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Methodology used in a recent highway construction in Portugal

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Summary

During the last years, Central and Eastern European countries aimed to increase the participation of the private sector in the construction of new highways and in the development of the transportation network. Presently, public funds are scarce to support the call for transportation infrastructures and the network development in the new EU countries, since projects and the construction of highways involve a high capital investment and an extremely long amortization. So, a possible solution for an adequate risk management of the public funds is the private-public partnerships (PPP), namely through the use of concessions (i.e. construction and exploitation of the public highways network by private entities). One of the European countries which is widely using the concession model in its Road National Strategic Plan is Portugal. This paper is based on the work carried out at the Department of Civil Engineering of the University of Minho, within the Highways group, in the frame of "Leonardo da Vinci" Student Mobility Program, Contract RO/2004/PL93209/S, and the main objective is to study the Portuguese experience on the use of the concession model, in order to determine its main advantages and disadvantages. A case study on the use of the concession model was followed for four months during the construction of some new stretches of highways located near Oporto city.

KEYWORDS: private-public partnership, transportation infrastructure, concession, concession stages.

1. INTRODUCTION

The need of improving the infrastructures network of a country, especially in the transport sector, is seen as an essential condition of a successful economic growth.

At a European scale, the High-Level Group of the Trans-European Transport Network (TEN-T) confirmed the need of reformation in the current trans-European transport network guidelines, especially after the 2004 and 2007 European Union inclusion of 12 new countries and the resultant enlargement of boundaries [1].



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One of the potential solutions for the reorganization of the European transportation network is the involvement of the private sector. Private-public partnerships (PPP) can provide and operate transport infrastructure facilities and services that were once seen as natural monopolies which should be provided and managed exclusively by the public sector [2].

Through the establishment of a partnership between the public and private sectors, concessions can be an effective means of satisfying the strategic needs of highway transportation agencies [3].

The main reasons for using a concession model range from a lack of public funding to a belief that private financing and delivery provide a higher quality [3]. Public-private partnerships can provide an important share of private capital. They essentially require a greater transparency of costs, what obliges the public authorities to have a more strict management and to clarify their long-term policy (regulation, infrastructure charging) committing themselves contractually, so as to reduce the risks [1].

2. SOME EUROPEAN PRACTICES AND THE PORTUGUESE EXPERIENCE

Governments have to manage public highways as a result of the lack of inherent incentives supported by the private sector. In some European countries, however, there is a belief that the private sector can provide higher quality services at a lower cost. In other countries, the public sector is not capable of or is not willing to make the financial investment required to complete major infrastructure projects. These are just some of the reasons for the use of concession contracts as a part of highways agencies' long-term strategic network plans [3].

Many European highways agencies are beginning to take the role of network operators rather than providers of services, thus leading to an outsourcing of production tasks through concession contracts. A concession contract is present whenever the concessionaire carries out the whole capital investment, operates the resulting service and is remunerated through service fees paid by users. Moreover, the facilities are to be handed over to the oversight public authority at the end of the contract period [3].

Table 1 clarifies the differences between concessions and other PPP. The option in column 1 of Table 1 provides the spectrum of PPP from traditional public agency management to complete privatization [4].



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Some European countries are aggressive users of the concession model, since they believe that concessions will provide a better value for each spent Euro. Concessionaires are seen as an extension of the highways agencies.

Table 1. Different types of public-private partnerships [4]

Option	Capital Investment	Operation & Maintenance	Commercial Risk	Asset Ownership	Contract Period
Public Agency Management	Public	Public	Public	Public	
Service Contract (Performance Contracting)	Public	Public/ Private	Public	Public	1 to 2 years
Management Contract	Public	Private	Public	Public	3 to 5 years
Concession of Existing Network	Private	Private	Private	Public	5 to 30 years
Concession of New Facility (Build, Operate, Transfer)	Private	Private	Private	Public => Private	20 to 30 years
Privatization	Private	Private	Private	Private	Indefinite

Table 2 lists the financial and political advantages of using concessions for the administration [4].

Table 2. Advantages of using concessions [4]

Financial Advantages	Economic & Social Advantages	Political Advantages
<ul style="list-style-type: none"> • Easing of budgetary constraints • Optimal allocation and transfer of risk to the private sector • Realistic evaluation and control of costs 	<ul style="list-style-type: none"> • Streamlined construction schedule and reliable project implementation • Modernization of the economy and improvement of services • Access to financial markets, combined with the development of local financial markets 	<ul style="list-style-type: none"> • A new role for the public authority • Allocation and not "abdication" • Project stability

France and Portugal are the most aggressive users of concessions in Europe. In France, concessions have been an integral part of its program to develop, operate, and maintain its main highways for more than 30 years. Portugal is aggressively employing concessions as part of its strategic plan to develop its national highway system, and about 90 percent of that system is controlled by concessionaires [3].

The primary factor leading to the Portuguese concession plan was the entry of Portugal in the EU and the need of strengthening its trading ability [5]. The Portuguese public agency for highways (*Estradas de Portugal*, EP) has made major



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changes in its form of approaching to the need of a highway network development. In 1991 Portugal's roadway network included only 431 km of concessions. In 2006 it has a total of 2700 km of built concessions, thus representing 90 percent of its national highway network. The concession model allowed Portugal to complete its strategic National Road Plan eight years earlier than scheduled [3].

Financially, the State budget could contribute towards the initial investment up to 35% and towards the economical equilibrium of the concession [3]. Moreover, the Portuguese concession contracts use two primary payment vehicles: i) real tolls, through which concessionaires finance and maintain the roadway in return for payments collected as tolls from users; ii) shadow tolls, through which the government compensates the concessionaire based on the number of vehicles which use the roadway. The system with shadow/virtual tolls (known in Portugal as SCUT) was introduced whenever a motorway was required and there was no good quality alternative, or the traffic forecast was not considered to be interesting enough as to bring sufficient competition between bidders.

In a concession strategy such as that developed by the Portuguese, appropriate risk allocation is essential. The risk-control strategy suggests that the party more capable of managing the risk supports it. For instance, the risks associated with design, construction, operation and maintenance, latent defects, and legislation are assigned to the concessionaire, while there is a shared responsibility for environmental actions, land acquisition, and force *majeure* events. Planning is the only risk which the government fully maintains [3].

Two of the most difficult risks which affect transportation projects are right-of-way acquisition and environmental approval. EP's preference is to obtain environmental approval before launching its program or to retain the risk of failure so as to obtain approval. Many of the projects are subjected to environmental problems which result in a delayed beginning of the payments. When this occurs, the government compensates the concessionaire for additional costs, what can be very expensive.

Right-of-way acquisition cannot be totally delegated to the concessionaire because expropriation (condemnation) rights may be only exercised by the government. The first Portuguese concessions gave the government primary responsibility for acquisitions. This method has proved to be burdensome. The most recent concessions have significantly reassigned the right-of-way risk to concessionaires. Concessionaires handle negotiations and the government provides the public interest declaration. If it is contested, the matter goes to court and the government handles the case and the potential risk of delay in the court proceedings.

The loss of the owner and valuable EP's expertise is one of the adverse impacts of the aggressive Portuguese concession program, because it has enabled the EP to downsize its engineering and administrative staff. In fact, EP must keep on developing design, construction and operation standards, and policies which will be



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the basis for the establishment of the scope of the concessionaires' duties. The loss of the expertise will be felt for many years, both in the lack of resources to review future concession proposals and in the administration of current contracts [3].

Moreover, there are other examples of PPP in Europe. The United Kingdom has commitments or plans for more than 15 projects to date. The Netherlands have embarked on a limited use of concessions (tunnel and rail projects), and now they are trying to contract concessions for smaller maintenance/operations works [3].

The experience with concessions diverges among the different countries in Central Europe. In Hungary, there was a strong policy to encourage the development of highways on a privately financed basis and the government actively promoted the development of several concessions. In Poland, public-private partnerships are favoured under the management of the Motorway Agency. In the Republic of Croatia, a Toll Road Authority has been established in order to oversee the execution of the motorway network with the participation of the private sector. In the Czech, Slovakian and Slovenian Republics, there has been no development of highways on a concession basis. The highway network is being essentially developed on a public financed basis (contribution from fuel taxes etc.) [6].

There are arguments both pro and against the concession model for Eastern European countries. While the private involvement can fill important financial gaps, the institutional difficulties make this system still difficult to apply. Actually, it has been noticed that, due to the adverse institutional conditions prevailing in the transition period, high transaction costs and unrealistic demand expectations, PPP in Central and Eastern European countries have been less successful than in other countries and certainly less successful than it was initially expected [7].

Problems arisen from the implementation of PPP programs in EU countries are also connected to the poor management of pre-qualification steps, for the sorting of bidders with required financial means and expertise. Moreover, it was concluded that the management of a concession agreement should be simplified and monitoring schemes ought to be implemented in order to prevent a contractor's opportunistic or free-rider behaviour [8].

3. PRESENTATION OF THE STUDIED HIGHWAYS STRETCHES

This study refers to the stretches of new and existing highways which are being built (or reconstructed) near Oporto city by using the concession contract model. These road infrastructures are integrated in the concession *SCUT of Greater Oporto*, which congregates a group of roads and highways of the Portuguese National Road Plan, placed in Greater Metropolitan Area of Oporto. The stretches of roads under construction, presented in Figure 1, were visited during the



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scholarship period of four months and they are the main object of study of this project.

Some of the stretches of roads of the concession under construction will only be broadened through the increase of the number of lanes, because of the high occupancy of these roads and their extremely low level of service (16.3 km of IC 25, IP 4 and IC 24). However, the building of new stretches of highways is the main segment of the observed work, with a total length of 39.3 km distributed along IP 4, VRI, IC 24, IC 25 and EN 207 [9].

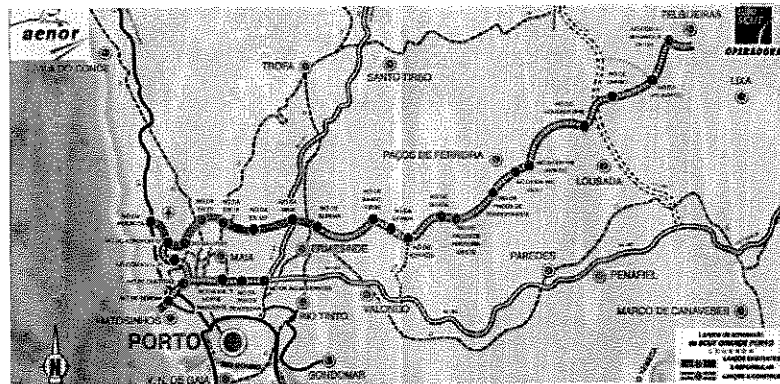


Figure 1. Stretches of road being built in the concession *SCUT of Greater Oporto*

The new roads and highways, which are being built in this concession, will work out as ring roads for the urban area of Oporto (namely, the new stretch of IP 4 and the IC 24), as local distributor roads (IP 4, IC 24 and VRI, linking IP 4 and IC 24) and as through highways which link the outlying cities to the nuclear centre of greater metropolitan area of Oporto (IC 25 and EN 207).

According to the available elements of traffic, it was considered, during the public competition phase and in the negotiation phase to attribute the concession, the implementation of a profile with four lanes in each direction, thus occupying a total platform width of 36.60 m.

The temporal macro objectives established by the concessionaire and the contractor for the design and construction of the roads are the following:

- Conclusion of the project phase : December 2004
- Conclusion of the expropriation phase: December 2004
- Construction beginning: November 2003
- Construction deadline: September 2006

The negotiation volume of the contractor with the concessionaire was fixed at 763.0 millions of euros (project, construction, traffic counting equipment, other expenses and management) for a total construction length of 55.6 km.



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4. CONCESSION METHOD: THE GREATER OPORTO CONCESSION

The roads and highways which are being built in the greater Oporto concession, as well as the headquarters and the laboratory of the contractor, were visited during the four months of this study. As an example of the Portuguese concession process, a new concession method was described (entities involved in the process, their contractual interactions and obligations).

The main entities involved in the concession process are the following:

- Owner – entity who gives the concession or the right to perform some type of business activity in its own lands or properties;
- Concessionaire – entity who has been given a concession to perform the business activity;
- Contractor – entity responsible, before the Concessionaire, for the punctual execution of the project and construction of the highway stretches;
- Sub-contractors – entities hired by the contractor, which are responsible for the conception and project of the highway stretches (designers) and for the construction of the several highway stretches of the concession.

The Portuguese Government owns the greater Oporto concession, whose agent responsible for giving road or highway concessions is the public entity *Estradas de Portugal* (EP).

The greater Oporto concession contract integrates the conception, construction, duplication and increase in the number of highway lanes, financing, exploitation and conservation, in a system with shadow or virtual tolls (SCUT without user's fee) for a period of 30 years. This concession contributes in an undeniable way to a better life quality of the people who live or work in the district of Oporto and to the economic and social development of the country. In fact, through the 56 km of highways of the greater Oporto concession, it is possible to:

- have access to an alternative network of great speed roads, which links the metropolitan area of Oporto with the Northern municipalities of that district;
- have access to the border with Spain through a fully highway connection in an hour and a half;
- have access directly to the local airport and harbour, without needing to drive through the city.

The concessionaire which has been given the greater Oporto concession in 2002 is the Lusoscut, Highways of Greater Oporto (Lusoscut GO). This is a group of several construction companies associated with some banks. The Lusoscut GO is one of the five concessionaires of the Aenor organization, which is responsible for 600 km of the Portuguese highways given in concession.



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In Portugal, the main concessionaires are Brisa Group, Aenor Group (in which Lusoscut GO is included), Highways of Atlantic Group, Euroscut Group, Lusoponte, Norscut and Scutvias.

The contractor associated with the greater Oporto concession, which is responsible for the execution of the project and construction of the highway, is the Complementary Group of Companies (ACE in Portuguese) designated as Portuscale. The ACE Portuscale is the contractor linked to the concessionaire Lusoscut GO, since these two entities were formed by the same group of associated construction companies.

Thus, the ACE Portuscale is basically the contractor branch of the Lusoscut GO concessionaire, and the construction companies associated with the ACE are the sub-contractors responsible for the construction of the several stretches of the concession's highways. The ACE designers are the entities responsible for the conception and elaboration of the project for the highways of the concession GO.

In this concession model, the owner gives the concession to the concessionaire by setting down a Concession Contract (CC) to regulate the rights and duties of the concessionaire, which can be divided into the following sub-contracts:

- Conception, design and construction of the highway;
- Financial support of the construction;
- Maintenance and exploitation of the highways of the concession.

During the period of concession (thirty years in the case of GO), the concessionaire must construct and maintain the highways at a good service level, by using their own funds. In order to be compensated for this huge investment, the concessionaire can benefit from the concession exploitation, essentially by receiving real tolls (users) or shadow tolls (SCUTS).

The Project and Construction Contract (PCC), which is enclosed in the CC, regulates the relationship between the concessionaire and the contractor. The PCC objective is to define the phases of conception, design and construction of the highways of the concession, by the contractor, in a fixed and global price system, with a specific deadline for the conclusion of the work. This contract represents an integral sequence of the concessionaire responsibilities before the owner, for what respects to the conception, project and construction of the highway.

The Project Contract (PC) legalizes the trade between the contractor and the companies which carry out the highway projects of the concession (coordinators, verifiers and designers). The PC defines the objectives and conditions required to conceive and design the projects of the highway. These are essential to begin the construction of the highways of the concession on time and to obtain a final product of good quality.



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The Sub-Contract Agreement (SCA) normalizes the relationship between the contractor and the sub-contractors responsible for the punctual construction of the highway stretches. The SCA is also a full sequence of the contractor obligations before the concessionaire and, consequently, of the concessionaire before the State, concerning the construction of the several highway stretches. Thus, based on the SCA, the sub-contractors must execute and conclude all the construction works on the several stretches of highways without delays.

Each entity involved in the concession model has specific obligations. The main responsibilities of the owner are the activities of expropriation and the actions of approval of all the studies and projects needed to close up the concession contract.

The concessionaire must exploit the concession acceptably, by maintaining the concession at a good service label and assuring a profitable outcome. Thus, it has to negotiate and assure an adequate relationship with the owner and with the financing institutions (banks), by also mediating the defence of the contractor rights before them. During the construction of the highway, the concessionaire assumes the role of owner of the construction.

The duties of the contractor are related to the supervision and coordination of the several entities involved in the construction process and the certification of reliability of the projects, procedures and inspections made by the designers, verifiers and other sub-contractors. The contractor must also assist the sub-contractors when dealing with external qualified entities and act as an intermediary body in the safeguard of their legal rights before the concessionaire.

The main obligation of the sub-contractors is to construct the highway stretches of the concession as established in the sub-contract agreement, which is in conformity with the project and before the deadline established in the SCA, by following strictly the safety and environmental rules defined in the project.

The main phases of the concession are the project, the construction and the exploitation of the highways of the concession. These three phases are included in the concession contract and comprise:

- the Construction Programme, which encloses the studies and projects, the expropriations and the construction of the highways of the concession;
- the Programme of Major Maintenance and Enlargements, during the exploitation phase of the concession, which also includes the respective project.

This paper is essentially focused on the concession phases observed during the several visits to the contractor (Portuscale). The contractor activity comprises the project and construction phases, which are included in the PCC and are planned out in the construction programme (also called Plan of Studies and Projects, PSP). The PSP specifies the period of the various phases of the project and construction. As these are the main phases observed *in situ*, they will be described next.



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5. PROJECT PHASE OF THE CONCESSION

The project of a highway is formed by a specific number of volumes for each type of work. Every volume has a descriptive memoir and specific drawings to detail the work. A report on the environmental conformity of the execution project must be also annexed to the project (in Portuguese, *Relatório de Conformidade Ambiental do Projecto de Execução* – RECAPE). The main contents of a highway project are:

- Vol. 1 – Synthesis;
- Vol. 2 – Setting out and surveying support;
- Vol. 3 – Geological and geotechnical studies;
- Vol. 4 – General alignment/layout;
- Vol. 5 – Junctions;
- Vol. 6 – Re-establishments, parallel roads and other passageways;
- Vol. 7 – Drainage;
- Vol. 8 – Paving works;
- Vol. 9 – Landscape integration;
- Vol. 10 – Safety equipments;
- Vol. 11 – Traffic signing;
- Vol. 12 – Equipment to count and classify the traffic and closed-circuit TV;
- Vol. 13 – Telecommunications;
- Vol. 14 – Lighting;
- Vol. 15 – Fences;
- Vol. 16 – Affected services;
- Vol. 17 – Usual engineering structures (e.g. overpasses and underpasses);
- Vol. 18 – Special engineering structures (e.g. viaducts and long bridges);
- Vol. 19 – Ancillary projects (e.g. retaining walls);
- Vol. 20 – Expropriations;
- Vol. 21 – Measures to reduce the highway impact (e.g. noise barriers);
- Vol. 22 – Operation and maintenance centre;
- Vol. 23 – Service facilities, street furniture and picnic areas;
- Vol. 24 – Tunnels.

The relationships between the main entities involved in the project phase of the concession are presented in Figure 2.

The objective of this organization is to assure the punctual execution of the studies and projects of the highway, with the required quality, and to respect the financial plan defined in the concession contract.

The beginning of the construction phase depends on the project phase which includes fundamentally the following three aspects:

- Delivery and approval of the expropriations project, in order to begin the process of expropriations, which is a responsibility of the owner and which is carried out during a further period of 6 months;



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- Delivery and approval of the final and complete project of reestablishment of the affected services, in order to contact promptly the several external entities (by controlling the affected services) and thus allowing the urgent removal of these services at the beginning of the construction works;
- Delivery and approval of the execution project for the highway or, at least, of the drawings needed to start the first construction works.

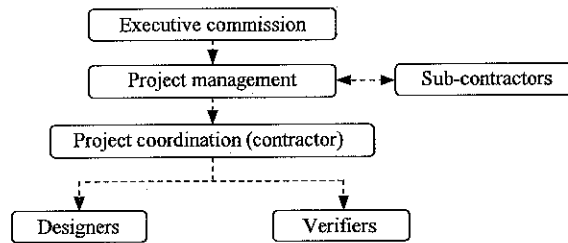


Figure 2. Organization of the main entities involved in the project phase

The expropriation project is organized by the contractor, namely by evaluating and proposing a unitary value for the expropriated lands. However, the owner should approve that project and start the expropriations process by acquiring those lands.

The expropriation phase must be finished before a 6 months period. The expropriated lands can be taken over by the Portuguese state (EP), without any legal impediment, since the highway is a construction of national interest. Nonetheless, lands with inhabited houses can only be expropriated after the residents leave their house, and EP must compensate the inhabitants for their land and house. The value of the compensation can be determined by mutual agreement, but sometimes it is a legal verdict given by the judge in the court of law, thus extending greatly the period of expropriations (more than 1 year). The tenants who live in these houses must also be compensated by the state (with money or a new house).

The construction of the highway usually begins before the end of the expropriation phase. The lands not yet expropriated and their accesses will obstruct the normal advance of the works *in situ*, thus delaying and probably compromising the contractual deadline to build the highway. In this case, the owner must compensate the contractor and the concessionaire (e.g. by extending the concession period).

Regarding the services affected by the new highway, they are mainly gas pipes, water pipes, sewer pipes, telecommunications and electrical cables and poles. The reinstallations of the affected services are usually projected and carried out by the designers and sub-contractor companies working with the contractor. Nevertheless, the telecommunications and the electricity reestablishments are carried out by the external companies responsible for those services, and the contractor can only



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negotiate the value to be paid for those works. Basically, the contractor has the role of mediator with the several external entities, by reaching an agreement as quickly as possible (to avoid delays during the construction), by negotiating the cost of the reinstallation works and by solving the problems of the sub-contractors. The main phases for the reinstallation of the affected services are the following:

- 1st phase – After finishing the preliminary study and before starting the geometrical layout – Looking for information about the affected services in the external entities;
- 2nd phase – At the beginning of the carrying out of the execution project – Emission of the project with the record of the affected services;
- 3rd phase – Until the end of the production of the execution project – Emission of the project with the solutions for the repositioning of services.

6. CONSTRUCTION PHASE OF THE CONCESSION

The organization of the construction process is coordinated by the contractor administration, whose main objective is to guarantee the execution of the construction works before the deadline, within the quality and budget limits [10].

The contractor activity during the construction phases fundamentally comprises the achievement of the following objectives:

- To guarantee the accomplishment of the contractual deadline through an adequate Construction Plan by following the work evolution;
- To guarantee a final product with the requested quality through inspections and tests and through adequate solutions to eventual non-conformity situations;
- To control and to process all the paperwork (including the invoices to the sub-contractors and to the concessionaire);
- To guarantee health and safety conditions at all workplaces and job sites;
- To follow and deal with any environmental and archaeological occurrence on site without affecting the normal work evolution;
- To guarantee the correct management of the insurance policy.

Concerning the planning of the highway construction, any sub-contractor must produce and submit an Initial Work Plan to the contractor until the 30th day after reception of the detailed project (limited up to 10 days before the consignment). Once approved, this Work Plan becomes the reference document for all construction works. The content of this initial work plan can be listed as follows:

- Explanatory Report;
- Work Programme with physical and financial chronological diagrams;
- Charts of equipment and labour force requirements;
- Work yard Project and accesses, circulation and road sign plans;
- Organisational Diagram;



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▪ Expropriations Chronological Diagram.

The contractor has two procedures to follow up the construction work, namely the Work Programme Update (performed in a monthly basis) and Work Programme Revisions (performed every three months).

Concerning the Work Programme Updates, any sub-contractor must schedule and submit the initial work programme to the contractor until the 10th day of each month, with an analysis that justifies eventual work delays and the respective measures to recover them. These updates must always show the initial work plan or the last approved revision of the plan, registered as "Baseline", by underlining the essential sequence of procedures.

Regarding the Work Programme Revisions, they must be carried out every three months or every time the contractor considers it is necessary. The sub-contractors must submit the Reviewed Work Programme within 30 days after it has been required by the contractor. Those Revisions must explain the work delays and the respective measures and deadlines to recover the time lost, including the necessary equipment and labour force reinforcements to respect the work deadline established in the initial contract. The essential sequence of procedures must be underlined.

To allow the weekly planning of the contractor activities and the appropriate monitoring of works, the sub-contractors are requested to submit a fortnight work programme to the contractor, containing information about the current or new workplaces within the analysed period, the stop points (for Quality Control and Health and Safety Assessment) and all the necessary operations, regarding the Affected Services.

The following Work Programme must be submitted fortnightly, by the Sub-contractor to contractor, until the penultimate working day of the week, indicating the active workplaces, in order to allow the coordination of the activity of the several work agents.

In order to avoid eventual delays in the beginning of works, it is necessary to guarantee the exchange of several documents among the different parts involved in the construction (concessionaire, contractor and Sub-contractors). At the consignment date, the Contractor has to provide to the Sub-contractors the documents listed below (independently from previous deliveries of the same documents in other phases of the process):

- Approved detailed project
- Models for the emission of measuring reports, listing the articles and unitary costs settled with the Sub-contractors
- Sub-contractor's quality manual
- The verification of the supporting polygonal (road line)
- The verification of the expropriations polygonal (area)



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- Health and Safety Plan
- CD with the Work Quality Manual, sub-contract agreement and contract of project and construction
- Application of laboratorial management – Highways

The preparation, compilation and approval of the documents presented above imply the preparation of other documents, which the Sub-contractor must deliver to the Contractor, such as those presented in Table 3.

Table 3. Documents submitted by the Sub-Contractor to the Contractor

Documents	Delivery time limit relatively to the beginning of works
Surrounding conditions	until 45 days before
Preliminary work programme	until 45 days before
Preliminary chart of labour force	until 45 days before
Preliminary chart of equipment needs	until 45 days before
Information concerning preliminary communication	until 12 days before
Crises management – Emergency plan	until 10 days before
Safety management – Organisational Diagram	until 10 days before
Special risks Work Plan	until 10 days before
Project of the workyard and plans of accesses, circulation and sign placing	until 10 days before
Sub-contractor quality plan	until 30 days before
Working procedures	until 60 days before
Definitive Work Plan	until 10 days before

The documents to be delivered by the Concessionaire to the Contractor, and vice-versa, are presented respectively in Tables 4 and 5 (some documents do not have an explicit deadline).

There are some fundamental definitions related to inspection, tests and non-conformity solution which must be understood, namely the following:

- Inspections and Tests Plan (or in Portuguese, *Plano de Inspeções e Ensaios, PIE*) – a document which contains a compilation of reference specifications, which demonstrate the conformity of an activity with the work quality manual, the detailed project of each highway stretch and the working procedures of the sub-contractor;
- Document analysis – an evaluation of the previous documents, necessary to begin an activity, by verifying the conformity of the materials, equipments, constructive methods or the work plan proposed by the sub-contractor;
- Stop point – situation of the work, in which the sub-contractor needs a special authorization from the Contractor to begin or continue the activity;



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- Nonconformity (NC) – a product which does not conform to the specifications; serious or imminent danger situations;
- Anomaly – a failure which occurs during the works. If not corrected, it will lead to a NC;
- Correcting action (or in Portuguese, *Acção Correctiva, AC*) – an action which eliminates the causes of nonconformity, anomaly or another unwanted situation in order to avoid its repetition;
- Derogation (DRG) – a written authorization to use or deliver a product which does not conform to the specifications.

Table 4. Documents submitted by the Concessionaire to the Contractor

Documents	Time limit
Document with specifications approved by EP	Undefined
Detailed project approved by EP	Undefined

Table 5. Documents submitted by the Contractor to the Concessionaire

Documents	Time limit
Sub-contractor quality Manual	Undefined
Inspection and test plans	Undefined
Sub-contractor quality plan	Undefined
Explanatory report	Undefined
Definitive working programme	28 days after consignment

Tests and inspections must be carried out by the sub-contractor, according to the traditional control methodology and assuring the total accomplishment of the PIE. The Contractor has to verify if they are effectively and correctly accomplished. The PIE defines the inspections and tests to be necessarily performed by the sub-contractor and those to be performed by the Contractor. It regulates the inspection of the Contractor and assigns the persons responsible for every inspection action. The PIE must also present how to assess (and who assesses) the qualitative service of the sub-contractor, by showing explicit rules to accomplish the referred inspection.

The Contractor will evaluate the sub-contractor's system of quality assurance and will execute its own inspections and tests on a sampling basis (10 to 20%), which is considered to be representative of every activity, in order to validate the sub-contractor's tests and inspections. In the case of a stop point, the Contractor intervention will always consist in a previous audit of the sub-contractor (by obtaining from the sub-contractor previous copies of the inspections carried out). Moreover, the Contractor can carry out the same verifications to confirm those made by the sub-contractor.



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Another phase of the construction process is the invoicing process, in which the Concessionaire, the Contractor and Sub-contractors intervene. The methodology adopted in the process of invoicing the works carried out on a monthly basis is schematically illustrated in Figure 3.

The Contractor has the aim of establishing all the activities that should be adopted in the planning and implementation of accident prevention and safety at the worksite, namely by applying the Health and Safety Plan which results in higher levels of health, safety and comfort.

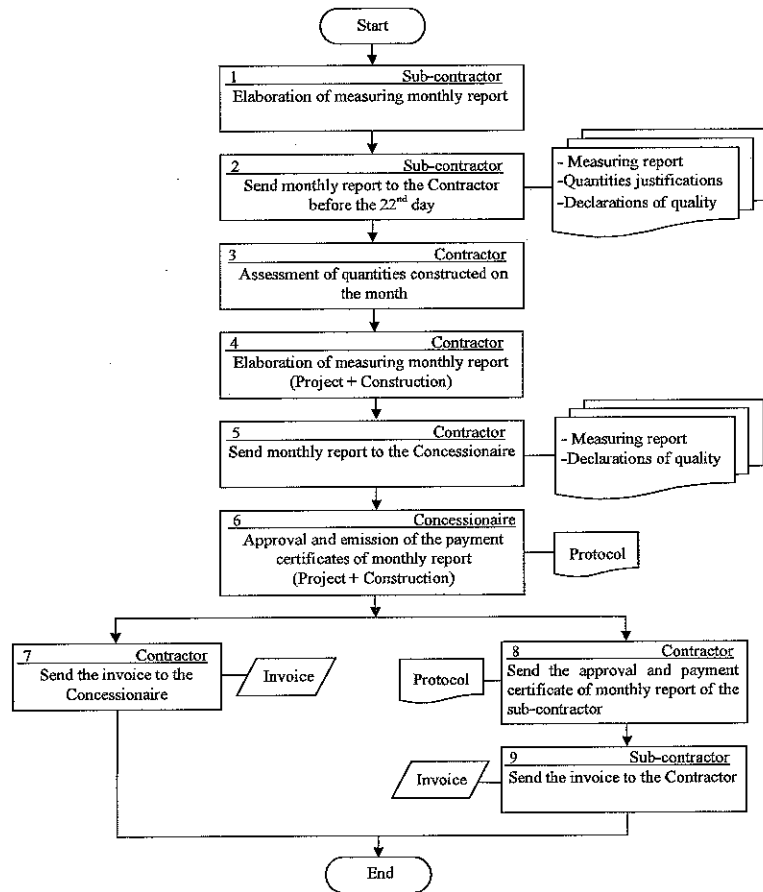


Figure 3. Methodology used in the invoicing process

This principle is applied to:

- All project and construction works of the highway sections and roads associated with the concession;



Methodology used in a recent highway construction in Portugal

- All the areas considered to be workyards (places which support the execution of works);
- All the areas near the workyards and worksites (in order to control the risks of human accidents).

All actions and responsibilities of the Contractor and other agents involved in the construction relative to safety are described in a specific document (*Manual Próprio* in Portuguese) by DPS (Department of Prevention and Safety).

7. CONCLUSIONS

In this paper, a new option for new EU governments (such as Romania) without sufficient monetary and human resources to construct quickly their network of highways, which is a crucial step for the economic development of these countries, was presented. The solution is the integration of private companies in the funding, project, construction and exploitation of new highways to be build, through the use of a public-private partnership known as the concession model.

The use of the concession model in the Eastern European countries, such as Romania, can be helpful (e.g. the private involvement can fill important financial gaps), but have some negative aspects (e.g. the institutional difficulties make this system still complicated to be applied). In fact, it has been noticed that the concession model in Central and Eastern European countries have been less successful than it was initially expected.

For a successful introduction of PPP, like the concession model, politicians and the general public must be confident and involved in the PPP system. Generally, the public is not informed and well prepared to accept new techniques involving private financing of public facilities. Essentially, it is difficult to understand that the development of the highways network has a great influence in the economic growth of the countries. Users will benefit directly from the tools they are paying in the newly developed highways with higher level of service.

Some of the problems in the implementation of the concession model are the shift from strategic to short-term objectives and the possibility of obtaining personal profit through the bidding process. Indeed, many opportunities for corruption exist in these transactions, and recognizing such possibilities is important when designing a successful concession program without those problems.

Nonetheless, given the substantial institutional progress in the Eastern European countries over the last years, in particular in the context of the EU access, a more fertile ground was developed for the use of PPP in the future, based on professionalism, transparency and responsibility. Now, it is time to show that the



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new EU countries, such as Romania, are able to make use of improved institutional capabilities to put in place efficient PPP projects.

In this context, it is important to observe the experience from other EU countries, like Portugal, which have been using the concession model with great success in the development of their national highways network during the last decades. In the frame a "Leonardo da Vinci" scholarship it was possible to observe an example of the Portuguese concession model (the Greater Oporto concession) in the phase of construction of the highway. The main advantages and problems experienced during several visits to the contractor of this concession were presented in this paper, in order to explain how a successful concession program can be implemented in the new EU countries.

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