analysing potential cost savings resulting from outsourcing decisions within government agencies is related to social security contributions, in particular as related to retirement schemes. In Belgium, workers who retire from the private sector receive their retirement benefits from of the Belgian social security system (which is funded through social security contributions collected from employees and employers). Civil servants who retire from the civil service where they were officially appointed (i.e., as statutatory agents) (Fr.: fonctionnaires statutaires nommés), however, receive a state pension, paid from the federal state's budget and funded by tax receipts collected from tax payers (which are different from the social security contributions). As pensions from the private sector are substantially lower than those from the public sector and sometimes even not high enough to have a decent life, government has encouraged private companies to create extra private pension schemes for their workers (so-called 'second pillar' or 'extralegal' pensions) to fill the gap.

So, when a cost-benefit analysis of outsourcing decisions in the public sector is made, whereby labour cost needs to be compared between the public and the private sector, it is necessary to know whether the labour cost includes contributions to such 'extralegal' (or 'second pillar') retirement schemes or not.[11]

In case these contributions are included in the labour cost of the outsourced activities, then the cost of internalising these activities will show an artificial benefit for the decentralised government, just because no contributions have to be paid for second-pillar retirement schemes. The pensions for all retired civil servants (which are higher than those from the private sector) are paid for by the federal government in Belgium, even for the civil servants who retired from a regional or decentralised government. In fact, when a regional government decides to officially appoint (or nominate) an agent in the regional civil service, it places an extra burden on the federal government's budget.

[11] Currently, this information is not available within BM, as external consultants are not required to inform BM on the structure and coverage of their rates.

However, as long as the agent is not officially appointed as a civil servant (but continues to work on a contract basis for the agency), then this adverse effect on the federal government's budget does not occur.

Another issue that arises when comparing labour cost related to outsourcing activities between the private and the public sector is that employing workers in the private sector entails higher social security contributions. These arise from the fact that contributions to unemployment insurances are no longer necessary for civil servants once they have been officially nominated in the civil service. The underlying reason here is that the stream of activities in the public sector is much more stable (and diversified) so that the risk for civil servants (once officially appointed or nominated) to be affected by unemployment is quite non-existent, at least for economic or technical reasons. Still another issue is related to social security insurance regarding sickness. For statutory (i.e., officially nominated) civil servants social security contributions (also regarding sickness) are lower, but the guaranteed remuneration (i.e., the period during which the agency has to pay the salary of a civil servant who is on sick leave) lasts longer than for contract staff.

Another issue that arises is related to the overhead cost. The reason for applying a so-called 'overhead cost' is that when the production department of a company or organisation expands (which may be due to the company starting new projects or selling additional products or launching new products), this also increases the other departments or activities' indirect cost, like e.g., accounting, HR, ICT, facility management, energy consumption, catering, etc. In fact the cost of secondary activities like cleaning, catering, office space, heating, personnel administration, accounting, etc. will raise because these services are now offered to a larger amount of primary activities and staff. Most companies apply some form of so-called activity-based costing (ABC) to be able to calculate the exact and entire cost of the different products they produce (or the projects they conduct).

The overhead is usually calculated as a percentage value on top of the value or cost of the primary activities. The exact amount of this percentage value depends on which particular cost items are allocated to the cost of the primary activity or not. A comparison can be made with e.g. university departments who conduct research projects funded by external agencies or industry and need to hire extra researchers (often on a temporary basis). Usually, for such projects an overhead cost of up to 17% is applied. However, this percentage covers only the indirect cost for the supporting departments or services (HR, ICT support, office space, heating, energy, etc.), because the full labour cost (i.e., including reimbursement of public transport commuting costs, bike allowance, ecocheques, etc.) of the staff working directly on the project as well as their equipment (e.g., computers, furniture, machinery, etc.) and operational cost (e.g., furniture, travel, etc.) are assigned to the project itself (and not to the central budget).

A. Cost-benefit analysis of outsourcing activities

In order to compare the cost of outsourcing with the cost of internal provision of the service, an Excel file has been submitted by the Directorate Maintainance (Direction Entretien, DEN) and the Directorate Management and Inspection (Direction Gestion et Inspection, DGI) of Brussels Mobility for the BCR. This Excel file contains a listing of all activities (and their associated cost) that needed to be outsourced in 2021 due to a lack of internal staff available within BM. The information from this Excel file is presented in Table 3.1. The upper part of this table is related to activities conducted by DEN, while the lower part is related to the activities conducted by DGI.

In order to calculate the indirect or overhead cost and integrate it correctly into the cost-benefit analysis, an additional meeting was organised with the Department Human Resources of BM. The result that came out of this meeting was that the different types of staff (and profiles) that are needed to re-insource the activities that had previously been outsourced are quite heterogeneous, ranging from civil engineers (profile I) to low-skilled manual workers (profile D). As the salaries of the former are substantially larger than the salaries of the latter group, while the actual indirect cost generated by recruiting the different members of staff is more or less the same (whether they are engineers or manual workers), it would not be correct to apply a uniform percentage rate for the overhead cost (e.g., 17% which is usual in research institutes or universities). The actual overhead cost to be applied in this cost-benefit analysis has thus been derived in a more empiric way as will be explained below.

Table 3.1: Comparison of cost outsourcing versus insourcing (2021) in the Brussels Capital Region (Source: Brussels Mobility, Brussels Regional Public Service)

								overhead 18.973	*overhead 18.973*						
Prestations externalisées en 2021 par manque de personnels en interne															
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	(N)	(O)	(P)
Mission	Dossier	Profil	Nombre (ETP)	Coût interne (6 ans ancienneté **statutaire**)/ETP	Coût interne (6 ans ancienneté **contractuel**)/ETP	Coût total interne 2021 (agent statutaire)	Coût total interne 2021 (agent contractuel)	Coût total interne 2021 (agent statutaire) majoré de l'overhead	Coût total interne 2021 (agent contractuel) majoré de l'overhead	Coût horaire HTVA externe	Coût externe **TVAC**/ETP	Coût externe **HTVA**/ETP	Coût total externe TVAC	Coûts total externe HTVA	Extra Info
DEN (Direction Entretien) :															
Responsables projets multidisciplinaires	Nouveau dossier AMO	A	1	55.000	64.000	55.000	64.000	73.973	82.973	95	183.920	152.000	183.920	152.000	
SPOC Osiris	Nouveau dossier AMO	A	1	55.000	64.000	55.000	64.000	73.973	82.973	95	183.920	152.000	183.920	152.000	
SPOC Osiris	Nouveau dossier AMO	B	1	41.000	47.000	41.000	47.000	59.973	65.973	60	116.160	96.000	116.160	96.000	
Responsables des projets de signalisation	Nouveau dossier AMO	I	1	71.000	83.000	71.000	83.000	89.973	101.973	110	212.960	176.000	212.960	176.000	
Responsable de la planification revêtement	E18.005	A	1	55.000	64.000	55.000	64.000	73.973	82.973	77	148.104	122.400	148.104	122.400	
Responsable PPI	E18.005	A	1	55.000	64.000	55.000	64.000	73.973	82.973	77	148.104	122.400	148.104	122.400	
Contrôleurs INFRA	Marchés controleur (E20.076)	B	3	41.000	47.000	123.000	141.000	179.919	197.919	60	116.160	96.000	348.480	288.000	
Responsable projet éclairage	Nouveau dossier AMO	I	1	71.000	83.000	71.000	83.000	89.973	101.973	110	212.960	176.000	212.960	176.000	
Chef de projet galeries techniques	Nouveau dossier AMO	I	1	71.000	83.000	71.000	83.000	89.973	101.973	110	212.960	176.000	212.960	176.000	
Gestionnaires d'avis techniques pour garantir l'intégrité de la voirie lors des chantiers	Nouveau dossier AMO	A	1	55.000	64.000	55.000	64.000	73.973	82.973	95	183.920	152.000	183.920	152.000	
Gestionnaire de l'asset management	Nouveau dossier AMO	A	2	55.000	64.000	110.000	128.000	147.946	165.946	95	183.920	152.000	367.840	304.000	
Contrôleurs EM	Marchés controleur (E20.076)	B	3	41.000	47.000	123.000	141.000	179.919	197.919	60	116.160	96.000	348.480	288.000	
Ouvriers Régie	Marché placement founriture	D	10	34.000	40.000	340.000	400.000	529.730	589.730	62	120.032	99.200	1.200.320	992.000	
TOTAL						**1.225.000**	**1.426.000**	**1.737.271**	**1.938.271**				**3.868.128**	**3.196.800**	

Mission	Dossier	Profil	Nombre (ETP)	Coût interne (6 ans ancienneté et **statutaire**)/ET	Coût interne (6 ans ancienneté et **contractuel**)/E	Coût total interne pour 2021 (agent statutaire)	Coût total interne pour 2021 (agent contractuel)	Coût total interne pour 2021 (agent statutaire) majoré de l'overhead	Coût total interne pour 2021 (agent contractuel) majoré de	Coût horaire HTVA externe	Coût externe TVAC/ETP	Coût externe HTVA/ETP	Coût total externe TVAC	Coûts total externe HTVA	Extra Info
DGI (Direction Gestion et Inspection):															
Ingénieur Civil Responsable inspections EM	F20.005 (Inspect. Tun.)	I	2,00	71.000	83.000	142.000	166.000	179.946	203.946	142	274.912	227.200	549.824	454.400	(travail de nuit)
Ingénieur industriel /inspecteurs EM	F20.005	A	4,00	55.000	64.000	220.000	256.000	295.892	331.892	126	243.936	201.600	975.744	806.400	(travail de nuit)
Agent Inspecteur de routine EM	F20.005	B	1,00	41.000	47.000	41.000	47.000	59.973	65.973	98	189.728	156.800	189.728	156.800	(travail de nuit)
Géomètre (Gestion administrative Asset)	Nouveau dossier AMO	A	2,00	55.000	64.000	110.000	128.000	147.946	165.946	98	189.728	156.800	379.456	313.600	
Juriste (Gestion administrative Asset)	Nouveau dossier AMO	A	1,00	71.000	64.000	71.000	64.000	89.973	82.973	110	212.960	176.000	212.960	176.000	
Agent de terrain (Gestion administrative Asset)	Nouveau dossier AMO	B	1,00	41.000	47.000	41.000	47.000	59.973	65.973	78	151.782	125.440	151.782	125.440	
SPOC Tunnels csc 2017.1092	CSC BMBDGEDBO2017.1092	A	2,00	55.000	64.000	110.000	128.000	147.946	165.946		166.363	137.490	332.726	274.980	
Ingenieur chef de projet	CSC F20.003	I	1,00	71.000	83.000	71.000	83.000	89.973	101.973		161.717	133.650	161.717	133.650	
RH	CSC F20.003	A	0,50	55.000	64.000	27.500	32.000	36.987	41.487		49.800	41.157	24.900	20.579	
Expert Ir.	CSC F20.003	I	1,00	71.000	83.000	71.000	83.000	89.973	101.973		180.338	149.040	180.338	149.040	
Superviseur Ing.	CSC F20.003	I	2,00	71.000	83.000	142.000	166.000	179.946	203.946		149.948	123.924	299.896	247.848	
Superviseur	CSC F20.003	A	3,00	55.000	64.000	165.000	192.000	221.919	248.919		77.565	64.104	232.696	192.311	
Operateurs	CSC F20.003	B	13,00	41.000	47.000	533.000	611.000	779.649	857.649		70.989	58.668	922.854	762.689	
Ingenieur chef de projet	AMO Inspections Voirie (nouveau dossier	I	1,00	71.000	83.000	71.000	83.000	89.973	101.973		161.717	133.650	161.717	133.650	
Ingénieur industriel /inspecteurs EM	AMO Inspections Voirie (nouveau do	A	2,00	55.000	64.000	110.000	128.000	147.946	165.946	98	189.728	156.800	379.456	313.600	
Agent de terrain	AMO Inspections Voirie (nouveau do	B	1,00	41.000	47.000	41.000	47.000	59.973	65.973	78	151.782	125.440	151.782	125.440	
Ingenieur chef de projet	Patrouillage (Nouveau dossier)	I	1,00	71.000	83.000	71.000	83.000	89.973	101.973		71.000	58.678	71.000	58.678	
Agent de terrain	Patrouillage (Nouveau dossier)	B	7,00	41.000	47.000	287.000	329.000	419.811	461.811		151.782	125.440	1.062.474	878.078	
TOTAL						**2.324.500**	**2.673.000**	**3.187.772**	**3.536.272**				**6.441.050**	**5.323.182**	
GRAND TOTAL (DEN+DGI)								**4.925.043**	**5.474.543**				**10.309.178**	**8.519.982**	

ther Explanation (and translation) of the elements (and abbreviations) contained in Table 3.1

Meaning of the columns

A:	Profile / Tasks
B:	Reference to the tender that allows Brussels Mobility to outsource these tasks
C:	Profile (level of education): I (=Civil Engineer, Fr.: Ingénieur Civil), A (=Master's level, including industrial engineers), B (=Bachelor's level), C(=high school completed, Fr.: niveau secondaire supérieur), D (=only first cycle of high school, Fr.: niveau secondaire inférieur)
D:	Full-Time Equivalent (FTE) (Fr.: ETP, Equivalent Temps Plein), i.e. number of FTE necessary to complete 1 year
E:	Labour Cost for 1 FTE statutory agent with 6 years of seniority. This labour cost includes employers' contributions (to the social security system), holiday allowances and end-of-year bonus
F:	Idem as Column E, but for contract staff members (i.e. agents recruited on a contract basis, not as official civil servants).
G:	Total Labour Cost for statutory agents (i.e. officially appointed civil servants) (with 6 years of seniority) to accomplish this task (i.e. the task mentioned in column A). $G=E \cdot D$
H:	Idem as Column G, but for contract staff members (i.e. agents recruited on a contract basis, not as official civil servants). $H=F \cdot D$
I:	Column G increased by an overhead cost of 17% (the overhead percentage is mentioned at the top of Column I)
J:	Column H increased by an overhead cost of 17% (the overhead percentage is mentioned at the top of Column J)
K:	Labour cost per hour for outsourced services (exclusive of VAT). This cost per hour has been estimated based on either the hourly rate quoted in the offers that have been accepted following a public procurement procedure or on Brussels Mobility's own expertise and knowledge of the particular market
L:	Cost of outsourcing per FTE calculated based on column G (with working days of 8 hours per day and 200 working days per year), VAT included
M:	Idem as column L (cost of outsourcing per FTE), but exclusive of VAT
N:	Total cost of outsourcing, VAT included ($N=L \cdot D$) The notion 'total cost' here refers to the fact that the total cost of outsourcing has been obtained by multiplying the cost of outsourcing per FTE by the number of FTE required to complete this specific task.
O:	Idem as column N (total cost of outsourcing), but exclusive of VAT ($O=M \cdot D$)
P:	This column contains extra info, e.g. when the work concerns night work (Fr. 'travail de nuit')

Meaning of the abbreviations

AMO:	Assistance à Maître d'Ouvrage
EM:	Electro Méchanique
ETP:	Equivalent Temps-Plein (Eng.: Full-Time Equivalent [FTE])
HTVA:	Hors TVA (i.e. Hors la Taxe sur la Valeur Ajoutée) (Eng.: Value-Added Tax non included)
INFRA:	Infrastructure
Ing.:	Ingénieur industriel (Eng. industrial engineer)
Ir.:	Ingénieur (Eng.: Engineer)
PPI:	Programme Pluri-annuel d'Investissements
RH:	Ressources Humaines
SPOC:	Single Point of Contact
TVA:	Taxe sur laValeur Ajoutée (Eng.: Value-Added Tax [VAT])
TVAC:	Taxe sur la Valeur Ajoutée Comprise (Eng.: Value-Added Tax Included)

To compare the cost associated with the outsourcing of activities with the cost of internal provision of the service, we refer to Table 3.1. The tasks that needed to be outsourced due to insufficient availability of internal staff are listed in column A, the profiles (i.e., the education levels) needed to conduct these tasks are included in column C, the number of full-time equivalents (FTE) needed to conduct these tasks is given in column D. The columns E and F contain the labour cost per FTE when the service is provided internally by respectively statutory staff (column E) or internal contract staff (column F) in both cases calculated for staff who have 6 years of seniority. The columns G and H contain the total labour cost (i.e., the labour cost per FTE multiplied by the number of FTE required to complete this task) for respectively statutory staff (column G) and contract staff (column H), in both cases for staff with 6 years of seniority. In the columns I and J these numbers are increased by an overhead cost of €18 973 per worker (as will be explained below).

Column K contains the labour cost per hour (exclusive of VAT) for outsourced activities. This cost per hour has been estimated based on either the hourly rate quoted in the offers that have been accepted by BM following a public procurement procedure or on BM's own expertise and knowledge of the particular market.

Column L contains the labour cost of outsourced activities per FTE, calculated based on column K (with working days of 8 hours per day and 200 working days per year), VAT included. Column M contains the same information (i.e., the cost of outsourcing per FTE), but exclusive of VAT. Column N gives the total cost of outsourcing, VAT included ($N=L \cdot D$). Here, the notion 'total' cost here refers to the fact that the total cost of outsourcing (column N) has been obtained by multiplying the cost of outsourcing per FTE (column L) by the number of FTE required to complete this task (column D). Column O contains the same information (i.e. total cost of outsourcing), but exclusive of VAT ($O=M \cdot D$).

It should be noted that the numbers shown in Table 3.1 purely refer to labour cost associated with technical assistance to the contract authority (Fr.: 'assistance à maître d'ouvrage') and does not include any other cost of input to the project (such as e.g., construction materials, use of machinery, equipment, etc.).

The overhead cost (which is shown in column I and J of Table 3.1) has been calculated by the Department Human Resources (DRH) using an empirical method. The DRH made a list of all the items of indirect expenditure that are associated with recruiting direct staff. This list is shown in Table 3.2 and comprises four types of indirect cost, namely (1) the cost of the staff working in the DRH and RFA[12] (payroll administration and other activities) and in the ICT Department, (2) additional cost elements related to recruiting staff (such as reimbursement of public transport commuting costs, telework allowances, meal vouchers), (3) ICT (operational and investment cost of the ICT Department) and (4) DRH and Facilities (operational cost, training, juridical expenses, special missions). The total indirect cost reaches an overall total of €27 644 145 for a total workforce of 1 457 people, which amounts to an average of €18 973 per person. Hence, it is this number that has been used for the overhead cost, irrespective of the profile or education level of the worker.

[12] RFA stands for Human resources and facilities.

Table 3.2 : Estimation of overhead cost related to insourcing activities at BM (Source: BM & Department of Human Resources)

Estimation 'overhead cost' BM			
Base:	dépenses du 01/01/2020 au 31/12/2020		
Effectif SPRB au 31/12/2020	1453		
1) Frais de personnel - RFA (DRH&Facilities) + ICT - 2020			
04.002.07.01.1111	Rémunérations barémiques	9.344.163 €	
04.002.07.01.1112	pécule de vacances	720.181 €	
04.002.07.01.1112	prime de fin d'année	376.365 €	
04.002.07.01.1140	ONSS pat.	1.845.509 €	
	COUT MOYEN	8.456 €	
2) Autres éléments de la rémunération (personnel SPRB)			
04.002.07.13	Ab STIB et chèques-repas	2.594.594 €	
04.002.07.14	Ab SNCB & TEC	1.071.502 €	
04.002.07.01.1140	Indemnité télétravail	203.877 €	
04.002.07.01.1112	primes soumises ONSS - agents SPRB	5.138.169 €	
	COUT MOYEN	6.200 €	
3) Frais ICT			
07.004.08.02	SPRB - frais de fonctionnement	1.327.995 €	
07.004.11.04	SPRB - dépenses d'investissement	654.343 €	
	COUT MOYEN	1.364 €	
4) Frais DRH & Facilities			
04.002.08.01	frais de fonctionnement - facilities	1.800.903 €	
04.002.08.03	frais de formation (DRH)	676.949 €	
04.002.08.05	dépenses juridiques	224.404 €	
04.002.08.08	frais de fonctionnement DRH	414.630 €	
04.002.08.13	missions spécifiques - facilities	1.234.540 €	
	COUT MOYEN	2.995 €	
	TOTAL (2020)	27.644.145 €	
	effectif au 31/12/2020	1457	
	COUT MOYEN	18.973 €	

Statutaire	Rang	Coût moyen	% ov.
Contractuel	A1	64.000 €	29,65%
Contractuel	A2	80.000 €	23,72%
Contractuel	I1	83.000 €	22,86%
Statutaire	A1	55.000 €	34,50%
Statutaire	A2	69.000 €	27,50%
Statutaire	I1	71.000 €	26,72%

Efficiency gains in the cost-benefit analysis from economic point of view.

In order to make meaningful cost-benefit comparisons from an economic point of view of the labour cost associated with outsourcing decisions in the BCR, we advise to compare the labour cost of hiring contractual agents in the civil service with the labour cost of hiring contractual workers in the private sector and to ignore the VAT bonus associated with insourcing.

As regards the labour cost, this approach makes sure that we actually compare 'apples to apples' and 'oranges to oranges'. This is because the (artificially) lower labour cost resulting from recruiting statutory staff will eventually increase the federal state's level of expenses and does not correspond to actual savings on economic or resource cost.[13] The same way of reasoning applies to the VAT bonus, because the VAT bonus for the BCR eventually results in lower VAT receipts (or a 'VAT malus') for the federal state (or proverbially 'unclothing Peter to clothe Paul').

Hence, the actual efficiency gain in the economic point of view can, at this stage, be obtained from Table 3.1 by comparing the bottom line of column J (i.e., €5.474.543 for both DEN and DGI together) with the bottom line of column O (i.e., €8.519.982 for both DEN and DGI together). This efficiency gain amounts, at this stage, to a total of €3.045.439 (= €8.519.982 - €5.474.543). This amount is also shown in Table 3.3.

Gains in the cost-benefit analysis from a budgetary point of view

If a pure budgetary point of view is taken, it would make sense to actually take into account the VAT bonus resulting from re-insourcing the activities that had previously been outsourced. In the budgetary point of view the only effects that count are the effects on the budget of the BCR.

Hence, the actual gain in the budgetary point of view can, at this stage, be obtained from Table 3.1 by comparing the bottom line of column J (i.e., €5.474.543 for both DEN and DGI together) with the bottom line of column N (i.e., €10.309.178 for both DEN and DGI together). This budgetary gain amounts, at this stage, to a total of €4.834.635 (= €10.309.178 - €5.474.543). This amount is also shown in Table 3.3.

It is, however, possible to achieve an even higher budgetary gain in a scenario whereby all the staff working for BM would be recruited as statutory staff instead of contract staff. In that case the gain in the budgetary point of view would be given by comparing the bottom line of column I (i.e., €4.925.043 for both DEN and DGI together) with the bottom line of column N (i.e., €10.309.178 for both DEN and DGI together). This budgetary gain amounts, at this stage, to a total of €5.384.135 (= €10.309.178-€4.925.043). This amount is also shown in Table 3.3. However, it should be noted that in case contract staff is given statutory employment, an extra cost may occur, namely the cost of guaranteed remuneration during sick leave (which is higher for statutory staff compared to contract staff).

[13] The present cost-benefit calculation is based on a scenario whereby the cost of contract staff in the public sector is compared with the cost of outsouring to the private sector. At present none of these categories of staff receive so-called extra-legal or second-pillar pension schemes (albeit not in the construction sector for this type of workers). However, there is a risk that in the future employers in the public sector, like e.g. (regional) governments, would become obliged to confer extralegal or second pillar pension schemes to their contract staff in order to align their benefit packages with those of officially nominated staff and alleviate the differences in treatment of both types of staff. Even in that case, our cost-benefit calculation will still hold, because one can assume that if this happens in the public sector, this tendency will sooner or later trickle down to the private construction sector as well. However, some risk may persist as such a tendency might become a reality in the public sector at an earlier point in time than in the private sector in the future.

Anyhow the conclusion at this stage is that in the budgetary point of view the budgetary gain ranges from €4.834.635 to €5.384.135 depending on the ratio of statutory versus contract staff employed for these tasks in the BCR (however, with the side remark of the guaranteed remuneration during sick leave). And this budgetary gain could even become higher when all the indirect staff working for BM (i.e., those whose labour cost is comprised in Table 3.2) were also recruited on a statutory basis.

The results of the efficiency and budgetary gains related to re-insourcing the activities that had previously been outsourced are shown in Table 3.3.

Table 3.3 : Synthesis of efficiency and budgetary gains resulting from re-insourcing activities at BM

Scenario	Economic point of view	Budgetary point of view
Scen. 1 (contract staff)	3.045.439	4.834.635
Scen. 2 (statutory staff)	n.a.	5.384.135

Additional elements to be taken into account in the cost-benefit analysis

The calculation of the potential efficiency gain shown in Table 3.1 and summarized in Table 3.3 has been performed based on quantified and monetary information readily available (or made available by BM officials). Elements that are more difficult to express in money terms have not been included in the cost-benefit analysis yet. We will list these items separately and treat them as a 'p.m.' post (i.e., a memorandum item).

Outsourcing activities to the private market entails a transaction cost, because public procurement procedures need to be initiated, calls for tenders need to be issued, etc.

Another transaction cost that arises from the outsourcing is that the outsourced work needs to be checked and inspected at several times, etc., which is to a certain extent of course also the case for internally provided services.

Still another cost associated with outsourcing is that expertise and skills may get lost as there may be a great turnover in the companies (and staff) to whom contracts are awarded.

Table 3.4 tries to evaluate in qualitative terms the non-monetary effects associated to outsourcing in the case of BM.

Table 3.4 : Pros and cons of outsourcing

Disadvantages	Advantages
Internal loss of expertise and knowledge	We manage to find interesting profiles because of the difficulties of recruiting internally
The risk of turnover at the end of the market (market relaunch after 4 years) and during the market	Engagement facilitated by the speed of engagement of specialists in our framework agreements
More costly	Flexibility in staff availability
The transfer of our data and operation to the outside	The risk of finding an equivalent profile
Takes time to learn about internal processes	People are operational faster

3.6 Efficient use of infrastructure: road pricing

SmartMove-project

The Brussels Coalition Agreement 2019-2024 states that road taxes must be reviewed to enable better use of the car while ensuring that it does not have negative social consequences. Traffic taxation is an instrument that will be used to achieve the objectives set by the Region in the context of the NEKP.

To this end, the Government reaffirms its desire to conclude a cooperation agreement between the Regions with a view to the introduction of an intelligent kilometer charge for light vehicles in the metropolitan area or throughout the national territory. The introduction of such a tax should ensure that the current tax is abolished and replaced by the new tax. Within the framework of its own competences, the Government will propose a thorough reform of traffic taxation to improve the quality of life in the city for all, as part of a fair and inclusive transition.

The system of the Tax on the Entry into Service (TES) will be revised by incorporating a greater progressivity, in function of the environmental performance of the vehicles (weight, real power and type of fuel), to allow the purchase of vehicles that are not adapted to to discourage traffic in an urban environment.

The current road tax (VB) will be revised in line with the objectives of the Low Emission Zone (LEZ) and will be based on the technology of the LEZ. This new regulation will apply to all vehicles driving in Brussels and will be adapted to use to reduce congestion, especially during peak hours. To this end, the Government will further expand the network of ANPR cameras.

The traffic in the Brussels-Capital Region is constantly increasing, which means that travelers are increasingly losing time in traffic jams. Drivers must take into account an extra travel time of an average of 38 percent. During the morning and evening rush hours, these percentages increase to an average of 75 and 77 percent extra travel time respectively. These lost hours represent an economic loss of 1 to 2% of Belgium's GDP.

In addition, traffic jams have a negative impact on air quality, generate noise pollution, are stress factors and increase the emission of greenhouse gases and air pollutants. They also cause buses and trams to get stuck in traffic, affecting their attractiveness as an alternative mode of transport. The list of negative effects is long. These reduce the quality of life in the city, which can contribute to the city flight.

SmartMove therefore aims for a social transformation that will ensure a region with a better quality of life and encourage responsible mobility choices.

In particular, SmartMove should encourage road users to optimize their routes, resulting in a substantial reduction in lost hours in traffic. By spreading traffic more over time, congestion can also be prevented without reducing the mobility of people. SmartMove also contributes to the Region's other important projects such as the Energy-Climate Plan and the Good Move Mobility Plan.

It cannot be denied that less traffic leads to better air quality. With a quarter less individual journeys by car, the emission of harmful exhaust gases such as CO2, SO2 and NOX will decrease significantly. In addition, CO2 emissions per vehicle are higher when it has to follow the traffic jam than when it can maintain a normal speed.

A decrease in traffic congestion may in some cases also lead to a decrease in road casualties. After all, in traffic jams, people can easily divert their attention, which increases the risk of an accident. Situations requiring sudden maneuvers, such as a sudden traffic jam, also increase the risk of accidents. Under this tax, drivers will pay more during peak hours, less during off-peak hours, and nothing during nighttime, weekends and holidays.

When determining the tax due, the financial capacity of the taxpayers is taken into account by varying the rates according to the power of the engine of the vehicle. This variable in function of the engine displacement also discourages the use of heavy vehicles, such as SUVs, which is not desirable in an urban context.

In this way, the SmartMove tax responds to four main needs of the Region: fair, just and favorable traffic taxation where not ownership but use is taxed, better mobility for everyone moving in the Region, a better quality of life for everyone. , and a technological advance that supports road users 24/7 and helps them make the best mobility choices.

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Appendix 1 Calculations savings insourcing

Appendix N°1: Cost Calculation Outsourcing versus insourcing of Road Maintenance activities (Source: Brussels Mobility)

Prestations externalisées en 2021 par manque de personnels en interne

Mission	Dossier	Profil	Nombre (ETP)	Coût interne (6 ans ancienneté et statutaire)/ETP	Coût horaire HTVA externe	Coût externe TVAC/ETP	Coût total interne pour 2021	Cout total externe TVAC	
DEN :									
Responsables projets multidisciplinaires	Nouveau dossier AMO	A	1	55.000,00	95	183.920	55.000,00	183.920,00	
SPOC Osiris	Nouveau dossier AMO	A	1	55.000,00	95	183.920	55.000,00	183.920,00	
SPOC Osiris	Nouveau dossier AMO	B	1	41.000,00	60	116.160	41.000,00	116.160,00	
Responsables des projets de signalisation	Nouveau dossier AMO	I	1	71.000,00	110	212.960	71.000,00	212.960,00	
Responsable de la planification revêtement	E18.005	A	1	55.000,00	76,5	148.104	55.000,00	148.104,00	
Responsable PPI	E18.005	A	1	55.000,00	76,5	148.104	55.000,00	148.104,00	
Contrôleurs INFRA	Marchés controleur (E20.076)	B	3	41.000,00	60	116.160	123.000,00	348.480,00	
Responsable projet éclairage	Nouveau dossier AMO	I	1	71.000,00	110	212.960	71.000,00	212.960,00	
Chef de projet galeries techniques	Nouveau dossier AMO	I	1	71.000,00	110	212.960	71.000,00	212.960,00	
Gestionnaires d'avis techniques pour garantir l'intégrité de la voirie lors des chantiers	Nouveau dossier AMO	A	1	55.000,00	95	183.920	55.000,00	183.920,00	
Gestionnaire de l'asset management	Nouveau dossier AMO	A	2	55.000,00	95	183.920	110.000,00	367.840,00	
Contrôleurs EM	Marchés controleur (E20.076)	B	3	41.000,00	60	116.160	123.000,00	348.480,00	
Ouvriers Régie	Marché placement founriture	D	10	34.000,00	62	120.032	340.000,00	1.200.320,00	
TOTAL							**1.225.000,00**	**3.868.128,00**	

Mission	Dossier	Profil	Nombre (ETP)	Coût interne (6 ans ancienneté et statutaire)/ETP	Coût horaire HTVA externe	Coût externe TVAC/ETP	Coût total interne pour 2021	Cout total externe TVAC	
DGI:									
Ingénieur Civil Responsable inspections EM	F20.005 (Inspect. Tun.)	I	2,00	71.000,00	142	274.912	142.000,00	549.824,00	(travail de nuit)
Ingénieur industriel /inspecteurs EM	F20.005	A	4,00	55.000,00	126	243.936	220.000,00	975.744,00	(travail de nuit)
Agent Inspecteur de routine EM	F20.005	B	1,00	41.000,00	98	189.728	41.000,00	189.728,00	(travail de nuit)
Géomètre (Gestion administrative Asset)	Nouveau dossier AMO	A	2,00	55.000,00	98	189.728	110.000,00	379.456,00	
Juriste (Gestion administrative Asset)	Nouveau dossier AMO	A	1,00	71.000,00	110	212.960	71.000,00	212.960,00	
Agent de terrain (Gestion administrative Asset)	Nouveau dossier AMO	B	1,00	41.000,00	78,4	151.782	41.000,00	151.782,40	
SPOC Tunnels csc 2017.1092	CSC BMBDGEDBO2017.1092	A	2,00	55.000,00		166.362,90	110.000,00	332.725,80	
Ingenieur chef de projet	**CSC F20.003**	I	1,00	71.000,00		161.716,50	71.000,00	161.716,50	
RH	**CSC F20.003**	A	0,50	55.000,00		49.800,00	27.500,00	24.900,00	
Expert Ir.	**CSC F20.003**	I	1,00	71.000,00		180.338,40	71.000,00	180.338,40	
Superviseur Ing.	**CSC F20.003**	I	2,00	71.000,00		149.948,04	142.000,00	299.896,08	
Superviseur	**CSC F20.003**	A	3,00	55.000,00		77.565,44	165.000,00	232.696,31	
Operateurs	**CSC F20.003**	B	13,00	41.000,00		70.988,76	533.000,00	922.853,85	
Ingenieur chef de projet	AMO Inspections Voirie (nouveau d	I	1,00	71.000,00		161.716,50	71.000,00	161.716,50	
Ingénieur industriel /inspecteurs EM	AMO Inspections Voirie (nouveau d	A	2,00	55.000,00	98	189.728,00	110.000,00	379.456,00	
Agent de terrain	AMO Inspections Voirie (nouveau d	B	1,00	41.000,00	78,4	151.782,40	41.000,00	151.782,40	
Ingenieur chef de projet	Patrouillage (Nouveau dossier)	I	1,00	71.000,00		71.000,00	71.000,00	71.000,00	
Agent de terrain	Patrouillage (Nouveau dossier)	B	7,00	41.000,00		151.782,00	287.000,00	1.062.474,00	
TOTAL							**1.740.500,00**	**4.133.338,24**	

Cout annuel							Cout si personnel interne	Cout si externalisation
COUT TOTAL							2.965.500,00	8.001.466,24
GAIN si internalisation							5.035.966,24	

Appendix 2 Ongoing policy measures and cost savings

- **Categorie 1: terminated**

  - Changer la méthode de réfection des trottoirs : effectuer des contrôles sur l'ensemble du tronçon, puis tout réparer en une seule fois grâce à un chantier " glissant " :

Une auscultation de la voirie est en cours, ce qui permettra de faire des économies. En effet une bonne connaissance du patrimoine implique une meilleure gestion de ce dernier.

Suite à cette auscultation, il y a une priorisation des interventions en trottoirs. Les trottoirs les plus dégradés et les plus fréquentés seront traités en premier.

  - Mieux utiliser le "hotbox" pour les trous dans la chaussée :

Pour avoir une meilleure optimisation du traitement des nids-de- poule et **réduire les coûts**, nous avons classé tous les incidents entrants concernant la chaussée en trois catégories, en fonction de la grandeur de leur section:

A : Traitement des nids-de-poule à petite section : 0,4m²

B : Traitement des nids-de-poule de moyenne section en asphalte coulé : 0,4m² à 1m²

C : Traitement des nids-de-poule à petite section Hot-box : + de 1m²

Les traitements sont rassemblés par zone géographique.

  - Développement d'un catalogue de bornes et création d'un stock :

Nous allons rationaliser le nombre de modèles de potelets présents sur les voiries afin de diminuer les stocks nécessaires et **d'éviter les pertes de temps** pour rechercher des modèles de potelets peu courants et **avoir des prix plus avantageux**.

  - Achat d'une installation saumure :

En service hivernal, la saumure de chlorure de calcium permet d'améliorer l'efficacité des épandages préventifs sur les voiries de la Région de Bruxelles-Capitale. La saumure fournie à la Direction Entretien est initialement concentrée à hauteur de 33% en poids de chlorure de calcium (CaCl2). Le présent marché porte sur l'acquisition d'une installation de dilution de saumure et sur l'installation de postes de remplissage au dépôt de Bruxelles Mobilité situé à l'avant-port de Bruxelles. La dilution voulue de saumure à 16% en CaCl2 permettra à la Direction Entretien de **réaliser des économies en termes de quantités de fondants chimiques épandus et de réduction des coûts de transport**.

- **Category 2 : Ongoing**

  - Établir une répartition des coûts pour la pose de câbles souterrains :

En tant que gestionnaire de voiries et suite à des problèmes récurrents concernant l'application de l'annexe 1 de la clé de répartition émise par le Conseil des Gestionnaires de Réseaux de Bruxelles actuellement appliquée à nos chantiers, nous avons demandé au CGRB de bien vouloir être considérée dorénavant comme une seule et même entité Bruxelles Mobilité et pas comme 3 entités distinctes.

Comme le prévoient vos statuts, BM demande de pouvoir insérer dans l'annexe 1 de la clé de répartition au plus vite 2 nouvelles combinaisons de 2 types de conduites avec une autre qui correspond à nos réels besoins à savoir:

- sur 30 cm de largeur et 80 cm de profondeur la clé de 2 canalisations de 110 et de 1 à 2 canalisation(s) de 50 ;
- sur 30 cm de largeur et 80 cm de profondeur la clé de 3 canalisations de 110 et de 1 canalisation de 50.

BM a calculé que, si ces deux points sont acceptés, cela implique une économie de +/- 25% pour BM (sur un montant de 1M€ en 2020 : **économie de 250.000€**).

- L'utilisation des LED pour l'éclairage public :

L'introduction de l'éclairage LED mène à une réduction de la consommation électrique d'environ 50%.

La suppression des hauts poteaux en béton pour l'éclairage des ponts mènera aussi à une **réduction de la facture électrique** et de la pollution lumineuse.

- Consommation d'électricité en général :

En éclairage public, le remplacement des anciens systèmes d'éclairage public par de plus économiques (par exemple éclairage LED) continue, notamment sur la petite ceinture où plus d'une centaine de luminaires ont été remplacés.

=> **économie estimée de 50% électricité**

Points forfaitaires : BM a identifié des points forfaitaires, pour notamment l'éclairage public, qui sont plus utilisés (pas enlevés dans le passé avec le renouvellement d'une installation et la mise en place d'un compteur). Un travail commun avec Sibelga d'enlèvement de ces points commence fin avril 2021 => **économie estimée de 100.000€ - 150.000€/an.**

Les mesures structurelles prises pour les feux tricolores sont la continuation de la transformation des carrefours en LED avec des lanternes nouvelle génération de moindre consommation. Les premiers LED ont été placés en 2003 (on a déjà dépassé le **double de leur durée de vie** fabricant).

75 % (463 / 617) des carrefours sont actuellement (avril 2021) en LED, 10 % en basse tension (halogène), 15 % en 230 V.

Tous les nouveaux systèmes ITS (comme des afficheurs de vitesse et des panneaux de téléjalonnement) sont toujours prévus d'afficheurs LED (économies d'énergie).

L'autre matériel ITS (réseau Manbru/ modems/…) est « state of the art » (ne consomme pas plus que strictement nécessaire).

- Réparation linéaire de l'asphalte et donc moins de réparations de nids-de-poule :

Les réparations de nids-de-poule ponctuelles coûtent en moyenne 250 €/m² HTVA et ont une durée de vie de 3 à 5 ans ; de plus, quand on est devant des revêtements d'un âge supérieur à 12 ans, les défauts se déplacent à faible distance, même après traitement des défauts. Le respect du cycle de vie du revêtement et le réasphalte à temps permettent des économies à ce niveau. Pour avoir un traitement dans le respect du cycle de vie du revêtement, il faut savoir qu'on traite les couches de roulement tous les 10 à 12 ans (35 €/m² HTVA) avec un remplacement intermédiaire des sous-couches tous les +/-20 ans (un supplément de 30€/m²), ce qui nous donne un investissement de 100 €/m² sur 20 ans.

Réduire les investissements dans le revêtement peut sembler bénéfique à court terme, mais ça induit une baisse de la qualité du revêtement et une réduction certaine de la durée de vie des sous-couches et des fondations à moyen terme. Ce qui implique des investissements conséquents pour la remise en bon état de service.

Garder le revêtement en bon état dans le respect de son cycle de vie **réduit considérablement les interventions ponctuelles** et **permet une meilleure maitrise budgétaire**.

- S'engager à mieux contrôler les réparations de l'asphalte :

Dans le cadre de la réalisation de nos chantiers d'asphaltages, nous avons mis en place une approche de renforcement des contrôles, et ce sur l'ensemble du processus, de la production jusqu'à la pose. Pour ceci et pour l'ensemble des asphaltages réalisés sur les voiries régionales, en tant que gestionnaire de voirie, Bruxelles Mobilité a conclu avec l'organisme de contrôle indépendant (Copro) une convention pour le renforcement des contrôles de production des revêtements bitumineux destinés aux voiries régionales afin de garantir la correspondance du produit aux exigences techniques définies lors du choix de la fiche technique, ceci dans le respect du CCT 2015.

Pour la pose, Maintain a renforcé ses équipes de contrôle par un AMO contrôle des travaux dont le rôle est en outre de :

- réceptionner l'ensemble des livraisons et s'assurer des températures du produit au moment de la pose ;
- s'assurer que le compactage est réalisé de façon optimale.

Ce renforcement de contrôle nous permettra de réceptionner et de poser un produit de qualité ce qui **augmente fortement la durée de vie du revêtement dans son ensemble**, et réduit l'apparition des défauts ponctuels dus aux carences en terme de suivi. Ceci également **permet une meilleure maitrise budgétaire**.

- S'engager dans des programmes pluriannuels :

Afin de **diminuer les coûts d'entretien curatif et de risquer de payer des dédommagements** suite à des accidents liés à un mauvais état de la voirie, la Direction Entretien se lance dans l'organisation de PPI pour tous ces assets. La première étape consiste en un inventaire exhaustif des assets et de leur état de vétusté. Ensuite, nous mettons en place une stratégie permettant d'anticiper les remplacements avant que les coûts d'entretien ne deviennent trop élevés tout en tenant compte des projets de réaménagement complet prévus.

- Marquage au sol :

Le marquage au sol permet de signifier à chaque usager sa place sur la voirie. Les marquages effacés ou manquants peuvent donner lieu à des situations ambigües source possible d'accident. La Direction Entretien organise au minimum deux fois par an des campagnes de rafraichissement du marquage réalisé en peinture. Cependant, à de nombreux endroits, ces deux campagnes annuelles sont insuffisantes pour garantir une bonne visibilité du marquage. De plus, le nombre de marquages devient de plus en plus important entre autres suite à la création de pistes cyclables. Afin d'éviter les campagnes de rafraichissement coûteuses et pénalisantes pour le trafic, il convient d'augmenter la quantité de marquages réalisés en thermoplastique qui a une durée de vie de 2 à 5 ans. Un budget d'investissement annuel supplémentaire de 500.000€ est nécessaire pour couvrir ce besoin. A terme, le budget nécessaire pourrait diminuer car le coût de la peinture devrait diminuer si aucun nouveau marquage n'est ajouté entretemps. Il s'agit donc d'un investissement durable.

En considérant que la durée moyenne de vie du thermo est de 4 ans (en réalité c'est probablement plus que ça), on peut considérer que si les marquages sont en thermo plutôt qu'en peinture, **une « économie » de 1.175.000€ TVAC / an pourrait être réalisée**.

Il est préférable de faire ces investissements le plus rapidement possible.

Changements qui sont prévus avec mises en thermo :

- Toutes les pistes cyclables COVID ;
- Tous les marquages après asphaltages

Logos et chevrons vélos et quelques passages piétons.

- Economies d'eau :

Arrosages diminués pour les plantations dans les projets équipés de sondes tensiométriques.

- Diminution des tailles des arbres :

Tous les arbres d'une voirie ne sont plus systématiquement taillés dans une commande globale -> commande sur mesure en fonction des besoins.

Strategisch plan MAINTAIN

Op 02/04/2021 werd het strategisch plan Maintain 2020-2025 aan de bevoegde Minister en DG bezorgd.

Binnen dit plan, dat **efficiëntie en een beter onderhoud** beoogt en dus **minder uitgaves tot doel heeft op lange termijn**, werden een aantal actiepunten beschreven om kosten te drukken.

Maar enkele algemene elementen uit het plan kunnen alvast aangestipt worden :

Budget

- Er moet een geïntegreerd beheer van de budgetten van de dienst zijn. Onder de verantwoordelijkheid van de Directeur-Generaal en in samenwerking met de Directeur-Diensthoofden van Brussel Mobiliteit, wordt de opmaak van het budget uitgevoerd. Deze opmaak van het budget dient op een geïntegreerde, uniforme en volledige manier te gebeuren, in respect van de deadlines en de geldende regelgeving.
- Er gebeurt een analyse van de budgetnoden, dat zal volgen uit de verschillende PPI's. Indien nodig, worden nota's opgesteld om bijkomend budget te beargumenteren, en te vragen.
- De jaarlijkse onderbenutting van de dienst moet weggewerkt worden.
- Er wordt geanalyseerd hoe er beter kan gebruik gemaakt worden van middelen om de dienst verder performant te maken. Een analyse met betrekking tot inter- en externalisatie wordt uitgevoerd.
  De resultaten daarvan worden voorgelegd aan de verschillende audits, zowel intern als extern, voor verdere analyse.

Asset Management

- BM heeft de ambitie om zichzelf uit te rusten met een geïntegreerde IT-tool voor asset management (EAM) om zijn activa (openbare ruimtes, wegen, transportinfrastructuur, enz.) effectief te beheren en te onderhouden.
- Het Asset Management Systeem zal een belangrijke basis zijn voor correcte toekomstige werking van de volledige directie, en ook daarbuiten, binnen de volledige administratie van BM.
- Er is continue opvolging van de uitgaven, per budgettaire lijn. Er is in per kwartaal een rapportage betreffende de financiën, zodat er kan worden bijgestuurd.
- Prioritair is het geoptimaliseerd uitgeven van de gekregen middelen. Waar nodig, wordt het nodige gedaan om bijkomende middelen aan te trekken.

Meerjarenprogramma

- De directie zal daartoe een globaal meerjarenprogramma (PPI) voor onderhoud (budget, middelen, …) opstellen. Gezien de verschillende organisatie en niveaus van organisatie, middelen en digitalisatie van verschillende cellen, gebeurt dit trapsgewijs. In dit programma dient een priorisering aangebracht te worden met betrekking tot de risico's.
- Dit programma zal men in functie van de beschikbare middelen opstellen (cf capacity planning), of, indien nodig en door middel van geargumenteerde risico-analyse, zal men hiertoe de nodige middelen aantrekken. De focus en prioriteit ligt daarom eerst op de assets wegen en openbare verlichting.

Onderhoudscontracten

- Optimalisatie van de contracten en praktijk van externe dienstverleners (kosten, deadline voor interventie, groepering van de contracten,…).
- Een denkoefening voeren met betrekking tot internalisering en externalisatie van de onderhouds-activiteiten.
- Er wordt daarnaast naar gestreefd om stockopdrachten te gunnen aan meerdere partijen. Dit om de concurrentie te verhogen, en de prijzen te drukken. Daarnaast kunnen zo ook meer middelen tegelijk ingezet worden.

- **Category 3 : Not started**

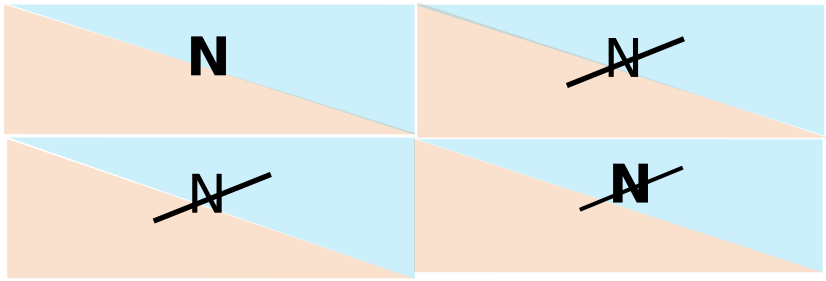
  - Consommation d'électricité dans les tunnels :

Actuellement BM paye l'électricité en fonction de la consommation et du maximum que nous déclarons avoir besoin. Ce maximum correspond à mettre tous les appareils (ventilation, ….) en route en même temps, ce qui est improbable mais possible en cas d'incendie. Si nous dépassons notre maximum défini, nous aurons une pénalité. Si le maximum dépasse les possibilités du réseau, on risque la panne mais actuellement le réseau permet (théoriquement) ces maximums et couvre souvent plusieurs tunnels. Une révision de ces maximums par la DPO suite à une analyse de risque permettrait **d'économiser 500.000€ et 700.000€ par an.**

Pour les cabines Haute Tension, nous payons des indemnités sur l'efficacité de la conversion de la Haute Tension. Meilleure est la conversion, plus les pertes sont faibles. Et si les conversions sont inférieures à 0.9, on paye des indemnités. Pour plusieurs cabines Haute Tension des tunnels, plusieurs mauvais facteurs de conversion ont été détectés. Un audit est prévu.

Les appareils d'éclairages des tunnels sont progressivement remplacés par des appareils led moins énergivores.

Appendix 3 Speltheorie: Rekeningrijden in Brussel of Vlaanderen ?



- **Beschrijving van de resultatenmatrix** (zie ook C13.1)

➢ De gewesten zijn elk afzonderlijk bevoegd voor mobiliteit en voor de wijze waarop dit wordt belast: via een vaste verkeersbelasting of via variabele heffingen van rekeningrijden (RR). Reglementair ingeschreven voertuigen (die verkeersbelasting betalen) buiten Vlaanderen (bv. in Brussel of buitenland) hebben gratis toegang tot het Vlaamse grondgebied. Zo ook krijgen voertuigen die zijn ingeschreven (en verkeersbelasting betalen) buiten Brussel gratis toegang tot het Brusselse grondgebied ;

➢ Bij RR wordt de vaste autobelasting vervangen door variabele heffingen per gereden km op wegen met file. Dit vormt een economisch middel om V en A naar mobiliteit in evenwicht te brengen. Maar politiek (en sociaal) ligt de haalbaarheid thans moeilijk. Ook kan RR soms resulteren in een extra last op arbeid ;

➢ In Brussel is het politieke draagvlak minder problematisch dan in Vlaanderen. Brussel heeft anno 2020 niet alleen een groot aantal groene ministers (3 op de 8, waaronder die van Transport), maar de bevolking lijdt er het sterkst onder de file en luchtvervuiling, die in sterke mate wordt veroorzaakt door pendelaars afkomstig uit Vlaanderen ;

➢ De preferentieniveaus zijn ordinaal uitgedrukt : niv. 1 – 4 (hoger is beter) ;

➢ Linksonder : Als Vlaanderen geen RR invoert (en dus de vaste autobelasting voor Vlamingen behoudt), maar Brussel vervangt ze door RR, dan krijgen Brusselaars gratis toegang tot Vlaanderen, maar betalen Vlamingen dubbel belasting (vaste autobelasting in Vlaanderen en RR als ze Brussel betreden). Dit geeft voor Vlaanderen het laagste preferentieniveau (1), maar voor Brussel het hoogste (4). Voor Brussel is het dan zelfs zo dat als het gewest budgetneutraliteit nastreeft binnen het gewest vanuit het standpunt van de gewestelijke belastingbetaler en dus wenst dat de gewestburgers globaal (geaggregeerd dus) aan RR niet méér moeten betalen dan ze vroeger betaalden aan vaste autobelasting – wat initieel het uitgangspunt kan zijn van RR – dan zal het gewest extra inkomsten halen uit de RR-heffingen betaald door Vlamingen. Of als ze volledige budgetneutraliteit vanuit het standpunt van de gewestelijke overheid nastreven, nl. dat de totale inkomsten uit RR (incl. deze betaald door Vlamingen) niet hoger mogen zijn dan de vroegere ontvangsten uit de vaste autobelasting van de Brusselaars, dan kunnen ze zelfs de hoogte van de RR-heffing laag instellen en betalen finaal de Brusselaars geaggregeerd minder aan RR dan ze vroeger betaalden aan vaste autobelasting. Vandaar dus zeker ‘niv. 4’ voor Brussel ;

- Rechtsonder: Nergens RR, zou men (gezien het problematische politieke draagvlak voor RR) als resultaat kunnen toekennen (4, 4), maar gezien het toch lichte draagvlak in Brussel eerder (4, 3) of (4, 3 à 4). De eindconclusie zal sowieso standhouden in beide gevallen ;

- Rechtsboven : Vlamingen rijden dan gratis in Brussel, maar Brusselaars betalen dubbel belasting als ze in Vlaanderen rijden. Voor Brussel is dit zeer slecht (niv. 1). Voor Vlaanderen kennen we, gezien de politieke aversie aldaar voor RR, het resultaat (2) toe. Voor Vlaanderen dus nog wel niv. 2, want het had voor Vlaanderen nog slechter gekund (als Vlamingen in Brussel RR hadden moeten betalen). Bovendien zal Vlaanderen in deze situatie inkomsten bekomen van Brusselaars die naar Vlaanderen pendelen (vandaar zeker 'niv. 2 voor Vlaanderen) ;

- Linksboven : RR in beide gewesten zou men als resultaat kunnen toekennen (2, 2) maar gezien de lichte preferentie/draagvlak in Brussel eerder (2,3). Maar de conclusie houdt stand in beide gevallen.

- **Verwacht resultaat**
  - Er is een dominante (of minstens een *weak dominant*) strategie maar alleen voor Brussel, nl. RR invoeren. We spreken hier van '*weak dominance*' omdat er mogelijks een *ex aequo* situatie bij zit ;

  - Er is een Nash-evenwicht bovenaan links, nl. dat als Brussel RR invoert (wat dominant is voor Brussel), Vlaanderen het dan ook best invoert.

- **Bijkomende nuancering**
  - Ook al kunnen grondwettelijk gezien de gewesten autonoom beslissen (zoals spelers in een spel), behoren de gewestelijke politici tot politieke partijen die elkaar ook ontmoeten op het federale niveau en daar andere akkoorden moeten zien te smeden. Zoiets verhoogt de complexiteit van deze materie.