Fiscalização a serviço da sociedade

REVISTA do TCU

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External Control in the infrastructure sector

Federative Republic of Brazil

Federal Court of Accounts

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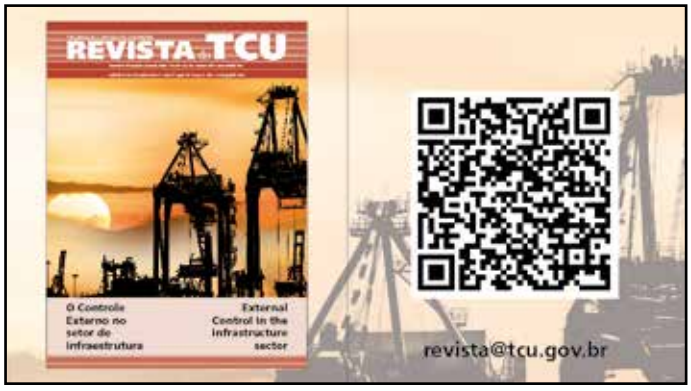
To improve public administration for the benefit of society through government audit

Vision Statement
To be a reference in promoting a more efficient, ethical, responsive and responsible public administration



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EDITORIAL RESPONSIBILITY
Serzedello Corrêa Institute
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CONTRIBUTORS
Biblioteca Ministro Ruben Rosa

TRANSLATION
Department of International Relations

Images
iStock

DESIGN
Pablo Frioli

Editorial Design and photomontage
Vanessa Vieira - ISC/Seducont

Documentation Center
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70.042-900
revista@tcu.gov.br

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Letter to the Reader

Bruno Spada

José Múcio Monteiro
Minister of the Federal Court of Accounts of Brazil and Head of the Editorial Council of the TCU Journal

Dear reader,

It is with great pleasure that we start, with this issue, our editorial activities for the 2017-2018 biennium.

Right after we took over the presidency of the TCU Journal Editorial Council, our first initiative was to assemble the Council to reflect about improvement opportunities for our journal. It quickly became clear that there was a need to listen to the most important party and reason of our work. You, the reader!

We launched an opinion poll to learn more about the readers' perception and collect suggestions to improve our periodical/journal. The result was excellent! Inspiring! In the following editions, we will bring more information about this poll and we will discuss the new goals of the TCU Journal. For now, we would like to thank everyone that has collaborated with the poll and offered so many valuable contributions for our improvement. Our most sincere thanks/appreciation.

This edition discusses an essential topic to the economic and social development of any nation: infrastructure. We had the honor to coordinate the post-crisis infrastructure development international seminar: the role of SAIs, held at TCU in September 2011. On that occasion, representatives from more than 30 countries shared information about the main challenges related to infrastructure investments in the period that followed the 2008 crisis, which began in the United States of America with the break of financial institutions, destabilizing other countries. Almost six years later, the topic could not be more current, considering that the national scenario is not exactly a "post-crisis scenario".

In 2011 and 2012, we reported on processes related to the Ministry of Transport and from 2015 to 2016, processes related to the Ministry of Mines and Energy. Thus, we can assure that the challenge of investing well in infrastructure in our country is more and more complex and challenging.

The articles selected for publication in this edition contribute to the topic by approaching extremely relevant issues. The analysis of methods and alternatives to improve the decision-making process on investments in infrastructure projects and the importance of evaluating the interdependence of projects to the success of the projects portfolio as whole are discussed. The potential of data analysis to improve the decision-making process regarding selection of control objects , as well as the usage of econometric techniques to calculate overprice in a case study in Petrobras contracts are shown. Hypothesis of better management of waterways in the federal transportation system, TCU contributions to the improvement of urban mobility and the influence of campaign donations on prices of public works are also discussed.

In the opinion column, the Coordinator-General for the TCU Infrastructure Sector, Saulo Benigno Puttini, brings an analysis of the infrastructure importance to the national development and the role of TCU in that scenario.

The resumption of the Petrobras divestment process, after improvements made by the state-owned company because of a TCU audit, and the successful auction of the Fortaleza (CE), Salvador (BA), Florianopolis (SC) and Porto Alegre (RS) airports deserve a highlight in this issue.

Our interviewee in this edition needs no presentations. Pedro Parente assumed the Petrobras presidency during an unprecedented crisis that put the company in the middle of a corruption scandal investigated by the Lava Jato operation, involving politicians, contractors and billions of reais. Our interviewee is known for his competence in crisis management and he shared his views on Petrobras, TCU, and strategies to overcome the crisis and continue moving forward.

Enjoy reading this issue!

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President promises transparency and asks for cooperation

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Tina Evaristo
for ***TCU Journal***

Pedro Parente

President of Petrobras

Pedro Pullen Parente needs no introduction. In the public sector alone, the engineer who graduated from Uni¬versidade de Brasília has a career of more than three decades. He was president of Serpro, Minister of Planning, Head of the Civil Household of the Presidency and Minister of Mines and Energy, to give just a few examples. In his most emblematic position in government, in 2002, he received the title of the "blackout minister". Brazil was going through a severe electric energy supply and distribution crisis and the President of the Republic at the time, Fernando Henrique Cardoso, gave him the mission to face the issue that was afflicting most of the country. His experience in solving national crisis made him one of the most qualified people to take on the main position as chair of Petrobras. Since March 2016, Parente presides over the company and looks for means to reduce the debts that, comparatively, represent 70% of the total debt of all Brazilian states. It is a very complicated task, but the oil company is not unknown to Parente. He was president of the Petrobras Board of Administration. In his opinion, the state-owned company was the main victim of the irregularities that became public with the Lava Jato operation and did not obtain benefits with corruption. In this conversation with the ***TCU Journal***, Parente talks about the challenges and priorities as head of Petrobras. One of them is to reduce costs and improve the relationship with several institutions that are regulators, supervisors or partners in the energy sector. For example, he believes that the divergences with the Federal Court of Accounts are in the past and that the current understanding will enable the company to advance the divestiture program and focus on oil and gas processing.

On the Petrobras webpage, there is the hashtag #DaquiPraFrente (FromHereOn) and the sentence "Sometimes, to move forward we must seek new paths." What are the company's new paths?

The synthesis of all of Petrobras' problems can be symbolized or represented by the size of the debt. The company has a debt that is larger than that of all Brazilian states together, except São Paulo. If we include São Paulo in this equation, we arrive at 70% of the total debt of all the states – which is a problem we need to face. Jim Collins, a North American author, wrote a very interesting book called *Good to great*, showing how an institution can evolve from "good" to "great" and "excellent". The author studied several companies that actually made this transition and one of his conclusions was that these companies, in general, did what he calls "*face the brutal fact*", that is, faced reality instead of procrastinating.

When faced with such a large debt, it makes no sense to believe that the National Treasury will make a contribution just because it is the main shareholder of the company. This problem was created within the company, although not by the company. The company was a victim but we have to solve this. If we do not change the way we do things, the results will always be the same. Doing something differently means, for example, to have the courage that we had to state, in our strategic planning, what we will and will not do in a clear and transparent manner. We are leaving aside petrochemicals and renewable fuel. Let us focus. Focus is an important word: let us focus on oil and gas, which is what the company can do.

> *"The company has a debt that is larger than that of all Brazilian states together, except São Paulo. If we include São Paulo in this equation, we arrive at 70% of the total debt of all the states – which is a problem that we need to face."*

How can the Federal Court of Accounts (TCU) help Petrobras in this difficult moment?

TCU approved a new system to carry out our divestitures. This was an important step for Petrobras. Although we used methods that we considered appropriate and that aimed at the best result possible, we needed to be frank and recognize that TCU had divergences regarding the system employed by us. Let us say that there is a historical dissension, a non-conformity on the part of the Court with relation to the possibility of Petrobras having a special regime, which is established by a decree whose source is an article of the new Oil Law. TCU never settled for that.

This impasse resulted in a series of writs of mandamus before the Federal Supreme Court (STF). However, we had long technical discussions with TCU and, from that moment on, there was great cooperation and understanding from each party. At the end, we reached an understanding that allows us to carry out the divestiture program with the assurance that this system, now approved, will not be questioned. This is very important for any public manager.

In 2001, when the country faced the "blackout", the then president Fernando Henrique Cardoso appointed you to manage the Chamber of Energy Management Crisis. In your opinion, as head of Petrobras, are you currently also managing a crisis? Which of them is worse?

The two crises are different in nature. The "blackout" had direct repercussion on the life of all families in the regions covered by the compulsory consumption reduction target, that is, Southeast, Midwest, North, and Northeast. The exception was the South region. Due to the dimension and scope of the decisions that we made and considering the impact on the lives of people, families, and companies, it is undeniable that, from this perspective, the 2001 and 2002 energy crisis was more severe than what happened in Petrobras. On the other hand, the context that involves Petrobras' situation is also very grave. We must examine the situation always taking into consideration that the company was a victim, since it did not receive any kind of benefit from what oc-

curred there. It was a victim of a gang that brought together a few of its executives – a minority of employees, companies, contractors and some bad politicians – who, in this collusion, obtained benefits for themselves but never for Petrobras.

The repercussion of these facts that occurred in the company raises important issues that do not stop with judgement of those involved, but tend to bring changes. It seems evident to me that the current political system does not cater to the interests of Brazil. In this specific sense, this crisis is more severe than that of 2002, but this part is not under my responsibility. It is the responsibility of prosecutors, of the Federal Police and of justice, who have been exemplary in investigating the facts, prosecuting and punishing all whomever they are, regardless of their social, economic or political position. I consider this a huge advance for the institutions of our country.

Your résumé shows that you have presided over the Petrobras Board of Administration. In your opinion, was it possible to detect that something wrong was going on in one of the largest companies in the country?

In first place, we need to recover the testimonies of the informers who said they did everything outside the company, did not use the institutional email system nor telephone, and made the deals outside of Petrobras. From a formal point of view, there were no questions beyond those normally raised regarding performance of any state-owned company. We can ask ourselves whether it would be possible to improve the company's internal control system; after all, improvement is always possible. On the other hand, the inescapable truth is that certain frauds or problems are only detected by instruments that the companies generally do not have. That is, wiretapping and breach of bank and tax secrecy. Thus, it would have been necessary to have a set of indications that could be confirmed by evidence found within the company itself.

> *"If we do not change de way we do things, the results will always be the same. Doing something differently means, for example, to have the courage that we had to state, in our strategic planning, what we will and will not do in a clear and transparent manner."*

Based on this, it would have been possible to demand that the judiciary begin investigations. In my previous period at Petrobras, when Philippe Reichstul and Francisco Gros were presidents, internal control was very strong, there were business units and certain procedures, but I cannot say if there were changes that weakened these controls. However, we need to acknowledge that certain frauds can only be discovered by investigative methods to which we do not have access. That is why it is important to have a completely independent denunciation channel so anyone who knows something can feel safe to denounce.

What do you consider your greatest challenge as president of Petrobras?

I would say that today we have two main challenges: a concentrated one and one that is diffuse. The first concerns the implementation of our action plan, whose objective is to reduce the size of the debt. This challenge has five pillars and two metrics, a safety and a financial one. With the safety metric and the indicator called Rate of Registrable Accidents (*Taxa de*

> *"The way in which the TCU expresses its viewpoints shows that its presumption is not of innocence. I know that in the past Petrobras contributed very much to this perception and played a part in creating a scenario of conflict. However, all this needs to be reviewed."*

Acidentes Registráveis-TAR), we intend to reduce the number of accidents per one million hours worked. Our pillar for this metric is called "commitment with life". The company's debt metric takes into consideration an indicator that is very common in the private sector, which is comparison of the size of the debt with its operating performance: EBITDA (earnings before interest, taxes, depreciation and amortization). A company is healthy when its annual operating performance or EBITDA is larger than the net debt (gross debt minus cash operation). That is, when its debt is not larger than its EBITDA multiplied by one. At the end of 2015, this indicator in Petrobras was 5.3. That is, the company's debt was equal to 5.3 times its EBITDA. Whenever an institution's debt begins to increase a lot compared to its operating performance, investors start to demand larger interest rates because the scenario indicates risk. That is why it was unacceptable for us to continue with such a large debt.

At this point, four more pillars come in: Prices Policy, we will reduce investments in financial resources and increase production even more. This will lead to an increase in our productivity. Regarding Costs Reduction, we have the incentivized and voluntary dismissal programs. The number of employees registered in these two programs equals 20% of all company employees. In addition, we will also reduce significantly the number of outsourced personnel, maybe the largest reduction ever recorded in Brazil. In our Partnership and Divestiture Program, we seek an additional total of U$ 21 billion. I say additional because we made U$ 13.8 billion between 2015 and 2016. This was the program approved by TCU, but it is being attacked by injunctions. Actually, it is a political party problem in Brazil. This program began when Graça Foster was president of Petrobras, but then it was under attack by unions. We are continuing the same program with the improvements determined by TCU, but, even so, we are the object of attacks. We are dealing with the problem, managing to overturn the injunctions, but this effort increases our workload a lot. Finally, we have the fifth pillar, which concerns Greater Productivity of Investments.

> *"Petrobras was a victim, since it did not receive any kind of benefit from what occurred there. It was a victim of gang that brought together a few of its executives – a minority of employees, companies, contractors and some bad politicians – who, in this collusion, obtained benefits for themselves but never for the company."*

As for the diffuse challenges, we need to increase the level of coordination with the different institutions that act as regulators, supervisors or partners of the oil and gas sector. Petrobras almost has to beg to work. In addition, the company has problems with the National Petroleum Agency, faces labor claims that can cost R$ 13 billion, tax claims that reach the billion mark and has to deal with environmental issues, etc. I do not want to generalize because there are different perceptions within the Brazilian Institute of Environment and Renewable Natural Resources (Ibama) regarding the work of Petrobras. However, there are sectors within Ibama that have great difficulty in helping our work. Beside the delay in issuing permits, there are legal disputes of several billion reais. We also have disputes with the state of Rio de Janeiro, who sets

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very high taxes. That is why I say that Petrobras needs to ask for favors in order to produce. Wherever the company turns, it finds difficulties.

Returning to the issue of corruption: how can TCU help Petrobras prevent problems like this from occurring?

In my view, the Court has been promoting important discussions on governance and improving the governance system is something that is quite necessary. In addition to the discussion regarding TCU jurisdiction over the accounts of the company, I believe if there was to be a dialogue between the Court and our Division of Conformity and Integrity to cross check our systems, among other measures, this would be very welcome help. However, I think we need to emphasize that one of the constitutional principles is efficiency. Today, taking Petrobras as an example, although this may be happening also in other institutions, the levels of control are better. Even so, the control bodies were incapable of stopping or preventing the things that happened. I have no doubt that we need to examine whether the constitutional principle of efficiency is being followed. The transparency and legality principles certainly are.

I think TCU has a fundamental role in the topic of efficiency. Nevertheless, what is this topic about? Efficiency means to deliver the highest possible result for the taxes paid by society. We must keep in mind that the National Treasury does not create money, that the government

> *"TCU has a fundamental role regarding efficiency, which is to deliver the highest possible result for the taxes paid by society. We must remember that the National Treasury does not create money, that the government does not create money. The resources invested come from taxpayers."*

does not create money. The resources invested come from taxpayers. Americans and British have the expression "value for money", which we can interpret as "valuing your money, valuing the taxpayers money". I am absolutely certain that the issue of efficiency, that is, the verifying results, needs to have higher priority in the oversight activities. Currently, such activities are still aimed at verifying compliance with the processes, that is, compliance with bureaucracy. I am not being critical, only realistic. The fact is that the huge bureaucracy in our country today did not prevent everything we saw from happening, right? It is also worth mentioning that, except for what is going on today in the Lava Jato operation, every time a problem occurs, instead of punishing those who were guilty, current practice was to create a new control. In other words, the ones who caused the problem were not punished. Punishment was inflicted on the other managers because they had to comply with one more control, which was more costly and generated less efficient actions.

In your opinion, which issue in the relationship between the TCU and Petrobras needs more attention?

If you had asked me this one year ago, I would have said that the main point would be for Petrobras to be more transparent. However, this has changed. Especially because of the vision of our financial director. Petrobras opened all its information and placed it entirely at the disposal of TCU. Today, my answer is that we would like to see TCU acknowledge this gesture of ours because the company

> *"I am absolutely certain that the issue of efficiency, that is, verifying results, needs to have higher priority in the oversight activities. Currently, such activities are still aimed at verifying compliance with the processes, that is, compliance with bureaucracy."*

is still treated as an institution that is closed, arrogant, always ready to fight. Not only by TCU but also by other governmental bodies. However, that Petrobras no longer exists. We want to establish a relationship based on cooperation and trust, fully respecting the constitutional roles of each organization. Another issue I would like to insist on is that the way in which the TCU expresses its viewpoints shows that its presumption is not of innocence. I know that in the past Petrobras contributed very much to this perception and played a part in creating a scenario of conflict. However, all this needs to be reviewed.

How can TCU and the Attorney General's Office (AGU) help Petrobras recover the amounts lost in the corruption scheme?

I think there is an urgent need for an understanding between the State bodies such as AGU, TCU, the Prosecutor's Office, and the Office of the Comptroller General (CGU), regarding the leniency agreements. I would like to reiterate that there would only be investments in the country when we have a good environment, that is, when we encourage good companies to invest. Today, the scenario is one of complete uncertainty and it is not the role of Petrobras to lead this process. Our company is always willing to help and we call on all State bodies to arrive at an understanding in benefit of the growth of our country.

Do the other areas of Petrobras understand and support the performance of the Governance Division?

> *"The most relevant thing is to have right people on board so that the company can be managed to fulfill its social objectives, which are to handle oil and gas exploitation, production and distribution in the country in a profitable manner."*

Yes. Definitely. However, as often happens in this situation, the pendulum first went to one extreme to later release itself and go completely to the other. We need to work to bring the pendulum to the center, that is, everyone understands the relevance of conformity and integrity but we must be reasonable. Petrobras has some extremely lengthy processes. Sometimes, a simple purchase operation can take up to one year. However, the company recognizes the need for this work. This is undoubtable. Nevertheless, we need to find the point of balance.

Concerning the company's management, how will Petrobras try to prevent political interferences that put in check good management and the search for better results?

Petrobras is a joint-stock company. Therefore, whoever has the majority of the voting capital stocks has the power to decide the fate of the company. Thus, the answer to this question depends basically on the controlling shareholder. We have recent rules related to, let us say, the characteristics a person must have to be appointed to a position in the company or in the Board. These rules comprehend experience, knowledge and integrity. Recently, we sent a proposal to change our statute, which makes these requirements even more severe. However, it is important to remember that our decisions are up to the controlling shareholder and the fact that we have a profile for these positions does not mean that appointments cannot be political. The most relevant thing is to have the right people on board so that the company can be managed to fulfill its social objectives, which are to handle oil and gas exploitation, production and distribution in the country in a profitable manner. In order to achieve the objectives, the company cannot operate in an unprofitable way. This would be contrary to the determinations established because the company needs to ensure its future operating in a sustainable form.

> *"Petrobras opened all its information and placed it entirely at the disposal of TCU. We would like to see TCU acknowledge this gesture of ours."*

Opinion

The road to solid and inclusive growth

Saulo Benigno Puttini
Office of the Coordinator-General for the Infrastructure Sector (COINFRA)

The importance of infrastructure as a driving force for the development of a country is a fact publicly known. Any nation wishing to grow sustainably, to ensure access to basic services to its population, and to rise in competitiveness in globalized markets cannot lose sight of how crucial infrastructure is to enable its economy to expand.

The lack of good roads, for example, does not only hamper the movement of people from one place to another, but also leads to an increase in costs of transportation of goods, hinders the access of consumers to products, and renders impossible for regions to invest in the development of their natural economic activities (agriculture, industry, tourism, services, etc.). As a result, as there are no means for people and goods to be transported efficiently, the whole economy loses competitiveness and quality. For the same reason, already in the 1920s, the then-president of Brazil, Washington Luís (1926-1930), came up with the slogan "to govern is to build roads", to stress the importance of infrastructure for the development of economy.

Obviously, the term "infrastructure" should not be exclusively associated with roads. Water power plants and transmission lines increase the offer of electric power in the country, enabling sectors of industrial production to enhance their activities. Irrigation systems promote the expansion of agriculture into areas previously deemed as unproductive. Efficient railroads and ports allow for mass transportation of goods, and reduce export costs, with gains for national companies and increase of job offer in the country. Modern airports, doors to foreign eyes, attract tourists and investors, increasing the flow of foreign capital into local economy. Efficient and accessible communication networks enable small businesses to develop at low operational costs, allow for research on new raw materials and suppliers, enhance conditions for sale negotiations, and expand the horizon of entrepreneurs.

Besides all benefits related to economic development, investments in infrastructure also play an important role in the offer of public servi-

ces, in poverty reduction, and in the betterment of life quality of the population. Besides the direct effect of creating job posts and higher salaries because of business growth, policies on urban mobility and universal digital services drive up the level of access to education for the low-income population; the installation of water supply and sewage networks improve health conditions and reduce the proliferation of endemic diseases, especially in highly populated regions; the building of schools, day care centers, health care centers and hospitals enables those most needed to access services that are basic and essential to any citizen.

Although past efforts for establishing a sustainable economic model, the clearly visible infrastructure gaps in our country have served as a proof that there is no sustainable growth without an infrastructure system that is well-planned, well-functioning and in constant conservation. Both in the category of social infrastructures (sanitation, education, health, housing, etc.) and in the so-called economic infrastructures (transportation, energy, communications, etc.), Brazil still has an immense liability that is reflected on the ill-fated "Brazil cost".

For public investments in infrastructure to fulfill their complete beneficial potential on the population, it is vital the government be able to plan and monitor investments. It is equally vital that the government have competent institutions to efficiently oversee the quality and legitimacy of such investments. In a scenario of strong economic downturn, with frequent reports of tax adjustments, falling job offer, restriction of public policies and pullback of government spending, it is important to reflect on the envisaged strategies for national infrastructure. The reason for that is that all advantages stemming from good investments in infrastructure may wither completely if planning is badly devised, if costs are overpriced, if constructions are of poor quality, and if a cycle of regular maintenance is not implemented.

Going against that understanding, unfortunately in Brazil when we talk about infrastructure, the picture that naturally comes to mind is of overpriced constructions, unfinished undertakings, misappropriation of public funds all over and the offer of inefficient and low-quality structures to users. According to the National Institute for Corporate Recovery, currently there are around 5.2 thousand halted constructions. The much-heralded Growth Acceleration Program (PAC) by the federal government recorded the building of over 60,000 undertakings between 2007 and 2015; according to the NGO Contas Abertas [Open Budgets], only 37% of the undertakings were finished, other 34% are delayed, and the remaining others are yet to be started. Of all constructions for urban mobility promised for the 2014 FIFA World Cup, to this day, less than 30% or the improvements in the host cities have been delivered to the population.

Those figures clearly show the way Brazil relates to its in-

frastructure is the real Brazilian tragedy: badly allocated and high public spending, halted and low-quality works; lack of access for the population to basic services, and uninterrupted historical deficits between offer and demand for infrastructure, which hamper growth. As if that were not enough, the plots unveiled by the Car Wash Operation proved it was precisely the investments in the segments of infrastructure the ones responsible for feeding the misappropriation and corruption scheme.

Pursuant to its constitutional mission of ensuring good and proper management of federal public funding, the Federal Court of Accounts (TCU) has devoted special attention to monitoring government actions and policies in the area of infrastructure. Overtime, TCU has specialized in assessing the correct application of public resources in public works (direct federal investments) and in privatizations and granting of services and economic activities by the government (procurements in the areas of transportation, electric power, oil and natural gas, communications, etc.).

Regarding public works, the oversight of undertakings with full or partial participation by the Federal Government is performed within an annual audit plan named Fiscobras, started in 1997, and which has overtime made a considerable name for itself and succeeded in investigating the process of contracting and executing federal works. Aware that remediating damages is more difficult and inefficient than avoiding them, TCU places increasing priority on preventive and concurrent control, focusing efforts so that works and services are executed as set by quality technical standards, and with reasonable costs.

Concerning the concession of public services and economic activities, the control exercised by the TCU is committed to monitoring decentralization and privatization undertaken by the federal government. As of the National Privatization Plan, started in the 1990s, the Court of Accounts examines regulatory and competition-related aspects of the public granting, aiming to offer efficient, plentiful, quality services, at fair levels of compensation.

Along with the success it has achieved in its areas of oversight, as a way to adapt to future perspectives, it is imperative the TCU see how important it is for the infrastructure sector to be constantly in line with the dynamism of the economy. In the current scenario of economic downturn, in which direct investments are partly limited, the Brazilian government will have to create means for the private sector to start developing national infrastructure again. It is in this reasoning that recent announcements by the federal government have announced the Investment Partnership Program (PPI), realizing the strategy they are pursuing will be that of expanding the relationship between the government and the private sector, so as to make the concession model more solid and attract investments in new projects.

One thing the most competitive countries in the world have in common is a friendly environment to entrepreneurship. In this regard, there is a lot to be done to enhance government action in Brazil. Reducing the regulatory risk

is distressing. Myriad and pulverized rules adopted overtime without consolidation or reviewing gives rise to a climate of suspicion, and drives away serious investors willing to seize the business opportunities in the country. Unifying and remodeling outdated and pointless work processes, sometimes established with the aim to "sell difficulties to harvest benefits", will allow for better transparency, promptness and legal certainty to government acts, showing to the public sector the Brazilian government is in fact committed to following international excellence standards.

Thus, in the light of the current events in the country, it is unavoidable to induce a real credibility shock in the institutions involved in carrying out infrastructure projects. Just good intention and promises from our leaders will not attract new investments. The times of lobbying and veiled interests must give in to a feeling of public, technical, ethical and moral spirit, which will ground the decisions of the agents involved in the effective functioning of society. In this area, some actions must be immediately supported by the government: i) devise a solid, credible and integrated planning for the different infrastructure segments; ii) create mechanisms to foster competitiveness among entrepreneurs; iii) properly assess priorities and technically question proposed solutions; iv) review and consolidate procedures among the different concerned government entities; v) ensure proper and clear sharing of contractual risks; e vi) monitor the effective compliance with rules agreed upon by the parties.

As the Federal Government plans are aimed to a greater role

of the private sector, the work of the TCU will place priority on assessing these new infrastructure projects, in a taskforce monitoring simultaneously the modelling of solutions and the technical motivation of decisions, in a constant dialogue with the concerned public institutions.

As a custodian of the public purse and collective interest, the Court is in charge of both ensuring lawfulness and law-abiding of the procedures adopted by the government, and further improvements in regulatory mechanisms which confer legal certainty and quality to the offer of infrastructure to the country. All of this work is joined together as to curb any forms of misappropriation, overpricing or unduly favoring bidders in procurement proceedings, as we understand that fighting corruption, in all its forms and levels, must be a goal constantly pursued by any government institution.

In sum, the availability of plentiful infrastructure is undeniably a driving force for the growth of any country. Regarding Brazil, the history of government action in developing infrastructure is not marked by a narrative of success and accomplishment; quite the contrary, it is marked by misappropriation, inefficiency, and lack of offer. The delay in making new investments and loopholes which provide favorable conditions for the work of hidden interests lag the recovery of the so-desired economic upturn.

The primacy of transparency and technical qualification will doubtlessly infuse confidence in investors who see in Brazil fertile grounds for advancements in the area of infrastructure; the betterment of the income of the population and the recovery of offer of job posts will be immediate consequences. If on the one hand, the government will be responsible for organizing itself to pave the way towards growth; on the other hand, the work of the TCU will be dignified, firm and watchful, safeguarding the faultless allocation of public funds, and especially catalyzing improvements, which ensure a cycle of long-lasting and sustainable development.

The country of the future we all hold on to is possible; the development of infrastructure is the vital means for attaining that; and TCU is side by side with the society to ensure that this is accomplished.

TCU authorized Petrobras to restart the process of disinvestment

Last March, TCU has revoked the injunction that prevented the sale of Petrobras' assets.

In December of 2016, TCU suspended provisionally the sale of assets when they detected signs of irregularities in the methodology used by the government agency for disinvestment of assets and agencies of the Petrobras system, such as, lack of transparency, restriction of participants, granting of unequal opportunities to bidders, among others.

After a precautionary measure, the government agency has adapted the norms to eliminate the risks identified by TCU. Because of that, the Court ruled for the continuity of the plan of disinvestment of the agency.

The sanctions of the Court were based on tying the object to the call notice, to ensure that participants understand the changes promoted on the object during the process, giving equal opportunities of trading to participants whenever the object changes and to enhance competitiveness through new rounds of negotiation.

The new version of the procedure provides, as a rule, to give publicity of the acts and dissemination of information to achieve greater transparency to the process and expansion of the dispute among investors, besides using an electronic system for the receipt of proposals.

Another important change is the better control of the process, which will require the approval of the Executive Board at the beginning of each relevant step of the transaction.

The Court ruled that the government agency apply to the disinvestment projects the new procedures approved by the Executive Board, restarting all contracts that have not been signed, except for the "Opera" and "Portfolio 1". These may proceed from the stage they were before halted.

Almost all businesses for sale will return to the initial stage, among them, the BR Distribution, considered the main asset. The projection is to raise U$21 billion in the next two years.

TCU will closely monitor the agency's sales processes and will take action based on the risk analysis methodology in order to identify the most critical processes.

Ruling 442/2017– TCU – Full Court
Proceedings: 013.056/2016-6
Session: March 15, 2017

In April of 2016, TCU authorized the federal government to carry out the auction for the airports of Fortaleza, Salvador, Florianópolis and Porto Alegre.

Analyzing the concession of public services for expansion, maintenance and operation of the infrastructure of airports, the Court examined the technical feasibility, environmental and economic studies (EVTEA) of the first stage of the fourth round of concessions of federal airports and pointed out several opportunities for improvement.

During the process, the flaws identified were corrected with the interaction between the teams and agencies and corrective measures were determined for future projects. The Court recommended that the National Civil Aviation Agency (ANAC)-loosen the criteria for the qualifying phase, adopting requirements that are "technically suitable, necessary, sufficient and relevant to the bid". Also, Anac should include in the notice for the bid clauses so the provider would make an effort and attempt to use Infraero's employees and to discuss in public hearings the need for allocating the resources from the concession to ensure the execution of the employees voluntary dismissal plan that eventually had not been absorbed.

The auction of the four airport terminals of Fortaleza, Salvador, Florianópolis and Porto Alegre lasted about 2 hours and reached R$3.72 billion, 23% up the amount estimated by the government (R$3.01 billion) and 93.75% over the proposed initial minimum bid.

Qualified companies with global recognition for services delivered acquired the four terminals.

The winning groups – Zurich Airport International, from Switzerland; Vinci Airport, from France; and Fraport, from Germany – shall pay 25% of the minimum amount of the concession, plus the premium when the contract is signed, scheduled to the beginning of August. The balance will go to the National Fund of Civil Aviation (Fnac), with payment in annual installments, beginning with the contract, and the monetary correction based on the variation of the consumer price index (IPCA).

The French provider Vinci Airports acquired the terminal of Salvador for R$ 660.9 million, with a 113% surcharge. Zurich International Airport AG secured the Florianópolis terminal with the proposal of R$ 83 million, with a 18.5% surcharge.

Rulings:

957/2016-TCU-Full Court - (Porto Alegre)

956/2016-TCU-Full Court (Florianópolis)

925/2016-TCU-Full Court (Salvador)

926/2016-TCU-Full Court (Fortaleza)

Econometric techniques and their innovative role in calculating overprice: the Car Wash case

Eduardo Juntolli Vilhena
is an auditor of the Federal Court of Accounts (TCU), with a BA in Mechanical Engineering from the University of Brasília, (UnB), and a specialization course in Public Law by Uniderp.

João Ricardo Pereira
is an auditor of the Federal Court of Accounts, with a BA in Civil Engineering by the Military Institute of Engineering (IME), with a master's degree in Economics from the University of Brasília (UnB), undertaking a doctoral degree in Economics from the University of Brasília (UnB).

Júlio César de Camargo
is an auditor of the Federal Court of Accounts, with a BA in Mechanical Engineering from the University of Brasília (UnB), and MA in Mechanical Engineering from the University of Brasília (UnB).

Rafael Jardim Cavalcante
is an auditor of the Federal Court of Accounts, with a BA in Civil Engineering from the University of Brasília (UnB).

Leandro Araújo de Almeida
is an auditor of the Federal Court of Accounts, with a BA in Economics from the University of Rio de Janeiro (UFRJ) and in Law by the Faculdade Marista do Recife.

Marcelo Rodrigues Alho
is an auditor of the Federal Court of Accounts, with a BA in Administration from the Unified Educational Association of the Federal District (AEUDF) and with a specialization course in Governmental Audit by the Faculdade Omni.

Nivaldo Dias Filho
is an auditor of the Federal Court of Accounts, with a BA in Civil Engineering by the Federal University of Paraná (UFPR).

Rafael Martins Gomes
is an auditor of the Federal Court of Accounts, with a BA in Civil Engineering from the University of Brasília (UnB), with a specialization course in Diagnostic Engineering by the INBEC and currently undertaking a master's degree in Construction Works Management by the IPOG.

ABSTRACT

The study was developed with a view to testing a methodology to calculate the difference between the value charged by public bid processes in an environment with cartels and the respective value that should be charged in a competitive environment. The forms of calculation of this article encompass an econometric model estimated by the ordinary least squares method in cross-section, and a binary response model, known as propensity score matching. The sample used in the calculations contains data of 135 contracts of enterprises from Petrobras's Supply Area, of which 48 have evidence of wether or not the cartel is active. The results of the estimation of these models indicated that public bid processes won by cartelized companies showed a discount 17% inferior to that of the public bid processes won by non-cartelized companies, which is statistically significant. Such study, due to the soundness and reliability of the results obtained, showed plausibility of the use of similar techniques in the scope of the activity of the Federal Court of Accounts in the fight against corruption in bidding processes of public construction works, including in the calculation of the damages and in the call for accountability, resulting in anincrease of the timeliness, continuity and effectiveness of the identification of such illegal acts in the public administration.

Keywords: Public bid process. Cartel. Econometrics. Petrobras.

1. INTRODUCTION

Cartels in public bid processes substantially harm the efforts of the states in using their resources for the development of the country, by wrongfully benefitting companies that, through an agreement among themselves, rig the competitive nature of the public bid processes. In addition to enabling anti-economic contracting by artificially raising prices – thus increasing state inefficiency -, the practice weakens the market by preventing, in the medium and long term, that companies who are apt and reliable from offering good products and services to the State. In a weaker and less innovative market, society as a whole bears both the economic cost of products that are more expensive and of products with lesser potential quality, as the cost of a more inert and worn out administration.

According to the Organization for Economic Cooperation and Development – OECD (2009, p. 2), the governmental purchases in different economic sectors, such as: health, education, infrastructure, public security, defense, etc., prove to be a key economic activity, representing, globally, around 15%, on average, of the worldwide Gross Domestic Product (GDP), reaching up to 20% in some countries.

Because of the bulky volume of resources involved, the public bid processes of public construction works are usually the target of associations among companies, major contractors operating in the infrastructure sector, to remove the competition element, and, thus,

dominate the market of major engineering works demanded by the public authorities.

However, the main difficulty in the fight against the cartels in this environment is the collection of evidence and the calculation of the damages caused by collusive practices, which has been a challenge for the control bodies. To identifythis kind of agreement, among their spheres of operation and mandates, the several administrative bodies of the State resort to all the methods and tools available for the detection and punishment of the companies that make up the cartel.

From changes promoted in the legal system, the plea bargain deals and the leniency agreements began to be used as tools to obtain evidence of anticompetitive agreements. This is the case of the ongoing investigations in the Car Wash Operation, whose developments are leading to the establishment of leniency agreements by the Federal Prosecution Service (MPF), by the Administrative Council for Economic Defense (Cade) and by the former Office of the Comptroller General of the Union (CGU) with some of the companies that participate in the cartel.

In this respect, in view of these observations and acknowledging the need to enable tools so that the State may identify in a faster, more frequent and continuous manner such criminal practice, but with the use of a more "available" collection of evidences – especially for the administrative control bodies -, several studies have been developed. In the past years, the international literature has been debating about the potential role of the use of economic methods and of appropriate econometric techniques that enable both to prove the existence of cartels and to calculate the damage caused by the anti-competition practices. According to what is going to be exposed next, learning about the potential for the use of these economic tools enables us to add to the traditional tools other forms of control capable of providing more efficient responses.

Within the Federal Court of Accounts (TCU), that has constitutional jurisdiction to calculate the damages caused to the government treasury and to impose sanctions (as is the case of the declaration of lost of good standing for companies), the use of the economic methods and of the econometric techniques may represent a new paradigm of activity of the external control in cases of formation of cartels to fraud public bid processes, as well as to complement the traditional methods of the Federal Court of Accounts for quantifying overcharging.

In this respect, the Federal Court of Accounts (TCU) recently analyzed Ruling (3.089/2015 – Plenary (TC 005.081/2015-7), whose rapporteur was Minister Benjamin Zymler, regarding an econometric study based on a group of public works contracts signed by the Petrobras's Supply Division in order to calculate the damage caused to the Administration as a result of the increase in hired prices in the cartelized environment in comparison to the prices in a competitive environment. According to the Court, the results of this innovative study will be the basis for assessment of the lawfulness and legitimacy of the possible leniency agreements that may eventually be established based on Law 12.846/13 (Anticorruption Act), under the terms of IN TCU 74/2015.

Thus, the purpose of this article is to present the main aspects of cartels in public bidpublic bid processes, their damages and the economic methods, as well as the econometric techniques to detect and quantify the damages. Based on this, the results of the study analyzed by the Court will be offered as an example of the potential for the use of these economic tools to exercise external control, in such way as to both subsidize the activity of the other control bodies and provide the State with faster and more effective mechanisms to require accountability for such damages.

2. CARTELS IN PUBLIC BID PROCESSES

The concept of cartel does not face major controversy in the specialized literature.

Gico Jr. (2006, p. 169) defines cartels as associations between companies of the same category to ob-

tain common advantages arising from the supression of free competition, while keeping internal autonomy. For Santacruz (2003, p. 415), cartel is an agreement among companies with the purpose of raising the prices for the buyer, by reducing competition, approaching the market outcome in terms of profitability, something that would be achieved in a situation of monopoly.

The cartels formed by economic agents may take different forms, such as: price fixing; quota fixing; zonal cartelss; service quality level fixing; public bid rigging, etc. However, the OECD (2003, p. 65) highlights the most common modalities of agreements: (i) among sellers: price fixing cartels; market allocation; output restriction; and public bid rigging; (ii) among buyers: price fixing cartels; allocation; and public bid rigging.

Taking into account the large sums of resources involved, the public bid procedures are frequently the target of cartelization. Just as in the cartels that are formed in the private sector, the main purpose of agreements among economic agents that explore public contracts is also to eliminate or reduce competition to increase the respective profit margins.

Coelho and Silva (2013, p. 201-202) state that cartels in public bids have a peculiarity in relation to the other types of illegal agreements. Unlike the traditional cartel (private sector), in which all the participants are allowed to immediately receive some benefit from the illegal agreement, the cartel operating in public bids allows only one economic agente to win the bid or lot.

The cartel in public bid processes may be operationalized in different ways, depending on the characteristics of the market in question as well as of other factual conditions. According to the Economic Law Secretariat – SDE/MJ (2008, p. 9-10), the international experience shows that the companies that participate in cartels in public bids use the following strategies: fictitious or cover bidding; bid suppression; bid rotation; market allocation or market division; and subcontracting.

Another common feature of the cartels that operate in the public sector is the corruption of employees in order to facilitate, for instance, the privileging of a given company or business group in the public bid processes. In these cases, the agreements among the cartel members may be enabled, for instance, by directing of the public call using restrictive clauses. Depending upon the degree of commitment of the internal agents of the contracting body/entity, other criminal tricks may also be observed, such as the manipulation of cost estimations; biased pre-qualification and selection of candidates; restricted or late publicization of the public bid processes; in addition to the stipulation of bidding and contracting procedures not typical of republican standards. International literature mentions the strong connection between the cartels operating in public bids and the corruption of public agents, in the most diverse organizational levels.

In addition to the several forms through which the economic agents operationalize their agreements, the OECD (2009, p. 4-5) stresses that the cartel in public bid processes depends upon certain structural conditions of the affected market, such as: small number of companies; reduced or null level of newcomers in the market; market conditions (demand and supply); the activity of class associations and employer's associations; recurrent bids / frequent bidding processes; identical or simple products or services; reduced or null level of alternatives and reduced or null level of technological innovation.

3. DAMAGES CAUSED BY CARTELS

The existence of anti-competitive conducts, such as the formation of cartels, leads to situations of high prices and profits, compromising competition and society in general. According to Hovenkamp (2011, p. 3), the main effects arising from these anti-competitive practices are the following: (a) overcharge, and (b) dead weight. These two effects are responsible for the reduction of society's well-being in a cartelized market in comparison with the level of well-being in a situation of competition. That is why such effects are considered by the economic literature as social costs.

Overcharge is understood as the difference between the value charged for a given product in an environment with cartel and the value that should be charged if that product were sold in a competitive environment. In this situation, by purchasing a given product at a price higher than the price in a competitive market, as a result of the defrauding of the competitive nature of the process, the consumer suffers a damage to his/her assets.

According to empirical research by Connor (2005, p. 2), the cartels generate, on average, a 25% overcharge, when compared to the price in a competitive market, whereas the OECD estimates between 10% and 20% (2002). A study by Oxera, commissioned by the European Commission, entitled Quantifying antitrust damages (2009, p. 88-90), concluded that 70% of the cartels examined resulted in an additional price ranging from 10% to 40%, with the average being around 20%.

Another important effect of the anti-competitive practices is called by the economic doctrine 'dead weight', which represents the damages caused not only to the consumers, but also to society, because of the inefficiencies attested by the bad allocation of resources. These inefficiencies may be represented, for instance, by the damages to the innovation and to the improvement of the quality of the products in the market. This results in the loss of well-being for the consumer and in the loss of competitiveness of the economy as a whole.

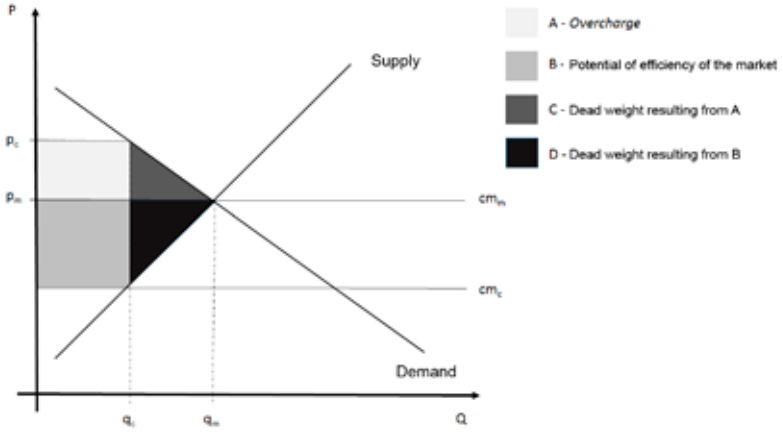
To illustrate overcharge and dead weight, we present next a graph that shows the losses arising from the practice of collusion, in which one may identify the areas corresponding to each of the situations described previously.

Area "A" corresponds to the damages arising from overcharge; area "B" refers to the potential of efficiency of the market, as a whole; and areas "C" and "D" correspond to the general loss of the market. We can observe that the cartel's actions bring a general loss to the market, identified by the social damage and that appears in the graph above as areas "C" and "D". The damages arising from "A" and "B" are individual while those arising from "C" and "D" are collective and diffuse. Therefore, the power of the cartelized market causes the reduction of the economic well-being.

In the cartels in public bids, Braga (2015, p. 115) comments that the agreement among competitors who aim to compromise competitiveness is is to extract the highest possible income from the Public Administration without the interference of the competition, distributing to society the loss of well-being arising from the cartel. In fact, the companies that participate in the collusion wrongfully benefit by obtaining additional profits resulting from the absence of effective competition in the public bid processes and charging prices above the ordinary market value.

As a result, the social damages arising from the cartels in public bid processes are bigger than the damages of classic cartels (private sector), because the consumer directly damaged is the Public Administration itself. However, indirectly society as a whole bears the damage, which is much more costly. In addition, the damages caused generate concern not only because of the resul-

Graph 1:
The cartel and its effects



Source: Maggi, 2010, p. 103 (developed by the author)

ting overcharge, but also because of reduced efficiency of public spending, affecting directly the well-being of society and the governmental efforts in the pursuit of country's development.

4. DETECTION OF CARTELS AND QUANTIFICATION OF DAMAGES

The issue of the sufficiency of evidence collected by the competent authorities to prove the existence of a cartel constitutes a key element. In the absence of material evidence of collusion (such as minutes of meetings, testimony of people involved or signed documents), the detection of cartels may be based on indirect evidence; that is, on the set of evidences. In this respect, Santacruz (2003, p. 426-429) states that in the absence of direct evidence the economic theory may show that the actions taken are irrational from an economic perspective.

4.1 METHODS FOR THE DETECTION OF CARTELS

According to the International Competition Network (2010, p. 6-7), in general, the cartel detection methods may be divided into reactive and proactive. The former rely on some external event, such as a denunciation or a leniency agreement; the latter are methods that do not depend upon an external event and are employed by the authorities dedicated to fight anti-competitive practices, with the use of economic analyses, analysis of previous cartel cases, among others.

In practice, the the competent authorities may use reactive and proactive methods in a complementary manner to increase the opportunities for cartel detection. For instance, the investigation about collusive behavior may be conducted by obtaining information from leniency or the denunciation programs together with the use of economic methods.

Thus, in view of the seriousness of the conduct and of the difficulty of detection, in the past years several studies have been dedicated to the research of different economic methods for cartel detection. In the international literature, Vasconcelos e Vasconcelos (2010, p. 3-4) highlight the contributions of Harrington (2005 and 2008) to the understanding of how to detect cartels based on the behavioral focus of the collusive companies from the analysis of economic data.

In fact, the economic analysis of the existence of a cartel, carried out by analyzing the behavior of the companies and evolution of prices, may be used both to serve as indirect evidence of the existence of a cartel

as to calculate the damage caused by the cartel. This is done, by comparing the cartelized market in a period in which its operation was competitive or to another similar market, not cartelized, used as reference, as we will see next.

4.2 METHODS FOR THE QUANTIFICATION OF DAMAGES

Quantifying the damage caused by the activity of a cartel is a complex task. However, according to Connor (2005, p. 28), since 1970, the rigour and the accuracy in estimating the damages arising from cartels have advanced considerably, boosted by the evolution of the oligopoly theory, the availability of detailed data, statistical methods and econometric models.

The main American and European methods in the literature consist in estimating the price that would have been charged in the scenario of absence of cartel, the so-called counterfactual or but-for-price scenario. These are the so-called comparative methods that seek to determine an appropriate reference scenario and estimate the price that would likely be charged for the product if the infringement had not occurred.

Connor (2005, p. 27-28) and Hovenkamp (2011, p. 6) state that the most common methods of quantification of damages acknowledged by the literature and by the American courts seek to compare the cartelized market to the same market in another moment in time

or, alternatively, to other markets (of products or geographical) considered comparable and competitive. Such methods that are most used to quantify the damages caused by cartels are the following:

a. Before and after method: consists in comparing the prices charged in the cartelized market in different moments: the period prior or after (or both) the cartel. The overcharge shall be the difference betweeen the prices observed in the period affected by the cartel and the prices in the periods in which the cartel was not active. In this method, the premise is that other characteristics of the market that are not associated to cartelization remained constant throughout time.

b. Yardstick Method (comparison of markets): consists in comparing the prices of the cartelized market to the prices charged in a similar market (of product or geographical). The measured overcharge shall be the difference between the price charged in the cartelized market and the price that prevails in the similar market. This method is especially useful in situations in which the cartel establishes itself in a given geographical region, given that markets of the same product from other regions may be used as similar markets.

The European Commission's Practical Guide (2013, p. 19-26) presents the methods that are most often used by the parties and by the courts to estimate the counterfactual scenario, that is, the price that would have been charged in the absence of the competition infringement. Thus, it is possible to compare the price charged during the infringement to the price in a scenario without infringement. The most commonly used methods are those described in letters a) and b), not only in an isolated manner, but also in combination.

According to Korenblit (2012, p. 6), the American courts have widely accepted the use of regression analysis for the comparative methods. When conducted correctly, this analysis is considered a reliable means to prove the anti-trust damages for producing robust estimations. Harkrider and Rubinfeld (2005, p. 2-4) also state that the econometric evidence, together with other elements of evidence, have been used to determine the existence of damages and the quantification of anti-trust damages, among other anti-trust cases.

4.3 ECONOMETRIC TECHNIQUES

The application of comparative methods is perfected by the use of complex techniques, by means of econometric models that use regression analysis to combine economic theory with the statistical or quantitative methods to identify and measure the economic relationships among variables (for instance: price, sales volume, market quotas, profit margins). The use of econometric techniques may result in robust and accurate estimations.

All comparative methods are, in principle, susceptible to application through econometric techniques based on regression analysis, provided there are sufficient data available for this purpose. Regression analysis, because it is a statistical technique, enables us to examine the relationships among the economic variables and to determine to what extent a given variable of interest is influenced by other variables.

The specialized literature (Oxera, 2009, p. 51; Connor, 2005, p. 29) describes the quantification of damages based on regression analysis with the use of a dummy variable. This technique consists in using data related to the period (or market) affected by the cartel to estimate the regression. The cartel's effect (γ_i) shall be taken into account in the regression equation through this dummy variable (D_i):

$$P_i = \alpha_i + \sum_{K=1}^{N} \beta_{ik} . X_k + \gamma_i . D_i + e_i$$

Regression analysis seeks to identify the statistical relationship among the other variables. The parameters that are estimated in the model are an intercept (α); the relationship among the characteristics of the companies in the market (X_k) and the price (β); the relationship between the dummy variable (D_i) and the parameter γ_i, which is the effect of the cartel; and the variable e_i is a random element that affects the price of the company i. The variable D_i assumes value equal to 1 for the company that belongs to the market in which there is the practice of cartel and value equal to 0 if the company belongs to the comparison market.

With the estimated model, it is possible to calculate the overcharge attributed to the cartel by means of the parameter γ_i, which is the main interest in this regression, as it represents the average variation of prices effectively established by the cartel. Thus, the overcharge would be the difference between the estimated price

without a cartel and the price effectively established by the cartel, in a context in which one is working with a database about which one knows which are the observations attributed to the cartel and which are not. This occurs whether in time-based comparison, in different markets (geographic or of products), in data from legal procedures or even in data from rewarded collaborations (plea bargain deals).

Therefore, in the case of damages suffered by cartels, the econometric techniques enable to assess whether – and to what extent – other observable factors other than the infringement contributed to the difference between the value of the variable of interest (for example: price) observed in the market affected by the infringement and the value observed in a comparative market or during a period of comparison, in a no-infringement scenario. Thus, the overcharge shall be the difference between the observed price and the price that would prevail according to the econometric estimations conducted.

4.4 LEVEL OF ACCURACY OF THE ECONOMETRIC METHODS AND TECHNIQUES

The quantification of the damages in cases of cartels is subject to limitations regarding the level of certainty and accuracy because of its own nature. According to the European Commission's Practical Guide (2009, p.12) it is not possible to determine exactly how a market would have evolved in the absence of infringement, because the prices, the volumes of sales and the profit margins depend upon a series of factors and of complex interactions between market operators which are often not easy to estimate.

As a result, it is not possible to determine a single and real amount of the damages suffered because of the cartel. It is only possible to make estimations based on approximations. In this respect, Korenblit (2012, p. 7-8) highlights that the American Supreme Court has already decided that approximations are not sufficient to show the extension of the antitrust damages based on a just and reasonable inference, even though the outcome is only approximated, because the infringer is not entitled to complain if the damages are not accurately measured.

5. THE PETROBRAS CASE – ECONOMETRICS

In this topic, we present the strategy defined to estimate the damages suffered by Petrobras's Supply Area due to cartel activity, uncovered within the "Car Wash Operation". To do that, we considered the discounts offered in the Cost Estimatesof the state-run company. In this context, two scenarios stand out: one in which cartel activity was succesful and the other without the victory or without the participation

of the cartel. The difference between the discounts in these two scenarios made it possible to estimate the damage of the crime at the moment of the public bid process. This assessment is called counterfactual analysis, and proved extremely useful in view of the progression of the Car Wash Operation as commented in the Introduction.

With this purpose, initially it must be saidthat the studies were based on information from 135 contracts of the refining area (Petrobras's Supply Area) after requesting data related to the construction works that took place between 1997 and 2015 with values higher than $100 million BRL. From these data, several variables were defined, such as, for instance: number of companies invited to the public bid process, type of construction work, contract value, percentage of companies invited that were part of the cartel, among others.

In addition to these variables, a dummy qualitative variable was also used to indicate the successful activity of the cartel. This variable was built individually for each of the 135 contracts in line with a plethora of evidence and/or signs arising from documents shared within the Car Wash Operation. This dummy variable, of qualitative nature, aimed at outlining the "counterfactual" scenario described by the international technical literature. When the dummy variable assumes value 1, it indicates that the cartel won the public bid process; in the opposite case, the value is zero.

After the assembly of the database, we began an analysis with the statistical software Stata, for which the Federal Court of Accounts (TCU) possesses a license, following the general guideline exposed in the equation bellow:

$$Discount_i = \alpha_i + \sum_{K=1}^{N} \beta_{ik}.X_k + \gamma_i.D_i + e_i$$

The parameters that are estimated in the model are an intercept (α); the relationship among the characteristics of the public bid processes (X_k) and the coefficient (β); the relationship between the dummy variable cartel (D_i) and the parameter γ_i; and the variable e_i is a random element. The variable D_i assumes the value equal to 1 when there is a successful collusive practice and the value equal to 0 in the opposite case.

The parameter of interest to be estimated γ_i, is interpreted in the following manner. As an example, consider that this parameter was estimated as -0.2, or -20%; The interpretation is that when the binary variable assumes the value Di = {1}, that is, whe the cartel wins, the discount obtained by Petrobras in the public bid process is 20% lower than the discount obtained when Di = {0}, without the activity of the cartel.

We adopted two approaches to analyze the existing database. First, a more restrictive approach, containing only contracts with direct evidence of successful or non-successful performance of the cartel; second,a wider approach, gathering all the contracts of the database, that is, with signs and direct evidence of the successful activity or of the defeat of the cartel. These two groups covered 48 and 135 occurrences. We opted to conduct this restrictive analysis because, in this restricted case, there was evidence of wheter or not there was cartel activity. The idea was to verify if the behavior of the restricted database would occur in the wider database, in which there was no sufficient evidence for all the contracts, but only signs.

Then, regressions were estimated according to the methodology of the Ordinary Least Squares (OLS). In this stage, ten econometric models were estimated in order to identify the model that would better explain the Discount offered at the exact moment of the public bid processes: five for the restricted base and another five for the extended base. The models had different combinations of the variables contained in the database made available by Petrobras.

In the context of these studies, we necessarily verified the adjusted R2 (measures the explicative power of the model), F test (evaluates the joint significance of the explicative variables) and t test (evaluates the individual significance of the explicative variables). In addition, it the fulfillment of the inherent assumptions of the Ordinary Least Square was observed, such as error normality, homoscedasticity and non-perfect correlation among the parameters. The most robust models indicated a discount 17% lower in the event of the successful activity of the cartel, both in the restricted and in the extended database.

Aiming to both corroborate and improve the results obtained with the use of OLS, a sophisticated logit model was used: propensity score matching. This latter technique aimed at mitigating possible selection bias. In other words, one wishes to compare public bids as similar as possible within the used explicative variables. Here too, we built models according to the same logic adopted for the OLS regressions that is, using the restricted and extended databases. Once again, the most robust result obtained was the 17% already mentioned, in both databases.

Taking into account the clear convergence around the 17% difference (to the detriment of Petrobras when the cartel operated and won), we set out for the monetization of the damage in the Supply Area (for the period from 1997 to 2015 and objects above $100 million BRL) as a result of the collusive actions committed by the operating cartel. We then reached the significant amount of $5.7 billion BRL at historical values.

We highlight that the Federal Court of Accouts has already been investigating overcharging and responsibility for the damage caused in some contracting operations of the database studied in this article. In eight contracts established with companies that are part of the cartel, based on traditional auditing techniques, a total damage that reaches 16% of the value of the audited contracts was pointed out so far.

Although the methodology used to calculate the damage caused to Petrobras – which are the TCU methodology to calculate overpricing and the econometric analysis of this study - is completely different in both cases, we cannot forget the proximity of the percentage of damage in relation to the estimated value of the contracts. The percentage was around 16% to 17%, which strengthens the reliability of the econometric results.

Finally, the value of 17% is in total agreement with the values found in the national and international technical literature, which is around 20%, according to what is established in the references of this paper.

6. CONCLUSION

A cartel in public procurement is typified as bid rigging and is a serious and highly harmful crime to society. In addition to enabling antieconomic contracting, due to the artificial raising of prices – increasing state inefficiency -, the practice weakens the market, preventing, in the medium and long run, companies that are apt and reliable from offering good products and services to the State. In a weaker and less innovative market, society as a whole bears both the economic cost of products that are more expensive and of products with less potential quality and of a more inert and worn out administration.

It is a fact that the identification and quantification of the damage caused by cartels in public contracting operations – in view of the limitation of available elements of proof – is an old (though continuous) challenge for control bodies. As known, recent investigations uncovered a huge scheme of collusion of major contractors in the country, with anti-competitive practices identified by means of rewarded collaborations (plea bargain deals), leniency

agreements, telephone tapping and exchange of electronic messages.

Thus, acknowledging the need to make available to the State tools that will enable it to identify such criminal practice in a more timely, continuous and recurrent manner, but using a more "available" collection of evidence – especially for the administrative control bodies -, several studies are being developed. By collecting a robust history of contracting operations, each with its own characteristics, among competing companies, contracted prices, discounts offered, number of qualified companies, number of bids, inherent characteristics of each market, among other possibilities, statistical-mathematical methods and economic techniques have been caught up in the "sea of information" generated by years of records.

This paper, in this perspective, has examined the results achieved by means of a new approach in the quantification of the overcharge of public procurement recently analyzed by the Federal Court of Accounts (TCU), by means of Ruling 3.089/2015-Plenary. Through the study, that used methods already acclaimed in the United States and in the European Union, econometric techniques were associated with regression analyses, from fifteen years of contracting of construction works conducted by Petrobras's Supply Area. Such data, applied to information arising from ongoing legal procedures in the Car Wash Operation – or provided by Petrobras itself and by the Judiciary Power -, duly "treated" from an econometric perspective, offered a powerful tool for the identification of the "general damage" caused by the monopolistic price charged in the state-run company in this past decade.

The methodology consisted in comparing the behavior of the discount offered by the contracted companies against Petrobras's budget, in the scenarios with cartel (factual) and without the infringement (counterfactual). As the outcome of the application of the methodology, we obtained the estimation that the activity of the cartel reduces in 17%, on average, the discount offered in a competitive scenario.

The methodology is in consonance with TCU's Bylaws, Article 210, §1 item II. The article states that the calculation of the debt may occur by "*estimation, when, through reliable means, one calculates an amount that would certainly not exceed the actual value that should be paid*". Considerint this, one investigates the advantage of calculating the damages through this means, in comparison with the "traditional methods" - and even the call for the relevant accountability. In addition to simplifying the procedural development (without some loss in technical soundness), shorter trials in addition to being consistent with the efficiency demanded from control by dealing calling for the consequences of the irregularities committed in a faster manner, provide more resources to identify cartelized practices in other sectors of the state activity.

According to a statement by Minister Benjamin Zymler, rapporteur of Ruling 3.089/2015-Plenary, this was a leading case, as it involved a procedural apparatus containing new strategies, statistically robust and of major practical relevance. It also had direct applicability in the greatest corruption scandal in the history of the country – because of the activity of a cartel in Petrobras's construction works.

The Rapporteur also highlighted that the results of this innovative study shall serve as a foundation for the evaluation of the lawfulness and legitimacy of future leniency agreements that may eventually be established based on Law 12.846/13 (Anticorruption Act), under the terms of TCU's Normative Ruling 74/2015. This Ruling establishes rules about TCU monitoring of the processes of establishment of leniency agreements within its jurisdiction.

Recently, the Attorney General of Brazil (AGU) filed two misconduct lawsuits against 15 companies suspected of involvement in the corruption scheme uncovered by the Car Wash Operation. Together, the amount charged in the lawsuits reaches $11 billion BRL, with $3 billion BRL corresponding to 17% of each of the relevant fraudulent contracts, based on the econometric study analyzed by TCU through the Ruling 3.089/2015-Plenary.

Therefore, we can conclude that the use of the internationally acclaimed methods and of the econometric techniques may represent a new paradigm of operation of the external control. They can be used in similar cases in which there are signs of the formation of cartel to rig public bids, as well as to quantify overcharge/overcharging, when it is not possible to compare quoted/hired prices based on parameters of prices defined in law as market references (Sinapi and Sicro, mainly).

REFERENCES

BRAGA, T. C. A. CADE, Cartéis e Licitações: um novo nicho da Política Antitruste Brasileira. Revista de Defesa da Concorrência, Brasília, DF, v. 3, n. 1, p. 108-132, 2015.

COELHO, G. F.; SILVA, R. V. M. A. Os eventos esportivos de 2014 e 2016 e o combate aos cartéis em licitações no Brasil. In: NETO, A. D.; CASTRO, R. P. A. Temas de direito econômico: A Copa do Mundo de 2014 e os Jogos Olímpicos de 2016. Curitiba: Clássica, 2013.

COMISSÃO EUROPEIA. Guia prático sobre quantificação dos danos nas ações de indenização com base nas infrações aos artigos 101 e 102 do Tratado sobre o funcionamento da União Europeia, 2013. Disponível em: <http://bit.ly/2p3bveJ> Acesso em: 4 nov. 2015.

CONNOR, J. M. Price-fixing overcharges: legal and economic evidence. Research in Law and Economics, Bingley, v. 22, p. 59-153, 2005.

GICO JÚNIOR, I. T. Cartel: teoria unificada da colusão. São Paulo: Lex Editora, 2007.

HARKRIDER, J.; RUBINFELD, D. L. Econometrics: legal, practical, and technical issues. American Bar Association, Chicago, 2005. Disponível em: <http://bit.ly/2p5dcpc>. Acesso em: 6 nov. 2015.

HOVENKAMP, H. J. Quantification of Harm in Private Antitrust Actions in the United States. University of Iowa Legal Studies Research Paper/Elsevier, Iowa City/Amsterdam, 11 feb. 2011. Disponível em: <http://bit.ly/2p375o8> Acesso em: 6 nov. 2015.

HARRINGTON JR., J. E. Detecting cartels. Johns Hopkins University, Baltimore, dec. 2005. Disponível em: <http://whr.tn/2onc6VD>. Acesso em: 5 nov. 2015.

INTERNATIONAL COMPETITION NETWORK. Anti-Cartel Enforcement Manual – Cartel Working Group – Subgroup 2: Enforcement Techniques, Istanbul. 2010. Disponível em http://www.internationalcompetitionnetwork.org/uploads/library/doc628.pdf. Acesso em 7 nov. 2015.

KORENBLIT, C. M. Quantifying Antitrust Damages Convergence of methods recognized by U. S. Courts and the European Commission. Competition Policy International Journal, Philadelphia, mar. 13 2012. Disponível em: <http://bit.ly/2oVHjCD>. Acesso em: 29 out. 2015.

MAGGI, B. O. O cartel e seus efeitos no âmbito da responsabilidade civil. 1985. 233 f. Dissertação (Mestrado) – Faculdade de Direito da Universidade de São Paulo, São Paulo, 2010. Disponível em: <http://bit.ly/2otdcRz>. Acesso em: 11 nov. 2015.

ORGANIZAÇÃO PARA COOPERAÇÃO E DESENVOLVIMENTO ECONÔMICO – OCDE. Diretrizes para combater o conluio entre concorrentes em contratações públicas. 2009. Disponível em: <http://bit.ly/2oq1Spd> Acesso em: 26 out. 2015.

OXERA. Quantifying antitrust damages. Towards non-binding guidance for courts. Study prepared for the European Commission. 2009. Disponível em: <http://bit.ly/2p5jsNC>. Acesso em 11 nov. 2015.

SANTACRUZ, Ruy. Cartel na lei antitruste: o caso da indústria brasileira de aços planos. In: MATOS, César (coord.). A revolução da antitruste no Brasil – A teoria econômica aplicada a casos concretos. São Paulo. Singular, 2003, p. 415 e p. 426-429.

SDE/MJ. Secretaria de Direito Econômico do Ministério da Justiça. Combate a cartéis em licitação: guia prático para pregoeiros e membros de comissão de licitação. Brasília. Publicação Oficial, 2008.

VASCONCELOS, S. P.; VASCONCELOS, C. R. F. Ferramentas de detecção dos acordos em preços no mercado de gasolina a varejo. Juiz de Fora, 2010. Programa de Pós-Graduação em Economia Aplicada – Faculdade de Economia da Universidade Federal de Juiz de Fora, 2010. Disponível em: <http://bit.ly/2p8NCQ4>. Acesso em: 9 nov. 2015.

VASCONCELOS, S. P.; VASCONCELOS, C. R. F. Ferramentas de detecção dos acordos em preços no mercado de gasolina a varejo. Juiz de Fora, 2010. Programa de Pós-Graduação em Economia Aplicada – Faculdade de Economia da Universidade Federal de Juiz de Fora, 2010. Disponível em: <http://bit.ly/2p8NCQ4>. Acesso em: 9 nov. 2015.

Feasibility Studies under suspicion: cost/time overrun and low return in construction projects

David C. R. P. Grubba
Auditor at the Federal Court of Audit, degree in Civil Engineering by the Federal University of Juiz de Fora – UFJF and Master's degree in Transportation Engineering by the University of São Paulo - USP.

Cynthia de F. Queiroz Berberian
Auditor at the Federal Court of Audit, degree in Civil Engineering by the University of Brasília – UnB and MBA by Bentley College, Boston, USA.

Ivan Lucio Santillo
Auditor at the Federal Court of Audit, degree in Civil Engineering by UnB.

SUMMARY

Recent international research show that estimated cost-benefit used in the decision-making process regarding investments in infrastructure projects is usually not very realistic. Frequently, the final costs for the public treasury surpass the costs estimated, in feasibility studies, while foreseen benefits shrink. Serious mistakes in feasibility analysis entail mismanagement of public funds and, therefore cause great damages to taxpayers. This article discusses the main causes for errors in estimates and mechanisms to improve the quality of the decision-making process, regarding investments in large infrastructure projects. In such sense, it discusses the "Reference Class Forecasting" method, developed from theories of Daniel Kahneman, winner of the 2002 Nobel Economics Prize. Furthermore, the article assesses the methods for multicriteria analysis and continuous monitoring of feasibility. In addition, there is the presentation of a case study involving two audits from Tribunal de Contas da União, the Brazilian Federal Court of Audit , which the feasibility of projects. Finally, it presents proposals that increases the accuracy of external control actions, thus, maximizing the real benefits for taxpayers.

Keywords: Public expenditure effectiveness. Feasibility studies. Infrastructure projects. Project management.

1. INTRODUCTION

Large-scale infrastructure projects, whether public works or concessions, generally cost more to the public treasury than initially planned, get late and present a smaller return to society than previously disclosed in its feasibility studies.

In Brazil, we may find countless examples to illustrate such circumstances. For starters, the construction of Nova Transnordestina railway, under a concession regime, is an example of lack of planning and low performance. The project was announced as costing BRL 4.5 billion and with a 2010 deadline. However, by the end of 2016, only 56% of the construction has been completed and the expected cost for the conclusion surpassed BRL 11.2 billion. The construction of the Estádio Nacional Mané Garrincha arena in Brasília serves as another example of a controversial project. Initially estimated at around BRL 750 million, it costed BRL 1.8 billion to taxpayers. For FIFA´s 2014 World Cup arenas the cost spikes from BRL 5 billion to over BRL 8 billion. In addition, some of those sports arenas are currently deemed by critics as "white elephants", since their revenues are not able to cover the maintenance costs. In the oil sector, the situation is not so different – in fact; it is more serious considering the figures involved. . The costs to build the Rio de Janeiro Petrochemical Complex (Comperj) were expected to be around USD 6 billion, but currently surpass the sum of USD 47 billion. These facts, added to the current lack of funds faced by the Federal Government, States and Municipalities, reinforce the idea that public expenditure in large-scale ventures needs to be better planned, used, monitored and audited.

Thus, the purpose of this article is to discuss the quality of public expenditure in the planning and implementation of infrastructure projects. Therefore, we will analyse contracting costs forecasts errors, its causes and mechanisms to improve accuracy in the decision-making process. In this sense, the following methods will be considered: "Reference Class Forecasting", multicriteria analysis for alternative analysis and project feasibility continuous monitoring. As a case study, two audits carried out by the Federal Court of Audit (TCU) shall be presented. Finally, we present proposals for maximizing the effectiveness of external control in the inspection of large-scale enterprises, thus increasing the real benefits for society.

2. ERRORS IN ESTIMATES

Examples of errors in estimates of large developments are not limited to Brazil. Studies subsequent to the conclusion of the Euro Tunnel, a construction connecting the United Kingdom to France via railway, have disclosed serious facts. Its construction cost has increased 80% and its real demand proved to be 50%

smaller than predicted (FLYVBJERG; BRUZELIUS; ROTHENGATTER, 2003). Consequently, the current net amount of the development turned to 17.8 billion Dollars negative, with a negative internal return rate of 14.45%, leading experts to conclude that it would have been best for the British economy if the Euro Tunnel had not been built (ANGUERA, 2006).

Analyzing such enterprise separately, one could think that the loss was just a matter of bad luck. However, the Danish tunnel Great Belt, the second largest underwater tunnel of Europe, opened three years after Euro Tunnel, presented a cost increase of 120%, making the project unfeasible even before it started operations. From an economic point of view, the construction of both tunnels proved to be antieconomic. However, they were implemented because the cost-benefit rates initially presented to investors and politicians were highly inflated, whether willfully or not (FLYVBJERG, 2009). These and other cases of waste of funds led international researchers to thoroughly study the causes for extrapolation of estimated contracting costs and for failure to reach the expected benefits in the feasibility studies for large-scale projects.

A paper titled "Cost Underestimation in Public Works Projects: Error or Lie?" drafted by researchers Flyvbjerg, Holm and Buhl (2002), compared the cost estimates with respective final costs out of a large sample of transportation infrastructure projects. 258 enterprises, totaling investments of a USD 90 billion sum, were analyzed. The final costs were accounted for at the end of the enterprises and the estimated costs were accounted for at the moment of the decision to carry them out. All costs were calculated in the same currency, using historical exchange rate indexes and other statistic data assessment devices.

The analysis has shown, with high statistical significance, that costs were extrapolated on 9 out of 10 infrastructure projects assessed. The final costs were 45% greater than the estimates for railways, 34% for bridges and tunnels and 20% for highways. In general, the final costs were 28% higher than estimates.

Errors in cost assessment were found in twenty nations, spread out through five continents, indicating that it is a global phenomenon. The study has concluded that the cost estimates used in the decision-making process for the implementation of transportation infrastructure projects are systematically erroneous. The same is true for the cost-benefit analysis, given that they base themselves in the cost estimates to assess feasibility and rank the projects. That is, if the estimates are inaccurate, certainly the feasibility analysis are too.

The distortion of cost estimates certainly entails mismanagement of funds, producing losses for those financing public infrastructures, that is, the taxpayers.

> The policy implications are clear: In debates and decision making on whether important transportation infrastructure should be built, those legislators, administrators, investors, media representatives and members of the public who value honest numbers should not trust the cost estimates and cost-benefit analyses produced by project promoters and their analysts. (FLYVBJERG; HOLM; BUHL, 2002, p. 279).

Researchers have emphasized that the conclusions are not an attack on public investments versus private investments in infrastructure, since the analyzed data is insufficient to assess whether private projects presented worse or better data in comparison to public ones. Further, they have warned that the conclusions are not attacks on transportation investments, considering that other large-scale projects also proved to be sensitive to the same errors in decision-making.

3. UNDERSTANDING THE CAUSES FOR ERRORS

Several factors are commonly used as "excuses" to justify performance failures in large-scale projects, for instance, "unforeseen circumstances", "it is a very complex project", "the scope has been altered", "the demand did not materialize", "the economic scenario has changed", "the geological characteristics were unfavorable", etc. Such factors undoubtedly, affect the performance of a development, one way or another. However, are such "unforeseen events" the true causes for planning failure matters? Do failures occur due to bad luck (negative unforeseen events)? In order to clarify the reasons for the lack of accuracy in estimates, some recent researches have tested "technical" (traditional), psychological and political explanations.

Flyvbjerg, Holm and Buhl (2002) point out that the most common explanations are the so-called "technical" ones. These explanations argue that the lack of accuracy is allegedly a result of the usage of unreliable or out-of-date data, of inappropriate forecast models, as well as lack of experience of the planners. However, if that were the real cause for estimate errors, a regular error distribution, with an average close to zero, would be expected, that is, with some equivalence between under and overestimations. As seen in the previous topic, initial estimates are for the most part lower than the final contracting costs, proving that the matter is not related to accuracy. Further, if the imperfection in data and models are the main reasons therefore, an improvement in accuracy, over time due to the development of project management techniques, would be expected, which cannot be seen in the results. This indicates that factors other than poor data and incorrect models are actually responsible for errors in cost-benefit estimates. Pursuant to the abovementioned researchers, psychological and political theories are better suited to explain estimation issues.

Psychological explanations relate the cost-benefit estimates errors to what psychologists call optimism bias. Such bias is a cognitive predisposition in the sense of considering the impacts of future events more favorably and positively than what is demonstrated by previous and current experiences. People, unintentionally, foresee success scenarios and underestimate the potential for errors. Thus, it becomes unlikely that projects be delivered in the set forth deadlines and costs, or that they grant the expected benefits (FLYVBJERG; HOLM; BUHL, 2002).

Political explanations, on the other hand, explain the lack of accuracy in terms of strategic distortion (willful presentation of false data). It occurs when the persons responsible for estimation and managers intentionally and in a strategic manner tend to exaggerate benefits and underestimate costs, so as to increase the probability of their projects being approved or being allotted funds (FLYVBJERG; HOLM; BUHL, 2002). In corruption cases, the matter of stra-

tegic distortion is even more serious. For instance, if a certain corrupt public agent is granted a percentage over the amount of the works as kickback, why would he or she refrain from performing unfeasible or overpriced developments?

Professor Bent Flyvbjerg of Oxford University, in article "Survival of the Unfittest: Why the Worst Infrastructure Gets Built – and What We Can do About it" (2009), states that planners willfully expand success scenarios and hinder failure risks. Pursuant to such explanation, where there is political pressure, there is distortion; but such may be refrained by transparency measures, accountability and strict punishment.

It is important to highlight that the final contracting cost is not necessarily intertwined with the "real" cost of the works. In some cases, cost increases arise from initially unforeseen (whether willfully or not) events. In other cases, part of the accretions may arise from overpricing and corruption practices. The fact is that, by excess of optimism or strategic distortion, the possibility of increases throughout performance is ignored in the moment of decision making in most projects.

In Brazil, the scenario of decision making for investments on large-scale infrastructure projects/programs/policies is even more serious than the mentions collected from international literature. Whether on purpose or not, some billionaire infrastructure investments are decided on without any minimally consistent cost-benefit analysis and without consideration of other alternatives to meet the proposed objectives, or with very superficial studies. As a mere example of this situation, TCU found that the Railway Logistics Investment Program (PIL Ferrovias), launched in August 2012 by the Federal Government, with expected investments around BRL 100 billion, had serious issues in its management and planning, which could compromise the feasibility thereof and cause significant funds mismanagement.

As found in the audit, the weak planning of the program was marked by the lack of studies to base critic decisions. The lack of justification based on technical studies both for the change in the concession model and for the choice and priority of railway stretches caused great uncertainty, increasing the risks of, even after a billionaire investment, the expected reduction on logistic costs not materializing, in addition to the continuation of the unbalance in the transportation matrix and mismanagement of public funds (TCU, 2015a).

4. DEVICES TO IMPROVE QUALITY OF PUBLIC EXPENDITURE

This topic discusses some methodologies to improve the quality of public expenditure in infrastructure. First, it presents "Reference Class Forecasting", a method that improves trust in the initial decision-making process. Then, a method

for multicriteria analysis of alternatives. Finally, examines the need to monitor continuously projects feasibility.

4.1 "REFERENCE CLASS FORECASTING" METHOD

Based on the theories of Daniel Kahneman, winner of the 2002 Nobel Economics Prize, a promising project management method was created in order to minimize the effects of optimism bias and strategic distortion, thus improving the accuracy of the feasibility assessment of enterprises. This method, named "Reference Class Forecasting", has been endorsed by the American Planning Association (APA) and by the United Kingdom Treasury.

Professor Bent Flyvbjerg, on work "From Nobel Prize to Project Management: Getting Risks Right" (2006), explains the main characteristics of such method. The traditional manner of thinking about a complex project is to focus on the project itself and its details ("internal vision"), so as to seek maximum understanding thereof, paying attention to its unique characteristics, trying to predict future events which will influence it. However, this future prediction, with costs and demands, is usually optimistic and may be distorted, as previously discussed. Whereas the "Reference Class Forecasting" method defends a systematic planning analysis based on an "external vision" of the project. Specifically, the method requires the following three steps to improve decision accuracy:

1. Identification of prior similar projects (reference class). The set of information must be comprehensive enough to be of statistical significance;

2. Definition of a probability distribution of cost deviations for the selected reference class in order to allow empirical conclusions;

3. Comparison of the project at hand with the probability distribution of the reference class in order to establish the most likely result for the specific project.

Based on the probability distribution and in the risk accepted by the entrepreneur, the estimated project cost is adjusted for purposes of feasibility analyses only, similarly to a safety coefficient.

To facilitate the understanding of the relevance of "external vision", let us see a hypothetical example. Based on modern schedule management tools, a certain large-scale railway was planned in its feasibility study to be built in two years for the price of X $ per kilometer. However, railways of such size were never built by the institution in less than five years and never at less than 1.8X $ per kilometer. If no material technological revolution has taken place, what would lead anyone to believe that the current project will be more efficient than the previous ones?

It is important to highlight that this method does not replace feasibility studies, nor does it replace the basic project and executive project. In addition, it must be stressed that this method may not be used for project budgeting, considering that historical increases may have been improper (overpricing, corrupt mismanagement, etc.). It is simply a method, which adds an experimental risk analysis, in the decision-making moment, based in previous similar enterprises. That is, it allows the assessment of whether a certain project is feasible, even when contracting costs and benefits are assessed based in previous experiences.

The United Kingdom Department for Transport decided to apply "Reference Class Forecasting" as part of the assessment process for large-scale transportation projects (FLYVBJERG, 2006).

In view of the foregoing, this article argues that a way to improve Brazilian cost-benefit estimates is the supplementation of traditional assessment with an empirical risk analysis, which takes into account prior results of similar projects. For cost-benefit analysis closer to reality, the feasibility assessment of a certain project shall take into account the history of similar past projects. In a simple manner, it may be said that this method works as a type of screening which rejects potentially unfeasible projects.

4.2 MULTICRITERIA ANALYSIS

The cost-benefit analysis is based in the monetization of costs and benefits. However, these parameters may not always be easily adapted. In such cases, the multicriteria analysis turns into an important tool for it allows the weighing of benefits and costs of impacts, which were, not monetized (UNITED KINGDOM, 2009).

The multicriteria analysis aids decision making with regard to a complex matter, weighing factors by

means of weight, allowing the choice of alternatives pursuant to different criteria and points of view (JANNUZZI; MIRANDA; SILVA, 2009).

Recently, this method was defended as an important tool to improve auditing. Article "O uso de geotecnologias como uma nova ferramenta para o controle externo" [*The use of geotechnologies as a new tool for external control*] (FERRAZ et al., 2015) develops the use of a decision model based on multiple criteria, supported by geographic information systems, aimed at the planning of transportation. This type of multicriteria analysis simultaneously integrates distinct variables, combined in groups. Each variable is attributed a weight/points, establishing if the variable is attractive or repulsive for the project in question, as well as levels of attraction or repulsion. Thus, for instance, for a railway or highway outline, stretches with high terrain declivity repeal the outline, for they result in higher building costs; conversely, points with high agricultural and industrial productivity attract the direction of the outline, for they may demand transportation infrastructure. As a result, the model generates themed maps (each variable is plotted in a map) which are combined, so as to identify and quantify the areas of greater feasibility for implementation of the infrastructure.

The tool enables the assessment of several types of public policies consistently and in an interdisciplinary manner. It allows, for instance, the assessment of optimal location for schools, day care centers, hospitals and airports. In the case of linear projects, it allows for the establishment of optimized path outlines for highways, railways, channels and transmission lines, considering technical, economic and environmental characteristics. In addition to that, there are several customizations, which may be developed; amongst them, it is worth to highlight the possibility of monetizing variables and themed maps, so as to create financial surfaces comparable among each other. Finally, this tool allows the indication, in a transparent and objective manner, of the values used during the decision-making process.

4.3 DATA APPROPRIATION AND CONTINUOUS MONITORING

In order to better allocate public expenditure within infrastructure projects, it is important to create a culture of continuous assessment, monitoring and improvement of planning mechanisms.

Psychologist Daniel Kahneman argues that both individuals and groups need mechanisms to review how their decisions were taken. As a researcher, he never accepted the fact companies, which make decisions all the time do not keep record thereof. Thus, they have no means of learning with their own mistakes. Pursuant to Kahneman, that is not accidental, but due to the fact managers do not want to have their mistakes confronted. According to the psychologist, when human reason is left to its own artifices,

it is likely to create several fallacies and systematic errors. In order to make decisions more accurately, he defends that we need to seek solutions to escape such tendencies (KAHNEMAN, 2015).

As emphasized by Daniel Kahneman, it is extremely important to keep record of previous decisions, in order to learn with past errors. In the case of public expenditure, such investment errors should have been clearly demonstrated to the population, as a transparency measure. However, Brazilian public administration entities and agencies do not have the habit of appropriating and disclosing the evolution of the cost-benefit relation regarding large-scale infrastructure projects. That is, they do not produce/disclose studies confronting estimated cost-benefits in feasibility studies (used as justification for the decision to build) with final cost-benefits, so as to prove if the investment was in fact a good deal.

The monitoring of cost-benefit analyses throughout the implementation of the infrastructure project, program or policy is deemed a governance element. The development of operations inherent to public policies shall be constantly monitored and the results thereof periodically assessed, seeking to materialize the set forth objectives and to improve governmental performance. The Guideline for Assessment of Governance in Public Policies [Referencial para Avaliação de Governança em Políticas Públicas], published by TCU, indicates that a public policy (in this context, a public project may also be considered) shall have a routine for following up on its actions, to appraise results and use them to promote improvements in the policy.

Pursuant to the PMBOK Guide, a project management manual and good practices, monitoring shall be carried out from start to finish of a project. It includes the collection, measurement and distribution of information on performance and assessment of trends to apply improvements to the process. Continuous monitoring enables a clear comprehension of the project's "health". Such control includes the establishment of corrective or preventive actions, or replanning. Monitoring encompasses several aspects, such as: comparison of real performance of the project with management plan; identification of new risks, as well as analysis and follow-up of existing risks; among other factors (PMI, 2014).

The importance of monitoring is also related to one of the purposes of continuous cost-benefit analysis: appraising the convenience of continuing with the implementation of the project or the possible need of reformulation, so as to mitigate losses in projects which are no longer feasible throughout their performance. This analysis is especially relevant when it is verified that the premises of the original assessment of the project were substantially changed. Pursuant to PMBOK, the project is ended when its purposes are reached or when the project is terminated because its purposes will or can no longer be reached, or when the need for the project ceases to exist.

It is known that risks and uncertainties are greater at the start of a project, decreasing as decisions are taken and deliveries accepted. Conversely, costs of changes and error correction significantly increase as the project reaches its end.

Obviously, the longer it takes for a certain change in planning to take place, the more expensive it will be. For instance, when a large-scale enterprise is considered unfeasible in the Technical, Economic and Environmental Feasibility Studies (EVTEA), thus being aborted, losses are almost insignificant, such that only the funds applied to drafting the study are lost. If the development is found to be unfeasible during furthering of the studies, for instance, in the basic project stage, the losses increase a little in view of the greater costs with field surveys and assays; however, they are still low. If the development is deemed unfeasible and aborted after start of the works, due to the discovery of extra costs or even the demise of forecast demands, the costs involved shall be exponentially larger. Even more serious would be the case in which the project is completely carried out and, after its conclusion, it is "found" that its benefits barely cover its costs. The worst of all situations certainly takes place when in any of these cases it is found that the revenue of the project does not even cover its maintenance costs, that is, losses grow over time. In this situation, the development's investors/sponsors are extremely damaged, as their funds get drained. In case of public developments, the sponsors are the taxpayers, who witness their tax payments going to waste.

Analysis throughout the life cycle of the enterprise, carried out since preliminary studies, in the basic project, at the start and throughout building, up to the moment of conclusion, enable the appraisal of the good application of public funds, that is, quality of the public expenditure. Reanalysis in initial stages allow the assessment of whether the project must be kept without changes, delayed to a more suitable

moment, changed or even, last case scenario, aborted, when costs surpass benefits.

Considering it is incumbent upon the public manager the burden of proving the good and regular application of funds received from taxpayers, it is imperious that they be stimulated by external control to follow up and monitor the evolution of the cost-benefit relationship regarding investments in infrastructure projects, in a manner transparent to society.

5. AUDITS ON THE FEASIBILITY OF DEVELOPMENTS

5.1 HYPOTHETICAL EXAMPLE OF A COST AND FEASIBILITY ASSESSMENT

Recently, the Courts of Audit have greatly developed the technique of assessing overpricing and overbudgeting on developments, identifying and fighting significant losses to public treasury. However, few of these assess aspects related to the feasibility of infrastructure projects throughout the project's life cycle. Such scenario entails the following reflection: is it enough to assess whether the building price complies with market referentials? Table 1 shows three hypothetical cases.

Upon analysis of the overpricing and estimated return aspects in the feasibility study, "Project A" is the one causing the greatest loss to public treasury, while "Project C" causes none. However, analyzing the real return, after implementation of the development, we see that the losses arising from "Project C" are huge, even with no overpricing, for its return to society is not sufficient to reimburse even half of its costs. Thus, it is important to consider not only the pricing analysis, but also the feasibility of the development.

Pursuant to the International Organization of Supreme Audit Institutions (Intosai), one of the common approaches to performance audits is carrying out cost-benefit and cost-effectiveness analysis (ISSAI, APPENDIX 3000). For such, it enunciates a relevant audit question: "Do the benefits of the Program exceed its costs and are its purposes reached at the lowest cost possible?" (INTOSAI, 2010, p. 90).

In addition, the National Audit Office (NAO) has carried out cost-benefit analysis of the main developments carried out. Some examples of this type of audit can be seen on "Lessons from major rail infrastructure programmes" (2014).

Finally, it is urgent to clarify that this article is not disregarding the importance of market price analysis – on the contrary, it is notorious that such type of analysis assures great real benefits to society, in addition to contributing to the effectiveness and morality of public expenditure. What we are arguing in this article is that, in addition to assessing adherence to referential costs, it is necessary to employ efforts to avoid losses arising from investments in unfeasible enterprises.

5.2 CASE STUDIES

Some recent papers of this Court have furthered the feasibility assessment of developments and investment programs, among which, the cases of Fiol (West-East Integration Railway, under execution by Valec) and Comperj (Rio de Janeiro Petrochemical Complex, under execution by Petrobras) will be mentioned. The first case shows the results of the audit, advising the government to monitor the feasibility of the project in view of the signals of compromise thereof. The second case shows a serious example of mismanagement of funds in the construction of an unfeasible development.

5.2.1 FIOL

In an audit carried out in 2015, TCU assessed issues pertaining to the feasibility of Fiol, planned

Table 1:
Hypothetical example of costs and feasibility assessment

Projects	Overpricing	Return estimated by EVTEA	Real return
A	30%	$2 for each $1 invested	$1.6 for each $1 invested
B	15%	$2 for each $1 invested	$1.2 for each $1 invested
C	0%	$2 for each $1 invested	$0.4 for each $1 invested

to interconnect the municipalities of Ilhéus (BA) to Figueirópolis (TO), and found out that the premises adopted in the study justifying the decision to build the railway were not compatible with actual reality. The Technical, Economic and Environmental Feasibility Study (EVTEA) has not assessed the political, economic and financial risks involved in the implementation of the development. On the contrary, the analysis have presented an optimistic bias and several premises taken into consideration have failed, such as the delivery deadline estimate. The following information is taken from the report and vote of the Decision 2644/2015-Full Court (TCU, 2015b).

According to the study, the 1,500km of the railway should have been operational starting January 2015. However, until July of the same year, not a single operational kilometer was ready, and approximately one third of the railway had not even been bid. At the time, the most optimistic expectations would be to conclude the first leg, "Caetité-Ilhéus", in 2018, whereas the feasibility studies set forth the operation of the leg starting in 2013. In the case of the leg "Barreiras-Caetité", the situation was more serious, with several segments with undefined layout and non-appropriated land.

We found out, in addition to the existence of fabricated schedules, that the main product to be transported by the railway, iron ore, responsible for over 94% of the initial demand set forth in the feasibility study, presented a background of strong devaluation, entailing the revision of investment plans of the local mining companies. Subsequently, this situation entails a relevant increase in the risk of reduction of ore transportation demand (such demand being used as the main reason for the existence of the development). However, these and other changes in the premises of the feasibility study were not being monitored and handled by the government. Thus, the audit indicated that it was not possible to assure the maintenance of feasibility of the railway or some of its segments. That is, there was no real proof that the benefits arising from the implementation of the railway would surpass its costs, which could cause billionaire damages to public treasury.

Considering the significant delays in delivering the project, the downward spike in iron ore pricing, the increase of interest rates and contingency of funds, TCU opinion was that a feasibility assessment regarding the development was needed. Thus, it advised, by Decision 2644/2015-Full Court (TCU, 2015b), that the government reassess the cost-benefit relation with regard to Fiol, considering at least four alternatives, ranging from partial conclusion (operational legs) to the full conclusion of the development. In addition, it recommended studies with the identification, assessment and handling of project risks and the institution of mechanisms to monitor the benefits and costs of the railway.

5.2.2 COMPERJ

In an audit carried out in 2014, TCU characterized the management of Petrobras in the implementation of the construction works of Comperj, one of the biggest developments in the state-owned company's history, as "reckless". The following information is taken from the report and vote of Decision 3090/2014-Full Court (TCU, 2014).

The total cost of Comperj investments, initially estimated in USD 6 billion in 2004, hovered around USD 30 billion in 2012. However, pursuant to the last cost review of Comperj, carried out by the audit in 2014, the amount went up to USD 47 billion. We found out that Petrobras moved forward with the implementation of Comperj in a scenario of high uncertainty, low project maturity and lack of definition with regard to the models of partnerships to be made. In spite of that, the approval of the start of the construction occurred without structured analysis of risks, in total noncompliance with their own applicable internal rules. In fact, there were no studies to assess the probability and impact of risks in order to reach the set forth goals.

The audit report identified the existence of updated internal reports of Petrobras indicating the development's unfeasibility. Pursuant to the audit team, "Comperj's profitability forecast, which, in its initial approval, already proved to be marginally positive, now points to an undeniable propension to economic unfeasibility" (TCU, 2014, n/p). Consequently, the current net amount of the development became USD 9 billion negative. This means that, out of the entire investment made by Petrobras, USD 9 billion will not be returned to the state-owned company until the end of the working life of the development.

Furthermore, according to the audit, the scenario became aggravated upon the verification that the information provided by Petrobras with regard to feasibility of the development was not consistent. The audit found indication that the state-owned company has not accurately disclosed the real investment needs regarding the Comperj Program, for the information presented in multiple media channels proved to be conflicting. What is even more worrying, according to the head of the audit, is "the fact that the discrepancy in information may contribute to erroneous interpretations of Federal Government agencies and institutions responsible for the energy planning of the country" (TCU, 2014, s/p).

In the vote of the abovementioned decision, the Reporting Minister highlighted that

> the inspection is innovative in comparison to others in the enterprise, for it is not restricted to specific contracts, as it aims to identify the main managerial decisions which caused significant impacts to the schedule and budged of the enterprise, as well as to analyze the decision-making process which supported such decisions (TCU, 2014, s/p).

6. CONCLUSION

Serious mistakes in feasibility assessment entail huge losses to taxpayers. However, international literature and national examples demonstrate that cost-benefits estimated during the decision-making process regarding investments in infrastructure projects are systematically unreliable. Thus, routinely the final costs to the public treasury significantly surpass costs estimated in feasibility studies, while benefits usually go down, reducing projects feasibility.

As opposed to the usual excuses, the real causes for failure in project performance, may not be attributed to unforeseen events. They are rather the lack of minimally consistent cost-benefit analysis, the lack of identification and handling of risks, to the excess of optimism in planning and, in a more serious manner, to the strategic distortion of information used during the decision-making process regarding whether to invest.

One way to improve decision making regarding infrastructure investments is the supplementation of the traditional assessment with a risk analysis that takes into consideration the previous performance of similar projects, as described in the "Reference Class Forecasting" method. We must stress that this method may not be used for project budget.

Furthermore, the cost-benefit relation should not be assessed and audited only during the decision-making phase (feasibility study), it must be monitored throughout the life cycle of the project (preliminary studies, basic project, executive project, execution and operation). With reanalysis over time, government may assess if a development shall be kept with no changes, delayed to a more suitable moment, changed or even, last case scenario, aborted, when costs inescapably surpass benefits.

Additionally, the adoption of a better institutional system to halt and counter serious mistakes, including financial, professional and even criminal penalties, would result in the production of more realistic cost estimates.

Finally, it is suggested that government audit play an important role in the cultural change regarding analysis and monitoring of feasibility of infrastructure projects, and on stimulating public managers to apply funds more rationally and efficiently, minimizing the occurrence of unfeasible projects and, subsequently, improving the quality of public expenditure.

REFERENCES

ANGUERA, R. The Channel Tunnel: an ex post economic evaluation. Transportation Research Part A: Policy and Practice, v. 40, n. 4, p. 291-315, 2006.

FERRAZ, C. A. M. et al. O uso de geotecnologias como uma nova ferramenta para o controle externo. Revista do TCU, Brasília, DF, v. 133, p. 40-52, 2015.

FLYVBJERG, B.; HOLM, M. K. S.; BUHL, S. L. Cost Underestimation in Public Works Projects: Error or Lie? Journal of the American Planning Association, Chicago, v. 68, n. 3, p. 279-295, 2002.

FLYVBJERG, B.; BRUZELIUS, N.; ROTHENGATTER, W. Megaprojects and Risk: An Anatomy of Ambition. Cambridge: Cambridge University Press, 2003.

FLYVBJERG, B. From Nobel Prize to Project Management: Getting Risks Right. Project Management Journal, Philadelphia, v. 37, n. 3, p. 5-15, 2006.

FLYVBJERG, B. Survival of the unfittest: why the worst infrastructure gets build – and what we can do about it. Oxford Review of Economic Policy, Oxford, v. 25, n. 3, p. 344-367, 2009.

INTERNATIONAL STANDARDS OF SUPREME AUDIT INSTITUTIONS. Implementation guidelines for performance audit: Standards and guidelines for performance audit based on INTOSAI's Auditing Standards and practical experience. Vienna: INTOSAI, 2010.

JANNUZZI, P. M.; MIRANDA, W. L.; SILVA, D. S. G. Análise multicritério e tomada de decisão em políticas públicas: aspectos metodológicos, aplicativo operacional e aplicações. Informática Pública, Belo Horizonte, year 11, n. 1, p. 69-87, 2009.

KAHNEMAN, D. Interview. Revista ESPM, ed. 93, March/April. 2015.

NATIONAL AUDIT OFFICE – NAO. Lessons from major rail infrastructure programmes. Available at: <www.nao.org.uk/wp-content/uploads/2014/10/Lessons-from-major-rail-infrastructure-programmes.pdf>. Accessed on: June 28, 2016.

PROJECT MANAGEMENT INSTITUTE – PMI. Um guia do Conhecimento em Gerenciamento de Projetos – PMBOK Guide. 5th ed. São Paulo: Saraiva, 2014.

FEDERAL COURT OF AUDIT – TCU. Report of Decision 3090/2014. Full Bench 006.981/2014-3. Reporting Justice José Jorge. Brasília, DF, 2014.

FEDERAL COURT OF AUDIT – TCU. Report of Decision 1205/2015. Full Bench 019.059/2014-0. Reporting Justice Augusto Nardes. Brasília, DF, 2015a.

FEDERAL COURT OF AUDIT – TCU. Report of Decision 2644/2015. Full Bench 001.244/2015-9. Reporting Alternate Justice Augusto Sherman Cavalcanti. Brasília, DF, 2015b.

UNITED KINGDOM. Department for Communities and Local Government. Multi-criteria analysis: the manual. London, 2009.

The importance of data analysis for the improvement of the selection process of audit areas and objects: a systemic and risks view on the PAC public works

Thiago da Cunha Brito
is a public servant at the Federal Court of Accounts. He holds a bachelor's degree in Informatics Engineering from ISEP - School of Engineering of Polytechnic of Porto and a postgraduate degree in Marketing and Strategy from the University of Minho.

ABSTRACT

According to the Strategic Plan of the Federal Court of Accounts, the complexity, scope, diversity and extent of jurisdiction and of the control objects require that the Court act in a selective and systemic manner in relevant areas, aiming to reach greater efficiency and effectiveness in its oversight performance. This article shows the potential of data analysis for the improvement of the selection process of audit areas and objects, using the statistical analysis of public data of about 37 thousand projects of the Federal Government Growth Acceleration Program (PAC).

Keywords: Data analysis. Data Warehouse. Public works audit. Systemic selection of audit objects. Growth Acceleration Program (PAC).

1. INTRODUCTION

The activity of auditing the infrastructure projects is an attribution ultimately assigned to the Federal Court of Accounts (TCU) by the Federal Constitution. In more detail, the Budget Guidelines Law (LDO) states several criteria that must be observed in the selection of audit objects.

This noble mission assigned to TCU brings great challenges that result mainly from the complexity, scope, diversity and extension of jurisdiction and of the

audit objects that need to be analyzed and interpreted to support the selection of infrastructure works to be audited.

Considering only the infrastructure works under the Growth Acceleration Program (PAC), the universe of possible audit objects comprises about 37 thousand projects.

In this manner, it becomes extremely important for the Court of Accounts to use techniques and tools that enable an assertive and economic selection of the public works that deserve to be audited, considering materiality, relevance and risk criteria.

Aware of these challenges, the Federal Court of Accounts presented in its Strategic Plan (2015-2021) some initiatives regarding the need to improve the selection process of areas and objects of action, through the application of methodologies of data treatment and analysis that make it possible to evaluate, in a systemic manner, governmental performance by topics.

Thus, the objective of this paper is to cooperate with the dissemination of the use of information technology in the activities under the responsibility of the Court of Accounts, as an essential tool to treat and analyze great quantities of data. In addition, it aims to foster the improvement of the selection process of audit objects, by obtaining a systemic view of governmental programs that have a high budget impact and their associated risks.

2. GROWTH ACCELERATION PROGRAM - PAC

In 2007, the Federal Government resumed planning and execution of great social, urban, logistics and energy infrastructure projects in the country, with the creation of the Growth Acceleration Program (PAC).

According to official data, during its first four years, the PAC fomented Brazilian public investments, which went from 1.6% of the GDP in 2006 to 3.27% in 2010.

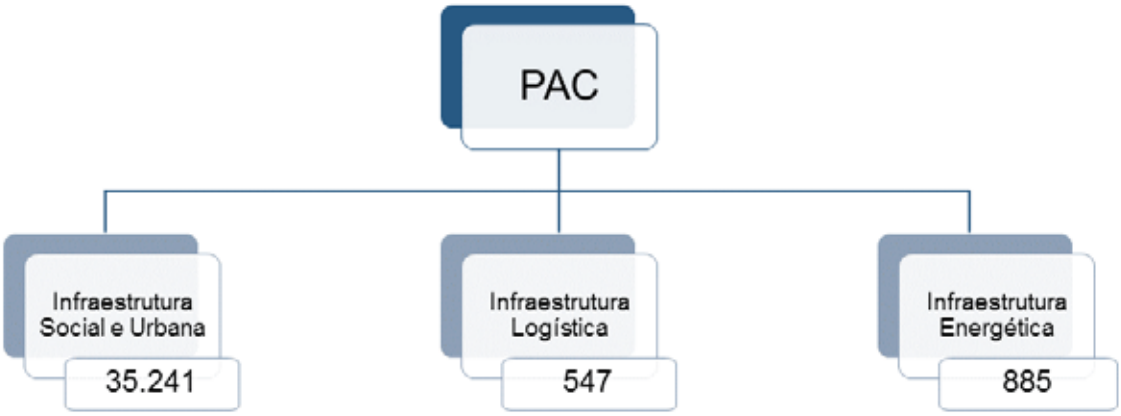
According to public data available on the Federal Government open data portal, in its second phase, initiated in 2011, more resources were reserved for the program and more partnerships with states and municipalities were established, aiming to improve the quality of life in Brazilian cities and increase trade competitiveness in the country.

In 2015, the program presented a portfolio of about 37 thousand projects with an expressive volume of resources, which, based on the data of the second balance sheet of 2015, totalized more than R$ 1.5 trillion reais.

The program is structured in three axes: social and urban infrastructure; logistics infrastructure; and energy infrastructure. Figure 1 shows the quantity of projects associated with each one of the PAC axis.

As can be inferred by Figure 1, the Social and Urban Infrastructure axis comprises about 96% of all

Figure 1:
Quantity of projects per PAC axis



Source: www.pac.gov.br.

PAC projects. The goal of the activities of this axis is to face the main challenges of small, medium and large Brazilian municipalities, and includes programs such as Minha Casa Minha Vida (My house, My Life).

The Logistics Infrastructure axis has as its goal the optimization of the national production outflow through investment in railways, roads, ports, airports and waterways. Strategic Armed Forces and Communications projects, which aim to expand access to the internet in isolated regions and increase security in data communication, are also included in this axis.

Finally, the Energy Infrastructure axis comprises investments with the goal of assuring the supply of electric energy in the country and promote oil and natural gas exploration and production activities, among others.

3. DATA ANALYSIS APPLIED TO THE AUDIT OF PAC PUBLIC WORKS

A holistic view of a determined set of data can offer an important direction for the selection of possible audit objects. However, in a universe of almost 37 thousand projects in portfolio, having a systemic view of the program and, consequently, being able to identify potential risks that deserve attention or monitoring, become great challenges.

Aiming to allow a systemic view of the PAC public works, a data warehouse was created to store the information of the PAC projects in the TCU Microsoft SQL Server database. It was supplied with the public data made available in the open data site of the Federal Public Administration (dados.gov.br).

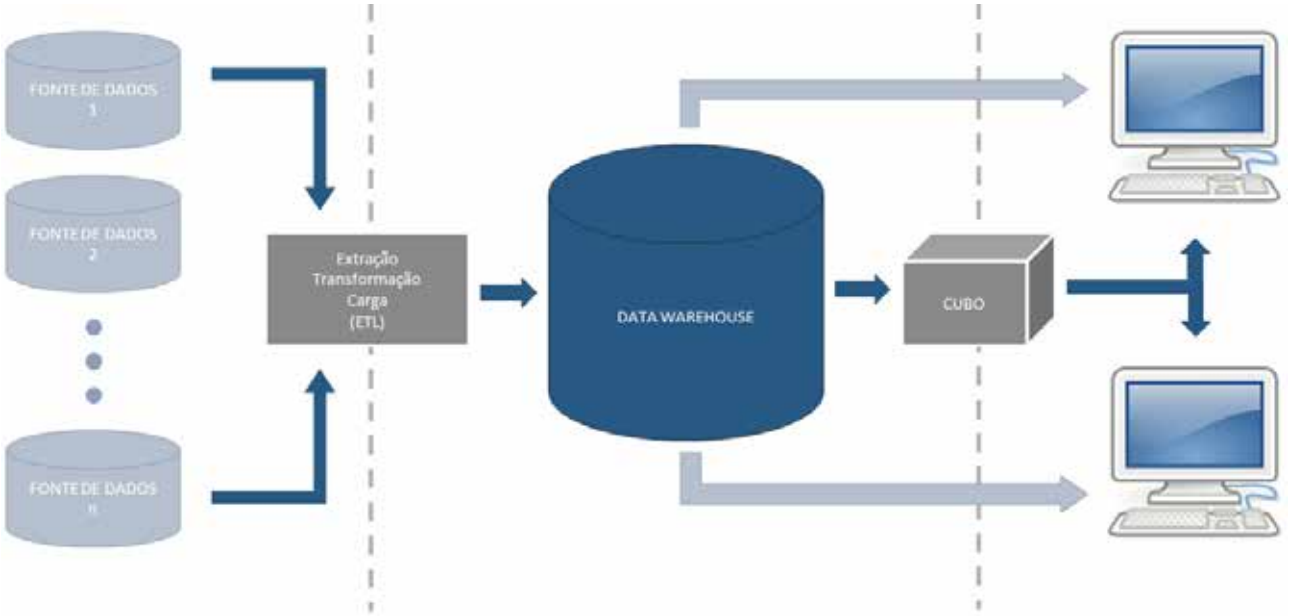
Ballard (1998) conceptualizes data warehouse as a database created to offer easy access to a high quality data repository, commonly used to support decision-making.

According to this same author, the main benefits associated with the implementation of data warehouse solutions are related to: i) the creation of a central data repository that is reliable, secure and accessible to the whole organization; and ii) the possibility of application of data mining and data cross-checking techniques, among others that are more traditional for data query and analytical reports.

In general, the data warehouses are fed by data coming from different sources of information. Nonetheless, before being loaded in the data warehouse environment, the data go through a process of extraction and cleaning or transformation, known as ETL (Extraction, Transformation and Loading).

In this analysis, the source of information used was the open data site of the Federal Administration. Before being permanently stored in the data warehouse, such data went through an intermediate process of cleaning and transformation to, only then, be loaded in the data repository, remaining available for queries and analyses by the authorized users.

Figure 2:
shows a simplified view of the typical architecture of a data warehouse



Source: The Data Warehouse Toolkit (adapted)

Once we have the information on the PAC projects (project status, volume of resources allocated, agency responsible for the execution, state of the federation where the project will be executed, program axis to which the investment is applicable, ministry, among others), it becomes possible to answer a series of questions that help in the creation of a systemic view of the program and in the selection of audit objects in an objective manner.

In order to exemplify how the data analysis can be applied to the process of selecting areas and objects of action, we attempted to answer the following questions about the PAC projects:

- Which PAC axis has the largest budget representation the?
- In the axis of greater representation, which is the area that has greater participation?
- In the area of greater participation, which is the main agency responsible for the budget execution?
- What is the status of the projects?

These questions will be answered in the following sessions, based on a descriptive statistical analysis of the information inserted in the data warehouse.

3.1 A MORE IN-DEPTH ANALYSIS OF THE PAC AXES

As described previously, the PAC projects are divided among the Social and Urban Infrastructure axis, the Logistic Infrastructure axis and the Energy Infrastructure axis.

Analyzing only the information presented in Figure 1, where we verify that 96% of the PAC projects are part of the Social and Urban Infrastructure axis, it can be concluded that this axis would be responsible for the greater part of the program budget.

However, when we analyze the PAC data inserted in the data warehouse, it is possible to identify that the social and urban infrastructure axis is responsible for the execution of only 22% of the program budget as a whole, even though it contemplates almost the totality of the number of projects of the program, according to Figure 3.

We note in Figure 3 that the largest portion of the resources planned is connected to the energy infrastructure axis, that represents about 66% of the who-

le budget amount, totaling over one trillion reais >R$ 1.044.087.709.827,00).

It is important to emphasize that the Energy Infrastructure axis only has 885 projects. Thus, analyzing the budget of this portfolio's projects, it is possible to disclose what, in a superficial analysis, could indicate a paradox: 2.4% of the PAC projects represent more than two thirds of the global budget of the program.

Considering only the Energy Infrastructure axis projects, which effectively have allocated resources (value greater than zero), one can conclude that only 444 out of the 885 projects of the axis are responsible for about 66% of the entire budget of the program. This reinforces the materiality of the axis, according to what is described in Table 1.

Therefore, once the Energy Infrastructure axis is identified as the one with greater representation (66% of the PAC resources), it is possible to answer the second question through a deeper analysis of this axis, studying the characteristics of each one of its areas.

3.2 A MORE IN-DETH ANALYSIS OF THE ENERGY INFRASTRUCTURE AXIS AREAS

AS SEEN, Energetic Infrastructure is the PAC axis of greater budget relevance. Internally, this axis is divided into the following areas: renewable fuels, electric energy generation, merchant marine, oil and natural gas and electric energy transmission.

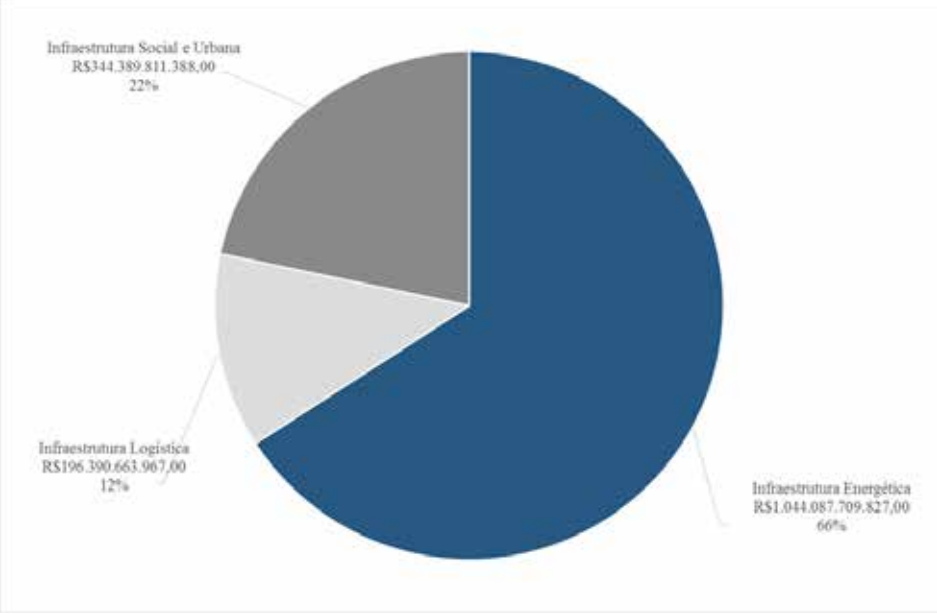
The division of financial resources in the areas that are part of this axis is rather unbalanced. The oil and natural gas area answers for more than 85% of the total budget of the axis, totaling more than R$ 890 billion reais in investments.

Figure 4 illustrates the relation between the number of projects of the Energy Infrastructure axis areas and the budgetary impact of these areas in relation to the axis.

At this point, it is important to highlight that the oil and natural gas area has 96 projects in its portfolio. This means that 11% of the projects of the Energy Infrastructure axis is responsible for the execution of more than 85% of the total budget of the axis, characterizing the materiality of this area in relation to the axis analyzed.

Through the analysis of the information of Table 2, we find that the area with the greater amount of projects of the axis is the electric energy generation, which also presents the greater number of entities responsible for the execution of its projects.

Figure 3:
PAC budget per program axis



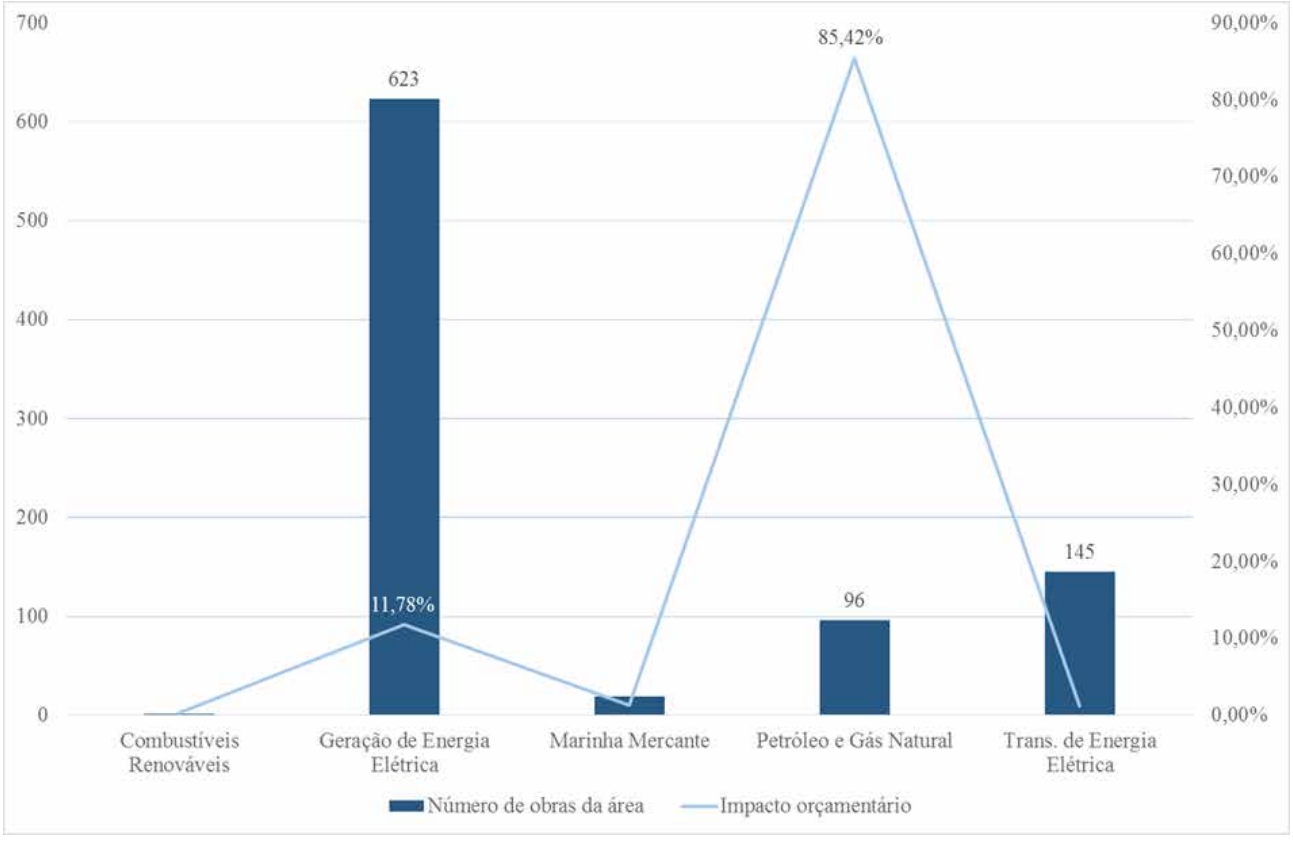
Source: dados.gov.br (own creation)

Table 1:
Stage of the projects of the Energy Infrastructure axis

Stage of the projects	Number of works	Investments (R$ billion)
Preparatory action	**24**	**0,00**
Concluded	133	13,931
Being contracted	**11**	**0,00**
Under execution	17	0,499
In bid stage	**406**	**0,00**
In progress	265	341,320
Operating	29	688,336

Source: dados.gov.br (consolidated data at the data warehouse)

Figure 4:
Relation between the number of public works of the Energy Infrastructure axis areas and their budget impact on the axis



Source: dados.gov.br (own creation)

Strategically connected to energy generation, the electric energy transmission area is the second axis area with the greater number of projects and executive bodies.

Moreover, the execution of 85% of the Energy Infrastructure axis budget is limited to only four executive agencies, showing a high concentration on the execution of the projects of this axis.

Table 2:
Energy Infrastructure axis areas

Axis areas	Projects	Executive agencies	Investments (R$ billion)	Representation
Renewable fuels	2	1	2,789	0,27%
Electric energy generation	623	399	123,033	11,78%
Merchant marine	19	10	13,885	1,33%
Oil and natural gas	96	4	891,833	85,42%
Electric Energy Trans.	145	65	12,547	1,20%
			1.044,087	**100%**

Source: dados.gov.br (consolidated data at the data warehouse)

Because of the representation on the PAC budget execution and the risks associated with its achievement and considering the concentration of resources in a few executive bodies, it becomes necessary to carry out an analytical assessment of the oil and natural gas area. The purpose of this is to answer the third question suggested in this study regarding which is the main body responsible for the budget execution.

3.3 A MORE IN-DEPTH ANALYSIS ABOUT THE OIL AND NATURAL GAS AREA

When we add the dimension related to the agency responsible for the execution of the projects in the area of oil and natural gas to the analysis, we observe that Petrobrás is the one responsible for the execution of 85 out of 96 projects planned in this area of the program, as listed in Table 3.

Below, Table 4 shows the PAC investments per axis, with special emphasis on the Energy Infrastructure axis and its material importance in relation to the total PAC budget.

In Table 4 we can observe that the 85 projects under Petrobras execution responsibility in the oil and natural gas area, in a universe of about 37 thousand projects in the PAC portfolio, represent more than 56% of the total of resources estimated by the program. This makes this government-controlled company the main executive company of the PAC projects.

It is important to remember that among the PAC projects under the responsibility of Petrobras, there are emblematic projects, such as Rio de Janeiro Petrochemical Complex (Comperj) and Abreu e Lima Refinery (Rnest), in Pernambuco state, whose total amount of resources represent R$ 76.6 billion, according to the data published by the site of the program.

According to the information extracted from the data warehouse, the program also estimates substantial investments in platforms for the production and processing of oil and natural gas in ultra-deep

Table 3:
Agencies responsible for the budget execution of the oil and natural gas area

Area	Executive agencies	Projects	Investments (R$ billion)	Representation
Oil and natural gas	ANP (National Agency of Petroleum, Natural Gas and Biofuels)	6	0,349	0,04%
	ANP (National Agency of Petroleum, Natural Gas and Biofuels) and Others	1	0,00	0,00%
	ANP (National Agency of Petroleum, Natural Gas and Biofuels) and Petrobras	4	0,428	0,05%
	Petrobras	85	891,056	99,91%
			891,833	**100,00%**

Fonte: dados.gov.br (dados consolidados no *data warehouse*)

Table 4:
The PAC Investments per activity axis

Axis	Area	Executive Area	Investments (R$ billion)	Representation
Energy infrastructure	**Oil and natural gas**	**Petrobras**	**891,056**	**56,22%**
		Others	0,777	0,05%
	Generation of electric energy	Others	123,033	7,76%
	Merchant Marine	Others	13,885	0,88%
	Electric energy transmission	Others	12,547	0,79%
	Renewable fuels	Others	2,789	0,18%
Logistics infrastructure	All	Others	196,391	12,39%
Social and urban infrastructure	All	Others	344,390	21,73%
			1.584,868	**100%**

Source: dados.gov.br (consolidated data at the data warehouse)

waters, with amounts of about R$ 225 billion that total more than 25% of the investments under the responsibility of Petrobras in the PAC.

It must be emphasized that several projects of the PAC portfolio under the responsibility of Petrobras were object of leniency agreements in the *Lava Jato* Operation. This was widely discussed in the media that reports payments of bribes to government employees and political agents, besides the creation of a cartel among the construction companies, corroborating the criticality of the risks of the Company's projects, as well as the relevance of the topic.

From this point on, we can use several variables to generate other views about the data, offering means for a greater understanding of the projects under Petrobras execution responsibility.

3.4 A MORE IN-DEPTH ANALYSIS OF PETROBRAS PUBLIC WORKS IN THE PAC

If we analyze the Petrobras public works inserted in the oil and natural gas area under the PAC Energy Infrastructure axis, we can be verify that about 25% of them are operating, 62% are in progress and 13% are in the bid stage, according to what is described in Table 5.

It is important to remember that 13% of the projects under Petrobras execution responsibility are still going through the bid process and, therefore, they have investment values equal to zero.

Crossing the data, it can be noticed that after the year of 2007, when the PAC was created, the total debt of Petrobras presented an average annual growth of 38%, going from R$ 40 billion in 2007 to R$ 493 billion in December 2015, according to Figure 5.

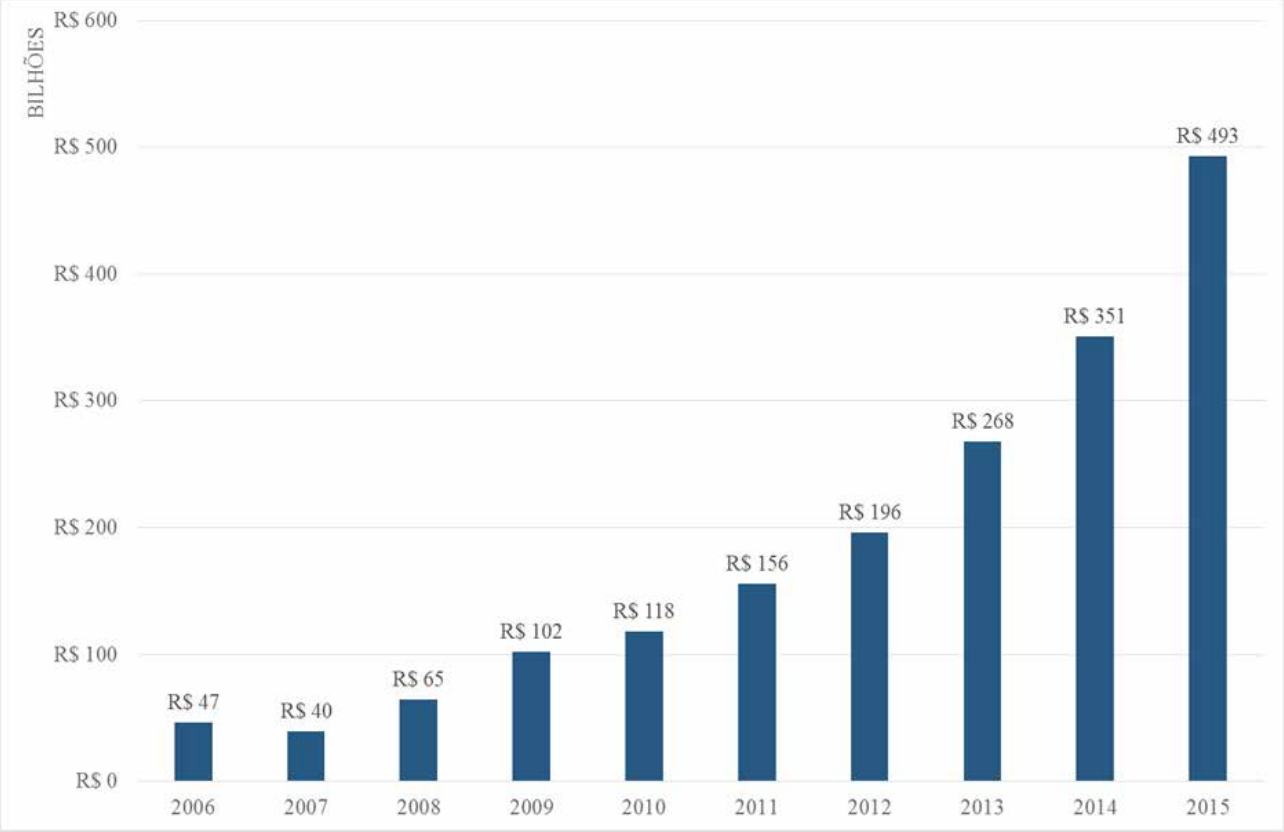
This scenario, in which we see that large investments were planned for Petrobras, associated with the current low oil price, the high exchange rates and the great debt level of the company, creates challenges to be overcome by the Company. The challenges regard operating efficiency and its internal processes, eviden-

Table 5:
Stages of Petrobras public works in the oil and natural gas area

Area	Percentage of projects	Number of projects	Investments (R$ billion)
Operating	25%	21	644,804
In progress	62%	53	246,252
In bid stage	13%	11	0,00

Source: dados.gov.br (consolidated data at the data warehouse)

Figure 5:
Evolution of total debt of Petrobras



Source: Petrobras – Relacionamento com Investidores (own elaboration)

cing, besides the materiality and relevance of the topic, the risks associated with the execution of its projects.

4. CONCLUSION

Without any intention of exhausting the topic under discussion, this study illustrated how data analysis is an important tool to improve the selection process of areas and objects for public works audit that has the ability to offer a systemic and risk view on a certain set of data.

Based on the analysis of the Growth Acceleration Program (PAC) data, we built a systemic view of the program projects based on its budget representation, allowing the identification of the axis and of the area of the program with greater budgetary relevance, its main executive company and the stage of the respective public works under its responsibility.

Based on the materiality, risk and relevance criteria, we identified that 56% of the budget estimated for the PAC is concentrated in a single executive body, making these projects potential audit objects.

REFERENCES

BALLARD, C. Data Modeling Techniques for Data Warehousing. In: IBM: International Technical Support Organization, 1998. Available on: <http://bit.ly/2pE99mW>. Access in: May 2, 2016.

BRASIL. Constituição da República Federativa do Brasil. Promulgated on October 5 1988. Brasília, DF: Presidency of the Republic, 1988. Available on: <http://bit.ly/1dFiRrW>. Access in: May 19, 2016.

_____. Law nº 13.080, of January 2, 2015. Provides guidelines for elaboration and execution of the Budget Law of 2015 and other provisions. Diário Oficial da União (Federal Official Gazette), Brasília, DF, 2 Jan. 2015. Section 1, p. 1. Available on: <http://bit.ly/2bYvgdK>. Access in: May 19, 2016.

_____. Ministry of Planning. Programa de Aceleração do Crescimento (PAC). Available on: <http://bit.ly/1fKKFZA>. Access in: March 18, 2016.

_____. Ministry of Planning. PAC: 2nd balance 2015-2018 – Year I. Available on<http://bit.ly/1V9nO2X>. Access in: March 18, 2016.

_____. Ministry of Planning. Portal Brasileiro de dados abertos. Available on: <http://bit.ly/1jazWcQ>. Access in: March 18, 2016.

_____. Portaria–TCU nº 141, of April 1st 2015. Approves the Strategica Plan of the Federal Court of Accounts – Brazil for 2015-2021. Tribunal de Contas da União, Brasília, DF, April 1st, 2015.

KIMBALL, R.; ROSS, M. The data warehouse toolkit: the definitive guide to dimensional modeling. 3th ed. New Jersey: Wiley, 2013.

PETROBRAS. Relacionamento com investidores: endividamento e alavancagem (Relationship with investors: debt and leverage). Rio de Janeiro: Petrobras. Available at: <http://bit.ly/2pncd2U>. Access in: February 24, 2016.

Do campaign contributions have an influence on the price of public works?

João Ricardo Pereira is a government employee of the Federal Court of Accounts. He holds a bachelor's degree in Civil Engineering from Instituto Militar de Engenharia (IME), a master's degree in Economics from Universidade de Brasília (UnB) and is a PhD student in Economics at Universidade de Brasília (UnB).

ABSTRACT

The objective of this article is to verify empirically how the campaign contributions have an influence on the price of public works. To achieve this objective, we used panel data of public works contracts bid between the years of 2008 and 2013, besides data from the accountability of the election campaigns occurred in 2008, 2010 and 2012. The results of the econometric models estimation indicated that companies that contributed to campaigns were able to increase the value of their contracts in 8 percentage points through contract amendments, in comparison with the amendments of the companies that did not contribute. They also indicated that bids won by companies that contributed to campaigns presented a discount lower than the bids won by non-contributing companies in 1 percentage point. We can conclude that it is essential to evaluate the legality of the contract amendments in the scope of the public works audits when companies that contract with the public authority contributed to campaigns.

Keywords: Bid, Public Works, Campaign Contributions.

1. INTRODUCTION

Currently, there is great concern over the funding of electoral campaigns in Brazil and abroad. This

concern is associated with the feeling that the private companies who fund the campaigns afterwards can have an influence on the government through political connections. This occurs because corporate funding of campaigns in Brazil is preponderant. According to data of the Supreme Electoral Court (TSE) for the 2010 elections, 75% of the contributions came from legal entities (companies), 15% from natural person and only 10% of resources from the candidates themselves.

Still according to TSE data, from the 10 greatest campaign contributions in the elections of 2012, 6 come from companies of the civil engineering industry. When the company contributions made by economic segments are compared, we find that the civil construction industries contributed with more than R$ 600 million. The second segment that contributed the most was the manufacturing industry, with amounts slightly over R$ 300 million.

Part of the international literature about the topic defends that there is a relation between companies that contributed to campaigns and benefits received by the government elected. Snyder Jr. (1990) states that great part of the researchers considers that campaign contributors view their contributions as an investment, expecting something in return in the future. However, the candidates expect the campaign contributions to help them win the elections. The explanation is intuitive: a return rate is expected from the campaign contributions, as well as from all the investments, forcing politicians to give any type of benefit to the contributors in exchange for campaign contributions.

Claessensa, Feijend and Laeven (2008) found empirical evidence for the hypothesis that campaign-funding purchases political favors for the companies that contribute. The authors explored a series of data at the company-candidate level in the campaign contributions for the elections of 1998 and 2002 in Brazil. The authors found that the access to bank financing is one of these favors.

2. CAMPAIGN CONTRIBUTIONS AND PUBLIC WORKS

The authors Boas, Hidalgo and Richardson (2014) argued that the history of campaign funding scandals in Brazil appears to have more relation with the civil engineering industry, which has a substantial amount of resources in contracts with the Federal Government. These of public works contracts can be directed at specific companies. The authors affirm that the victory of a candidate in elections in Brazil brings substantial increases in the number of contracts with the government to the campaign contributor.

Coviello (2016) used a set of data from bids under the responsibility of several mayors of Italian cities to provide empirical evidence regarding the power of influence of such politicians on public procurement. The main result obtained indicates that when the politicians

remain in power for a long period, there is a systematic deterioration of the bid mechanism operation. One observes less competition, higher cost of public works and increase in the probability of the contract being awarded to a company with political connections and greater probability of a company being awarded more frequently.

The author still emphasized that the works bid in the second mandate of a mayor have a discount in the bid 5.7% lower than the public works bid in the first mandate. In addition, competitiveness in the bid is reduced in 11.7%, in other words, the number of competitors decreases.

In their study, Goldman, Rocholl and So (2010), analyzed if the political connections in the United States affected the allocation of contracts awarded to companies with these connections after the 1994 midterm election, when the majority control of the House of Representatives and of the Senate changed from the Democratic Party to the Republican Party; and after the 2000 presidential election, when the Presidency changed from the Democratic Party to the Republican Party. The main conclusions of the authors show that, after these elections, companies connected to the republicans are more likely to attempt an increase in the total value of their contracts (greater number of contracts), while the democratic companies are more likely to go through a respective decrease. These results remain statistically significant after the control of the company characteristics, geography, as well as the industry where the company operates.

Therefore, the technical literature related indicates that there is evidence of favoring companies that were campaign donors in public procurement, whether they are from the construction industry or other sectors. Nevertheless, the study did not analyze how this favoritism occurs with regard to public works. The existing literature limited itself to evaluate: the number of contracts obtained by the companies that contributed with campaigns, according to what Bias, Hidalgo and Richardson (2014) and Goldman, Rocholl and SO (2010) analyzed; and the conditions at the time of the bid process, according to Coviello (2016). Thus, in this article we study how favoritism to companies that contributed with campaigns happens: if it is at the time of the bid process, throughout contract execution or at both moments. The amounts involved are also discussed.

3. METHODOLOGY

The goal of this article is to verify empirically how campaign contributions have an influence on the price of public works. The intention is to study the influence on the price of the works from two dependent variables (two econometric models): contract amendments signed during contract execution and discount offered in the bids in relation to the reference price.

More specifically, we try to test if companies that contributed with campaigns were able to increase the value of their contracts through amendments in comparison with the amendments of the companies that did not contribute; and if bids won by companies that contributed with campaigns had a lower discount than the bids won by those that did not contribute. For this purpose, we used panel data of public works, organized per construction companies (individual) and per 2-year periods, referring to the period of influence of the electoral contributions, periods of 2008-2009; 2010-2011; and 2012-2013.

3.1 DATA COLLECTION

Data related to the public works bids were collected on the site of the National Transportation Infrastructure Department (DNIT). Afterwards, data of the bids performed electronically through the Federal Government "Comprasnet" system, from the, were added. Following, data from the "Sindec" system, which is maintained by DNIT as a way to obtain information about the contracts, were collected. Thus, the primary database was created, with 423 works that refer to the period of 2008 to 2013, totalizing a value of about R$ 28 billion. It must be emphasized that for each company in each two-year period, the contract with higher value was selected, since a same company can have more than one contract each biennium.

The bids prior to 2008 are not included in the electronic systems of the government agency. In order to systematize the information of these works, the access to the hard copy of the processes, distributed to the DNIT Regional Superintendencies in the 26 Brazilian states, would be necessary. This was not possible in this study.

From the primary base of the 423 works, data related to the electoral campaign contributions collected from the accounting to Electoral Justice were added and separated into three groups.

The first group refers to the contributions by companies contracted by DNIT to the candidates for mayor and city-councilor, federal deputies and senators in 2010; lastly, the third and last group refers to the value of the contributions by the companies to the candidates for mayor and city councilor in 2012.

Below, is the complete description of the bid and contracts data used in this study (Table 1), followed by their respective statistics (Table 2).

Table 1:
Variables description

Variable	Description
Amendments	Dependent variable – model 1. Specifies the percentage of contract increase in relation to the initial value of the contract, obtained by the companies throughout the execution of the work.
Discount	Dependent Variable – model 2. Corresponds to the percentage range that the bid brought to the refference price of the work (estimated budget or maximum price). Its calculation occurs by the difference between the price offered by the wining company (PO) and the price estimated by the Administration (pe) over the (PE), according to the following equation: Yn=(pe-po)/(pe).
Donation	Dummy variable that identifies with 1 if The company Winner of the bid contributed with candidates or political parties in time t and 0, otherwise.
2008-2009; 2010-2011; 2012-2013	Dummy variable that attributes 1 for the period when the work wa bid and 0 fot the others.
Companies that submitted bids	Variable that specifies the number of companies that were enabled and submited of the bid - describes the competitors in the bid.
Work Type	The works were divided into three types, starting with the most complex ones. The first type represents the works of implantation, duplication and restauration; the second type the works of maintenance (Crema); and the third type the works of conservation. This manner, the variable Work Type has the values 1, 2 and 3, respectively, for each work type.
Work Value	Variable that specifies the value of the work that is in the advertiesement for bids. Values in million reais.
Total Asset	Variable that specifies the total of assets of the companies that submited bids in relation of the Year of 2013. Values in million reais.

Source: Own creation.

Table 2:

Variable	Condition	Average	Standard Deviation	Min.	Max.	Observations
Discount	overall	0.1255644	0.1361544	-0.0105592	0.5400617	N = 423
	between		0.1222388	0.000001	0.5280025	n = 257
	within		0.0666281	-0.1049047	0.36592	T-bar = 1.64591
Bidders	overall	6.799054	5.241088	1	34	N = 423
	between		4.229107	1	24	n = 257
	within		3.324772	-3.200946	20.46572	T-bar = 1.64591
Work cost	overall	66.14127	91.1214	0.1490619	605.4526	N = 423
	between		85.79571	0.1490619	605.4526	n = 257
	within		46.14628	-175.013	397.8735	T-bar = 1.64591
Kind of work	overall	1.817967	0.7894197	1	3	N = 423
	between		0.7667595	1	3	n = 257
	within		0.3123321	0.4846336	3.1513	T-bar = 1.64591
Donation	overall	0.4066194	0.4917843	0	1	N = 423
	between		0.4417286	0	1	n = 257
	within		0.2490107	-0.2600473	1.073286	T-bar = 1.64591
Total assets	overall	915.1781	14570.71	0	299686.2	N = 423
	between		18689.58	0	299686.2	n = 257
	within		0	915.1781	915.1781	T-bar = 1.64591
2008-2009	overall	0.3806147	0.4861129	0	1	N = 423
	between		0.3792509	0	1	n = 257
	within		0.3775911	-0.286052	1.047281	T-bar = 1.64591
2010-2011	overall	0.2576832	0.4378765	0	1	N = 423
	between		0.3225955	0	1	n = 257
	within		0.3424888	-0.2423168	0.9243499	T-bar = 1.64591
2012-2013	overall	0.3617021	0.4810622	0	1	N = 423
	between		0.3873731	0	1	n = 257
	within		0.3631963	-0.1382979	1.028369	T-bar = 1.64591

Source: Own creation.

3.2 ECONOMETRIC MODEL

To verify if the campaign donor companies were able to increase the value of their contracts through contract amendments in comparison with the amendments of companies that did not contribute, as well as to check if bids won by donating companies had a lower discount those won by the companies that did not contribute, the variables described in Table 1 were tested through the following econometric model:

$$Y_{it} = \alpha_t + \boldsymbol{X_{it}}.\boldsymbol{\beta_k} + \gamma.D_{it} + (u_i + \varepsilon_{it})$$

Where Y_{it} represents the dependent variable studied: contract amendments (model 1) or discount in the bid (model 2), α_t are *dummies* of period, $\boldsymbol{X_{it}}$ is a vector 1 x k of variables that variate throughout *i* (company) and *t* (period), β_k is a vector k x 1 of coefficients of $\boldsymbol{X_{it}}$, and γ is the coefficient of interest of the study, and D_{it} indicates if the company *i* contributed with electoral campaigns in the period *t*. The error term (u_i+ε_{it}) has a fixed parcel on the time, u_i, in what concerns the characteristics of company *i*, known as individual heterogeneity, and ε_{it} is the error term that variates throughout *i* and *t*, , known as idiosyncratic error.

It was chosen to use panel data because the individuals studied, the companies, can have effects not observed included in time, such as ability to negotiate with the public authority, technical qualification, etc. Below is the result of the econometric model estimation result, shown in Table 3.

4. RESULTS

4.1 AMENDMENTS TO THE CONTRACTS OF PUBLIC WORKS (FE AMENDMENT MODEL)

In public works, the companies propose contractual changes during the execution of the works, either to better adequate the project originally submitted to bid or to correct non-identified mistakes before the work initiates. These contractual changes are called amendments.

Table 3:
Estimation Results

Variable	(1) FE assets	(2) RE discount
Bidders	0.000527	0.00990***
	(-0.00392)	(-0.000808)
Work cost	-1.10E-06	-4.51E-06
	(-0.0001)	(-0.0000273)
Kind of work	0.0435*	0.0842***
	(-0.0236)	(-0.0075)
Donation	0.0812**	-0.0115
	(-0.0348)	(-0.00832)
2010-2011	-0.129***	0.0464***
	(-0.0358)	(-0.00924)
2012-2013	-0.163***	0.0451***
	(-0.0294)	(-0.00976)
Total assets	-	-2.07e-07***
	-	(-0.0000000385)
Constant	0.0716	-0.118***
	(-0.0497)	(-0.013)
Observations	423	423
R-squared	0.234	
Number of companies	257	257
robust standard errors in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

Source: Own creation.

When the results of model 1 in Table 3 are analyzed, called FE amendments, it can be verified that companies that contributed with campaigns achieved amendments 8 percentage points higher than the amendments achieved by the companies that did not contribute, at a significance level of 2%. In other words, companies that contributed with campaigns were able to increase the value of their contracts in 8 percentage points in relation to the amendments made by the companies that did not contribute.

In this sense, the survey question is answered in the following manner: public works executed by companies that contributed with campaigns are 8% more costly than the public works executed by companies that did not contribute.

It is important to mention that the result of 8 percentage points was obtained through the control of several factors: number of companies that submitted bids (competition environment); value of work; type of work (work complexity); bid period (time factor).

In addition, the econometric technique of data estimation in panel by fixed effects was used aiming to eliminate sources of endogeneity of the model (related to the individual heterogeneity of the companies), according to what is described in Wooldridge (2010).

4.2 DISCOUT IN THE PUBLIC WORKS BIDS

In public bids, the companies offer a discount in relation to the reference price of the Administration to be awarded contracts. The bids won by the companies that contributed with campaigns presented a discount lower than the bids won by the companies that did not contribute, according to model 2 on Table 3, called RE discount. This difference between the discount offered by the donating companies and the ones that dis not donate, is approximately 1 percentage point, at a significance level of 16%.

Despite the low statistical significance, portrayed by a p-value of 16%, we can emphasize the economic sign of the estimated variable that remains negative. In other words, companies that contributed with campaigns win bids with discounts lower than the discounts offered by the companies that did not contribute that also won bids.

Some peculiarities of the econometric estimate used for the discount variable must be mentioned. In this case, the panel data model using random effects was estimated, which is more efficient than the fixed effect method when the individual heterogeneity portion is

not correlated with the other independent variables of the model. The Hausman test between the fixed effects model and the random effects model presented a result chi 2 of 0.3, which indicates that the random effects model is not rejected for model 2.

5. CONCLUSION

The results found in the proposed econometric models estimation showed that companies that contributed with campaigns were able to increase the value of their contracts in 8 percentage points through contract amendments in comparison with the amendments of the companies that did not contribute. In addition, the bids won by donating companies presented a discount 1 percentage point lower than the bids won by the companies that did not contribute.

Therefore, the results indicate that campaign contributions have an influence on the price of public works in approximately 9 percentage points, or, works executed by donating companies are 9% more costly than works executed by companies that do not contribute, which answers the survey question proposed in this article.

In the sample analyzed, 40% of the works were contracted with companies that contributed with campaign, according to statistics of the variables presented in Table 2. Considering that the value of these works in the sample studied totaled R$ 11 billion (40% x R$ 28 billion), we can conclude that campaign contributions are related to a R$ 1 billion (9% x R$ 11 billion) increase in the price of public works. This if we consider only the National Transportation Infrastructure Department in the period between 2008 and 2013 for the sample analyzed.

In this sense, the evaluation of the legality of the contract amendments is essential when companies that contract with the public authority are campaign donors, since the estimation of the econometric models indicated strong correlation between campaign contributions and greater values of contract amendments, when compared with the contract amendments of companies that did not contribute. It must be emphasized that this result was reached by controlling several variables, such as value of work, type of work, number of companies that submitted bids, period and individual heterogeneity at the company level. That is, there is statistical evidence that high values of amendments are intrinsically connected to the fact of the company contracted being a campaign donor.

Finally, it is important to mention that the methodology used in this study can be used for quantification of other variables that can influence the prices of public works. For instance, instead of using campaign contributions as a variable of study, other variables could have been used: changes in legislation of contracts and bids aiming to evaluate its impact on the price of public works; change of managers of govern-

ment agencies or state-owned enterprises to evaluate the performance of the new management, etc.

REFERENCES

BOAS, T. C.; HIDALGO, F. D.; RICHARDSON, N. P. The Spoils of victory: campaign donations and government contracts in Brazil. The Journal of Politics, Chicago, v. 76, n. 2, p. 415-429, 2014.

CLAESSENSA, S.; FEIJEND, E.; LAEVEN, L. Political connections and preferential access to finance: the role of campaign contributions. Journal of Financial Economics, New York, v. 88, n. 3, p. 554-580, 2008.

COVIELLO, D. Tenure in office and public procurement. Amsterdam: Elsevier, apr. 14 2016. Disponível em: <http://bit.ly/2p2ogX3>. Acces on: Apr. 11 2014.

GOLDMAN, E.; ROCHOLL, J.; SO, J. Political connections and the allocation of procurement contracts. dec. 2010. Disponível em: <http://bit.ly/2nBGyhW> Acesso em: 28 jun.2016.

SNYDER JR., J. J. M. Campaign contributions as investments: The U.S. House of Representatives, 1980-1986. Journal of Political Economy, Chicago, v. 98, n. 6, p. 1195-1227, 1990.

WOOLDRIDGE, J.M. Econometric analysis of cross section and panel data. Cambridge: The MIT Press, 2010.

SNYDER JR., J. J. M. Campaign contributions as investments: The U.S. House of Representatives, 1980-1986. Journal of Political Economy, Chicago, v. 98, n. 6, p. 1195-1227, 1990.

WOOLDRIDGE, J.M. Econometric analysis of cross section and panel data. Cambridge: The MIT Press, 2010.

Assessment of interdependent projects in the infrastructure sector: a new approach to exercising external control

Leandro Araújo de Almeida
is a government auditor at the Federal Court of Accounts with a B.A. in Economy from the Federal University of Rio de Janeiro (UFRJ) and in Law from the Marista College in Recife.

ABSTRACT

This article presents the main aspects regarding the different types and patterns of interaction found in projects with close dependency relationships, as well as regarding the negative effects arising from the disregard of interdependencies while implementing a group of two or more interrelated projects. It also presents the benefits resulting from efficient management of interdependent projects that contribute to a successful project portfolio. Based on some recent judgments, it is possible to confirm that the Federal Court of Accounts has been moving forward when it comes to assessing interdependent projects. This innovative approach has great potential to contribute to governance in programs and projects in the infrastructure sector by strengthening the integrated, coordinated and articulated planning of a group of interrelated projects. It can also ensure greater optimization of projects, besides efficiency, efficacy and effectiveness of public expenses in this sector, having as an ultimate goal to increase the country's competitiveness in the international scenario and e collective well-being. This new approach goes against the Court's traditional one, which consists of assessing investment projects as an isolated entity, based on a fragmented view of its main components regardless, however, of the existing interactions between those components and, specially, the external interdependencies with other projects of significant synergistic effects.

Keywords: Projects. Interdependencies. Management. Synergy. External control.

1. INTRODUCTION

The annual report on the competitiveness of countries, recently published by the International Institute for Management Development (IMD), indicated that Brazil has moved down one position in the 2016 Global Competitiveness Ranking, falling to the 57th place among the 61 countries reviewed. Thus, the country has dropped 19 positions in a period of six years, being ahead of Croatia, Ukraine, Mongolia and Venezuela only.

According to the report, the main competitiveness weaknesses of the Brazilian economy are the following: low economy performance (55th), low government efficiency (61st); low corporate performance – productivity and efficiency (60th) and weak basic infrastructure (54th). Hence, the increase of the country's competitiveness is related to the improvement of the country's basic infrastructure, which has a direct impact on corporate productivity and efficiency and on performance of the economy.

Weaknesses and bottlenecks in the infrastructure sector restrict the options for the country's social economic development due to the so-called "Brazil Cost". This cost is actually nothing more than the cost, for instance, of transporting harvest on deficient and poorly kept roads, little integration between railroads, truck lines awaiting to have access to ports with insufficient capacity, increase of freight expenses, low investment in sanitation, poor housing, among others.

To increase the country's competitiveness we need to overcome the weaknesses and bottlenecks in the infrastructure sector. However, in a context of severe fiscal restriction of the federal, state and local governments, the big challenge is to vest more quality in public expenses and optimize results through the implementation of large infrastructure projects in all modalities of transportation (road, rail, water, ports and urban), in energy, petrol and gas, sanitation, urban mobility, communications etc.

In this scenario, the actions of the Federal Court of Accounts (TCU) stand out when assessing the integrated, coordinated and articulated planning and the effective management of the infrastructure projects with close dependency and complementarity relationships. As we shall see, a better understanding of the types and patterns of the interrelationships between the projects holds a potential of minimizing the negative effects resulting from planning and management flaws in interrelated projects.

The objective of this article is to present some relevant aspects of the existing theoretical framework regarding interdependencies among projects and some TCU precedents on the evaluation of interdependent projects in the infrastructure sec-

tor. They have potential to be a new approach to the exercise of external control in that sector which is so important for the country's social economic development.

2. LITERATURE REVIEW

Next, we will present the theoretical framework on interdependent projects without, however, trying to exhaust the topic and its peculiarities, since this shall be the goal of a longer study. Due to the lack of national studies, the types and patterns of interaction between projects and their negative effects and benefits are treated with greater focus by the international literature on interdependent projects in the many areas of knowledge, not limited to infrastructure projects.

2.1 RELATIONSHIP BETWEEN PROJECTS

Investment projects may have three types of relationships between themselves due to technical and/or economic reasons, whenever there is a chance of simultaneous implementation of two or more projects. According to Correia Neto (2009, p. 181-182) and Woiler and Mathias (1996, p. 181), projects may be classified as mutually exclusive, independent or interdependent.

Mutually exclusive projects are those that have the same goal and compete against each other and, thus, cannot be accepted jointly. Usually, the acceptance of one of them eliminates investment in the others (one should choose project A, B or C).

As for the independent projects, they do not have a relationship between themselves. Decisions made regarding one project will not have any effect on the other (it is possible to investment in independent projects A, B and C).

On the other hand, interdependent projects have some precedence relationship between themselves. Therefore, accepting one of the projects depends on the approval of the others. According to Harrison (1976, p. 99-101), in order to know if we are facing this type of relationship, it is enough to ask the following question "can the decision to accept or reject a certain project be made regardless of the decision to accept or reject another project?" If the answer to this question is "No", then the projects are considered "interdependent".

A sector where the existence of interdependent projects stands out is the infrastructure sector, as occurs with the electrical energy transmission lines, stretches of railroads, departure terminals, water supply dams, access roads, airports etc. These projects often require that others be implemented before, jointly with or after another.

The European Commission (2003, p.19) mentions two interesting examples when analyzing interdependent projects:

- a road project connecting city A to city B, which is justified by the perspective of an airport located near city B and the alleged increase in traffic volume: the project shall be analyzed in the context of the joint airport/road system;

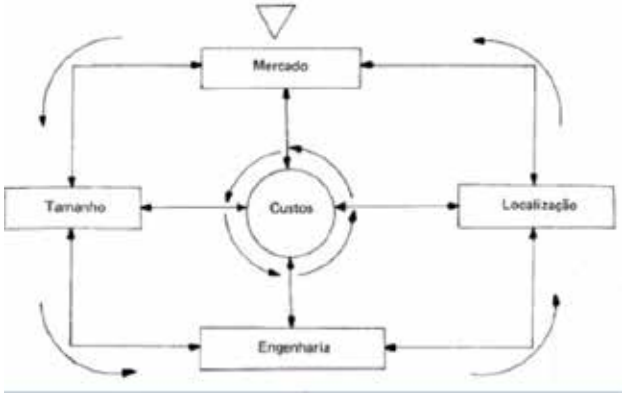
- a hydroelectric plant located in X and designed to serve a new industrial unit: if the two objects are interdependent, the analysis shall be integrated, even if the request for financing is for the energy supply component.

Interdependent projects may present synergy exploration as an outstanding aspect among other outstanding characteristics common to any investment project, such as complexity, interdisciplinarity, risks and uncertainty, among others, which may have higher or lower intensity depending on the peculiarities of each venture.

To Woiler and Mathias (1996, p. 25), synergy appears when there are two or more projects interacting and the result that is more than proportional to the sum of the projects. This occurs with the input-output relationships between projects (port-railroad) or when using common resources for different projects (hydroelectric plant-waterway).

2.2 TYPES OF INTERDEPENDENCIES: INTERNAL AND EXTERNAL

Illustration 1:
Internal Interdependencies



Source: BUARQUE (1984, p. 74)

The second category of interdependencies is the "external" one, which occurs when two or more interdependent projects interact with each other. Tasevska and Toropova (2013, p. 10-12) present five types of external interdependencies more often discussed in literature: resources, market, learning, results and benefits.

Resources interdependencies result from sharing common resources among several projects or from waiting for scarce resources until they are made available by other projects. Market interdependencies occur when a new product enters the market of an existing product or when several projects compete because of equal or similar objectives.

The interdependencies in learning arise when a project generates knowledge that is used by others. Interdependency of results occurs when a project depends on the results of others. Finally, the interdependency of benefits arises when there is synergy resulting from two or more interrelated ongoing projects.

We can also consider other types of external interdependency when evaluating projects. For example, Bathallath, Smedberg and Kjellin (2015, p. 70-71), mention technological and technical interdependencies, which result from the need to take advantage of common technology in multiple projects; or when success or technical failure in a project affects the probability of success or failure in another project.

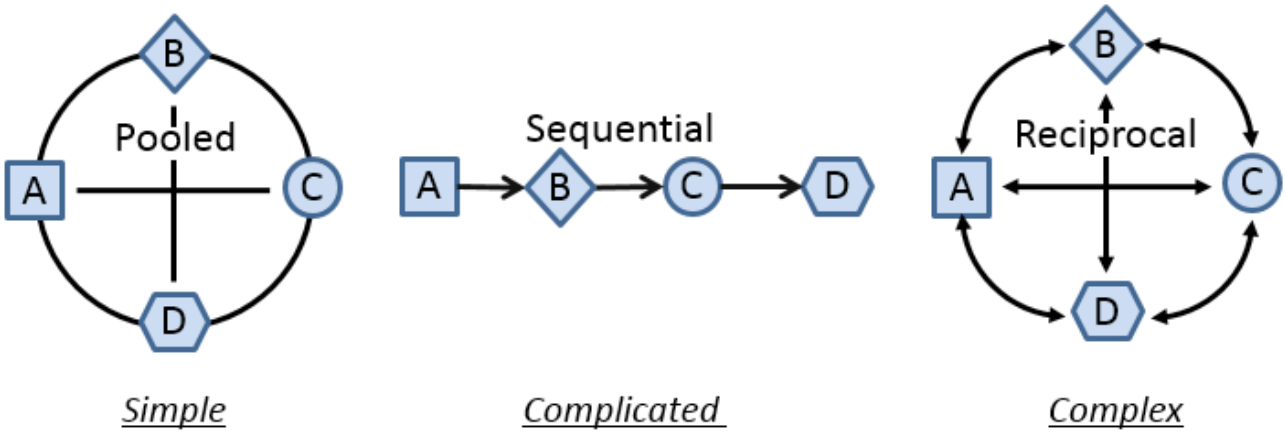
2.3 INTERACTION PATTERNS IN INTERDEPENDENCIES

In order to understand projects, besides separating the interdependencies in internal and external, there is also the need to identify different interaction patterns between them.

When adopting James Thompson's (1967) classification of interdependencies, Bathallath, Smedberg and Kjellin (2016, p. 71-72) consider that interactions in projects take three distinct forms: pooled interdependency, sequential interdependency and reciprocal interdependency. The authors illustrate interaction patterns according with Thompson's view as follows.

Pooled interdependency is the simplest form. Each project on the portfolio gives a discrete contribution to the whole and each one of them is supported by the whole. That way, the result of the

Ilustration 2:
Classification of external interdependencies



Source: BATHALLATH; SMEDBERG; KJELLIN (2016, p. 72)

project may indirectly affect the performance of the project portfolio as a whole. For instance, many times a city´s public hospitals network may operate as enterprises with indirect interdependencies because, although it operates separately, the failure of the project may affect the totality of the local network and other units.

Sequential interdependency occurs when it is possible to determine a clear direct relationship of dependence between two or more projects wherein order for a project to begin operating it requires another project´s output. This is a high level of interdependency in comparison to pooled interdependency, for the projects depend on one another for good performance. For example, the complementarity of the sequential form may occur between a project for energy generation and another related to transmission lines. The operation of the energy generation project depends on the construction of the transmission lines.

On the other hand, reciprocal interdependency occurs when there is a mutual relationship between two or more projects. This is considered the highest level of interdependency due to the complexity of the interrelationships between the projects. Each project strongly affects the other. This form of interdependency occurs when the operation outputs of a project become inputs for another project's operation and vice-versa. For example, the interaction patterns between road, railroad and port projects. The port will be the departure and arrival points for freight to be transported through roads and railroads.

2.4 TYPICAL PROBLEMS WITH PROJECT INTERDEPENDENCIES

In practice, several problems may be identified when interdependency characteristics of each investment project are not considered when they are drawn up and evaluated.

Correia Neto (2009, p. 182) highlights three types of problems. The first regards the decision to invest under capital constraint conditions, which limits the number of acceptable projects; the second occurs when the projects have different scales of investments; and the last refers to the existence of projects with a different lifespans, which causes the benefits generated to take place in different timeframes.

In contrast, Holanda (1982, p. 190-191) highlights some practical limitations practices resulting from the interactions between the studies that are a part of investment projects, for example:

- **Relationship between size and market:** the magnitude of the market sets the maximum limit for the size of the project. Therefore, choice of the size can be undersized when not all implementation impacts of other public and private investments in their areas of influence are taken into account. This could result in high levels of idle capacity within the timeframe of the project.

- **Relationship between size and location:** dimensioning of operational capacity and the location of projects shall be defined together because certain projects, due to their nature, are connected to the location of other projects, such as those related to mining, watering systems, hydroelectric utilization etc. In some other cases, the location may be decided considering merely the political nature, which could be the case of the location of airports, ports, refineries etc.

- **Relationship between market and engineering:** wrong choice of technical solutions to define the project's operational capacity without taking into account the market size can lead to bottlenecks related to product flow, especially due to the impact of operational inputs of new investments in the area of influence of the project within the timeframe.

The Ministry of Planning, Budget and Management manual for studies of viability of large projects (BRASIL, 2009, p. 11) cites two interesting examples of failure when identifying projects with interdependencies. A) the expansion of a port may have its usefulness jeopardized if there are no improvements in the complementary infrastructure, such as roads and railroads that allow for asset arrivals and departures; and b) the implementation of a system for sanitary sewage may only be necessary if there is, in that location, development of an industrial district.

2.5 MANAGEMENT OF INTERDEPENDENT PROJECTS

According to Killen and Kjaer (2009, p. 8), a large part of the literature specialized in project management treats each project as an independent entity, that is, the project is considered individually. Due to the complexities of projects, traditional tools of project management are not enough anymore to deal with interrelated projects, which makes interdependency management an area that needs improvement (HEURICH; KURZAC, 2014, p. 18).

However, recently, some studies began to recognize that projects are not implemented in an isolated manner and that there is the need to understand project interdependencies. Aiming to improve such techniques, Tasevska and Toropova (2013, p. 6) highlight the importance of creating Project Interdependency Management – PIM as an important area of the Project Portfolio Management – PPM.

In the new publications of the Project Management Institute (PMI), interdependencies between projects began to be addressed in their publication called Standard for Program Management. For PMI, according to Valeriano (2014, p. 44), a program "is a group of related projects, subprograms and program activities, managed in a coordinated manner to obtain benefits not available from managing them individually."

Valeriano (2014, p. 4-5) highlights that while a project is a unique venture of limited duration designed to accomplish a singular goal, a program coordinates and harmonizes the management of interrelated projects. Almeida and Almeida (2013, p. 10-11) note that the focus of a project management methodology is the interdependency between the projects and resource conflicts, from the beginning, through planning, execution, monitoring and control, until conclusion.

As seen, managing interdependencies between projects should be considered critical to implementing project portfolios successfully. According to Bathallath, Smedberg and Kjellin (2016, p. 68), organizations should be capable of understanding the interdependencies between projects in their portfolio in order to make appropriate project decisions to achieve the best portfolio results and, thus, avoid negative effects resulting from failure in project management.

2.5.1 NEGATIVE EFFECTS

Several recent studies have ointed to different types of problems that could result from inefficient management of interdependencies of projects. For example, Bathallath, Smedberg and Kjellin (2016, p. 76), highlight four groups of negative effects that occur when project interdependencies cited by specialized literature are not considered:

- **Waste of resources:** inadequate allocation of resources between interdependent projects may lead to badly used or deviated resources. A waste of resources would arise when there is improper use and/or sharing of limited resources between projects.

- **Failure to comply with timeline (deadline slippage):** a delay caused by a project may spread to a connected one, resulting in a global delay of the projects. For example, an interdependent project shall not begin its operations until the other is totally concluded.

- **Budget Waste:** not taking into account project interdependencies may lead to a bad selection of projects and, consequently, to wasting financial resources. For example, not identifying interdependency in the planning phase may lead the organization to implement two excluding or competing projects separately.

- **Inter projects competition:** interdependent projects may begin a competition for limited resources inside the organization to gain more power over other projects and, therefore, get more support from top management.

Other damaging effects resulting from not considering interdependencies are mentioned by Tasevska and Toropova (2013, p. 13): risk transfer, short term project resolution, delay in project schedule, lack of professional development, lack of synergy exploration, personal discouragement and cannibalization of resource . Therefore, all these effects might distort budget, deadlines and the estimated revenue affecting negatively the success rate of projects.

2.5.2 BENEFITS

Recent studies show that when project interdependencies are duly considered by the organization, their effective management brings a series of benefits that contribute to average success in a project portfolio, such as: selection and evaluation of more effective projects; easier problem resolution, saving costs, team cooperation, knowledge sharing, time efficiency etc. (KILLEN; KJAERB, 2012, p. 8-10).

A dimension of success in the effective management of interdependencies is related to "exploring synergy". Tasevska and Toropova (2013, p. 12-13) argue that this type of management should take into account the interfaces or interdependencies between projects in a way that, when actions are taken, they represent synergy between the projects. In addition, the authors highlight that effective management is a strategic matter for the organizations because it allows for efficient management of resources, overcomes difficulties in decision making, and finds better solutions, among other benefits.

3. TCU'S PERFORMANCE IN INTERDEPENDENT PROJECTS: PRECEDENTS

Traditionally, the main approach of external control actions in infrastructure projects has been the evaluation of the project as an isolated entity that is, not taking into account the forms and patterns of interactions between interdependent projects. Therefore, the sector's problems such as delayed or paralyzed public works, overpricing and low quality, are usually addressed from a fragmented viewpoint.

Recently, some control actions were concerned with identifying possible failures in planning and implementation of investment projects with a close interdependency relationship. These innovative actions have adopted a systemic approach when evaluating interdependent infrastructure projects. As an example, we mention the following TCU precedents:

3.1 WEST-EAST INTEGRATION RAILROAD AND SOUTH PORT COMPLEX

In Decision 3476/2012 – Plenary (TCU, 2012), whose rapporteur was Minister André Luís de Carvalho, TCU found that uncoordinated decisions regarding the port complex lead to a significant divergence between the implementation and operation phases of the two ventures. The result was a contract and the beginning of railroad construction works without a minimum guarantee of the feasibility of the abovementioned complex. The impact of this was estimated by the Court at R$ 2 billion, due to services revenue cuts and the high costs of fixed capital.

Recently, in Decision 727/2016-Plenary (TCU, 2016), the Court imposed a fine to the managers of Valec, from the Ministry of Transportation (MT) and the

National Agency for Land Transportation (ANTT), in addition to forbidding them to take on any position of trust for a period of five years. Furthermore, TCU determined that the MT coordinate with the government of Bahia in order to mitigate the effects of a possible divergence between the constructions of the West-East Integration Railroad and the facilities of the South Port Complex causing damages to the public coffers and to the efficiency of the system operation.

3.2 ELECTRIC POWER GENERATION AND TRANSMISSION

During the performance audit of the Brazilian electrical system, TCU pointed out some significant systemic delays in the beginning of the operations of the electric power generation and transmission ventures, authorized by the public power between 2005 and 2012. The audit found that 79% of the hydropower plants, 88% of the wind power stations and 75% of the thermal power plants did not comply with the initial schedule for beginning the operations. In the transmission lines and substations, the delay reached 83% and 63% of the ventures, respectively.

Through Decision 2316/2014-Plenary (TCU, 2014a), whose rapporteur was Minister José Jorge, the Court identified as the main reasons for these delays, environmental issues, lack of studies and lack of monitoring mechanisms by the Ministry of Mines and Energy (MME). These delays increase the risk for energy deficit in the country because they reduce energy offer and system flexibility and they overcharge transmission lines, besides increasing energy costs, which are later transferred to the final consumer.

3.3 AÇAILÂNDIA-BARCARENA RAILROAD AND VILA DO CONDE/PA PORT

During the compliance audit on the viability studies of the project for the construction of the Açailândia-Barcarena railroad and the project for expanding Vila do Conde/PA Port, TCU pointed out some imbalance between the port's and the railroad's de-

mand projections regarding the main products to be transported on the railroad towards the port. Thus, investment plans for the port infrastructure expansion would be incompatible with the demand projections, demonstrating failures in the integrated planning of the two infrastructure projects.

In Decision 2903/2014-Plenary (TCU, 2014b), having as its rapporteur Minister Marcos Bemquerer, the Court issued several recommendations to the MT, to the Ports Secretariat of the Presidency of the Republic (SEP-PR) and to the National Agency for Land Transport (ANTT). The TCU recommended that the technical studies of the abovementioned project observe, for example, the necessary integration and interface with all other existing means of transportation, reciprocal coherence in their demand studies, the availability of expansion areas and the risks for bottlenecks when freight is delivered or the underutilization of railroad infrastructure.

3.4 LOGISTICS CORRIDOR OF BR-163 HIGHWAY

TCU carried out a compliance audit on the Logistics Corridor of BR-163 (Cuiabá/MT to Santarém/PA), which comprises the BR-163 highway, the waterways of the Tapajós and the Amazon rivers, and the Ports of Outeiro, Vila do Conde, Belém and Santana. In this audit, the Court pointed out problems in integrated planning by the bodies in charge of hydroelectric exploitation of the rivers of the logistics corridor and for waterway transport in the Teles Pires, Juruena, and Tapajós waterways. This could lead to the dissociated construction between the hydroelectric power plants and the locks without analyzing the best moment for implementing level crossings.

In Decision 3290/2014-Plenary (TCU, 2014c), whose rapporteur was Minister Walton Alencar Rodrigues, the Court recommended to the Chief of Staff's Office that it promote integration between the hydroelectric planning of the MME and the logistics planning of the MT. The purpose is to ensure that the levels of navigability in the Tapajós river dams, when the studies for concession were performed, meet the transportation sector's need in economical and logistics terms.

3.5 LOGISTICS INVESTMENT PROGRAM: PIL RAILROADS

During the governance audit at PIL Railroads, TCU pointed out that the program was not based

on studies capable of indicating how concurrent modalities compete among themselves or complement the new stretches that integrate the program. This could cause obstacles (logistics bottlenecks) in delivering railway freight due to the incompatibility with the receiving port's infrastructure and its operational capacity and the underutilization of the railroad network.

In Decision 1205/2015-Plenary (TCU, 2015a), whose rapporteur was Minister Augusto Nardes, the Court made some recommendations to the Ministry of Transportation. One was that the Ministry's technical-economic studies should take into consideration the integration of the existing and future railroad network in the PIL planning, together with other modalities of transportation. Another recommendation was that the Ministry should evaluate the possibility of logistics bottlenecks coming up and possible underutilization of the stretches, due to insufficient demand for more than one modality of transportation in the same route or the lack of capacity in the ports to receive and store cargo.

3.6 SANITARY SEWAGE WORKS AND INTEGRATION PROGRAM OF THE SÃO FRANCISCO RIVER (PISF)

TCU carried out a performance audit regarding centralized orientation aiming to monitor sanitation sewage works in municipalities that would benefit from PISF, in the states of Pernambuco, Paraíba, Rio Grande do Norte and Ceará. TCU pointed out that the precarious state of sanitation sewa-

ge in most of the municipalities, together with the lack of agreements in some of them and the several bottlenecks identified in others, indicate that there are risks of pollution of the waters of PISF, which could jeopardize the full achievement of the project objectives.

In Decision 1421/2015-Plenary (TCU, 2015b), whose rapporteur was Minister Benjamin Zymler, the Court ordered that the Ministry of the Cities create an action plan with a schedule for adopting the measures needed to solve the identified problems. TCU also recommended that the Ministry of National Integration intensify actions together with the Ministry of the Cities and the National Foundation for Health, associated with state and local governments, aiming to cover the sanitation sewage services in the municipalities related to PISF that have a direct influence on the quality of waters to be transposed.

4. FINAL REMARKS

Projects are considered interdependent when the positive outcome of one depends on other projects. In general, there may be interdependencies when one project is influenced partially or totally by another in order to develop.

One of the areas that explores different interaction patterns between the projects is the infrastructure sector, not only because of the interactions among the several studies (engineering, market, location, size, among others) that are part of each project, but mainly because of the interdependencies between the various interconnected projects. Usually, infrastructure projects have a high level of interdependencies due to their own characteristics, which involve complexity, interdisciplinarity, risks and uncertainty in addition to synergy.

In practice, several problems are identified when the interactions and the interdependencies in investment projects are not properly considered. Failures in interdependent project planning and managing produce significant negative effects, such as: resource waste due to misuse, budget waste due to a bad selection of projects, non-compliance with the schedule, inter projects competition for scarce resources, among others.

Therefore, we need to understand and manage interdependencies, evaluating the degree of influence of these interactions on the possibilities of achieving the objective of each project. Integrated, coordinated and articulated planning in addition to the effective management of these interdependencies lead to a series of benefits that contribute to success.

Traditionally, external control actions in the infrastructure sector have considered the evaluation of investment projects as an isolated entity, based on a fragmented view of its main components (cost, period and quality), without taking into account, however, the existing internal interactions between their components and, especially, the external interdependencies with other projects with significant synergy effects.

On the other hand, the reading of some of the recent judgments shows that TCU has been moving forward in evaluation of interdependent projects and that this innovative approach has great potential to contribute to governance in programs and projects of the infrastructure sector by strengthening the integrated, coordinated and articulated planning of a series of interconnected projects. This ensures greater optimization of projects and efficiency, efficacy of public expenditures in the sector with the final objective of increasing the country's competitiveness in the international scenario, as well as collective well-being.

Thus, we conclude that the exercise of regular external control of the infrastructure sector may be improved through a systemic approach that enables understanding of the multiple interdependencies between projects and their effects on a group of interconnected projects. This innovative approach may be applied both in the selection phase of audit subject matters by the technical units as in the planning and execution phase of each control action performed by the audit teams, as well as to monitor the concession stages within this Court.

REFERENCES

ALMEIDA, N.; ALMEIDA, F. Metodologia de gerenciamento de portfólio: teoria e prática. Rio de Janeiro: Brasport, 2013.

BATHALLATH, S.; SMEDBERG, A.; KJELLIN, H. Managing project interdependencies in IT/IS project portfolios: a review of managerial issues. Int J Inform Syst Pro Manage, Sweden, v. 4, n. 1, p. 67-82, 2016. Available at: <https://goo.gl/BR80BL>. Accessed on: 3 jun. 2016.

BRASIL. Ministry of Planning, Budget and Management. Manual de apresentação de estudos de viabilidade de projetos de grande vulto. Brasília: CTPGV-CMA, 2009.

BUARQUE, C. Avaliação econômica de projetos: uma apresentação didática. Rio de Janeiro: Elsevier, 1984.

COMISSÃO EUROPEIA. Manual de análise de custos e benefícios dos projectos de investimento. Brussels: European Committee, 2003. Available at: <https://goo.gl/orFqt2>. Accessed on: 8 jun. 2016.

CORREIA NETO, J. F. Elaboração e avaliação de projetos de investimentos: considerando o risco. Rio de Janeiro: Elsevier, 2009.

DICIONÁRIO MICHAELIS. Interdependência. Available at: <http://bit.ly/2nVMZMP>. Accessed on: 8 jun. 2016.

HARRISON, I. W. Avaliação de projetos de investimento. Translation Antonia Z. Sanvicente. São Paulo: McGraw-Hill, 1976.

HEURICH, C.; KURZAC, K. Connecting project interdependency management to dynamic capabilities police Scotland's transformation authors. Umeå School of Business and Economics, 2014. Available at: <https://goo.gl/pSN144>. Accessed on: 3 jun. 2016.

HOLANDA, N. Planejamento e projetos: uma introdução às técnicas de planejamento e elaboração de projetos. 11. ed. Fortaleza: UFC, 1982.

INTERNATIONAL INSTITUTE FOR MANAGEMENT DEVELOPMENT. World Competitiveness Yearbook 2016. Available at: <https://goo.gl/C8G5EH>. Accessed on: 4 jun. 2016.

KILLEN, C. P.; KJAER, C. Understanding project interdependencies: exploring the role of visual representation, culture and process. Inl J Pro Manage, 2012. Available at: <https://goo.gl/TCgeIm>. Accessed on: 3 jun. 2016.

TASEVSKA, F.; TOROPOVA, O. Management of project interdependencies in a project portfolio. 2013. Available at: <https://goo.gl/lS77yC>. Accessed on: 1 jun. 2016.

THOMPSON J. D. Organizations in action. Chicago: McGraw-Hill, 1967.

THE FEDERAL COURT OF ACCOUNTS – TCU. Judgment 3476/2012-Plenary. TC 018.153/2010-0. Rapporteur Minister André Luís de Carvalho. Brasília, DF, 2012.

THE FEDERAL COURT OF ACCOUNTS – TCU. Judgment 2316/2014- Plenary. TC 029.387/2013-2. Rapporteur Minister José Jorge. Brasília, DF, 2014a.

THE FEDERAL COURT OF ACCOUNTS – TCU. Judgment 2903/2014- Plenary. TC 005.342/2014-7. Rapporteur The Hon. Minister Marcos Bemquerer. Brasília, DF, 2014b.

THE FEDERAL COURT OF ACCOUNTS – TCU. Judgment 3290/2014- Plenary. TC 004.875/2014-1. Rapporteur Minister Walton Alencar Rodrigues. Brasília, DF, 2014c.

THE FEDERAL COURT OF ACCOUNTS – TCU. Judgment 1205/2015- Plenary. TC 019.059/2014-0. Rapporteur Minister Augusto Nardes. Brasília, DF, 2015a.

THE FEDERAL COURT OF ACCOUNTS – TCU. Judgment 1421/2015- Plenary. TC 010.945/2014-8. Rapporteur The Hon. Minister Benjamin Zymler. Brasília, DF, 2015b.

THE FEDERAL COURT OF ACCOUNTS – TCU. Judgment 727/2016- Plenary. TC 018.153/2010-0. Rapporteur Minister André de Carvalho. Brasília, DF, 2016.

VALERIANO, D. Gerenciamento estratégico de projetos: governança, portfólio, programa e partes interessadas. 1. ed. Rio de Janeiro: Elsevier, 2014.

WOILER, S.; MATHIAS, W. F. Projetos: planejamento, elaboração, análise. São Paulo: Atlas, 1996.

Urban mobility projects and public works funded with federal resources – contributions of TCU audits

Victor Hugo Moreira Ribeiro
is a government auditor in the Federal Court of Accounts, with a degree in Engineering from the University of Brasília.

ABSTRACT

This study suggests possible contributions by the Federal Court of Accounts to the achievement of National Urban Mobility Policy objectives, based on its institutional mission to collaborate with improvement of the Public Administration for the benefit of society. We present concrete cases of audits conducted in relation to urban mobility projects and public works funded with federal resources, in addition to audits of the governance of this policy, as possible avenues for improving national urban mobility.

Keywords: Urban Mobility; National Urban Mobility Policy; Audits of Public Projects; Performance Audit; Urban Infrastructure; External Control.

1. INTRODUCTION

Brazil has undergone profound geographic and demographic change in the last 60 years. According to data from the Brazilian Institute of Geography and Statistics (IBGE) (BRAZIL, 2011a), urbanization in Brazil has accelerated in the last 30 years. In 2010, around 84.4% of the country's population resided in urban areas, according to (Ibid.). The difference is striking when compared with the 75.6% urban population recorded in 1991.

From 2000 to 2010, Brazil's urban population increased by 23 million inhabitants. In other words, Brazilian cities experienced major population expansion. This, in turn, generates greater demand for public services associated with urban environments, such as sanitation, housing, public roadways and areas, public lighting and especially public transportation.

This state of affairs intensifies the demand for urban public transportation, which requires the government to take action to meet the needs of the population in this regard.

Public transportation is a public service constitutionally considered "essential in nature" (Article 30, Subsection V, of the Federal Constitution of 1988 – BRAZIL, 1988). The constitutional text assigns responsibility for providing this service to municipalities and the Federal District (cf. Article 32, § 1, of FC/1988), which can deliver the service directly or through concessions or permits.

Regarding the increased demand for public transportation in Brazil in recent years, it is worth mentioning that, according to data from São Paulo Municipality (cf. BRAZIL, 2012b), the demand for urban public transportation in the city of São Paulo grew 86% between 2002 and 2011, while the city's resident population grew 7.5% in this same period.

Studies on Line 3-Red of the São Paulo Subway indicate overcrowding of the line, with an average of 7.4 passengers/m² during peak hours, in 2015 (cf. BARBOSA, 2016), whereas the Brazilian technical standard for manufacturing urban public transportation vehicles sets maximum saturation at six passengers/m² (BRAZILIAN ASSOCIATION OF TECHNICAL STANDARDS, 2009).

The role of the Federal Court of Accounts (TCU) in this situation fits into its institutional mission of helping improve Public Administration for the benefit of society (cf. BRAZIL, 2015g). In other words, it is expected that audits performed by the TCU will provide input for and indicate possible improvements in public policies, leading to greater effectiveness of the actions carried out by the Public Administration.

This study seeks to point out some important TCU oversight actions that could benefit urban mobility and public transportation.

2. IMPORTANT CONCEPTS REGARDING URBAN PUBLIC TRANSPORTATION

In addition to the mandates of municipalities and the Federal District in this area, the Federal Constitution of 1988 gave the Federal Government (in Article 21, Subsection XX) the mandate to establish guidelines for public transportation.

This relevant legislative mandate was materialized recently in an important reference document to help understand how the issue of urban transportation is structured in its several modes in

Brazil. The document is Law No. 12587, of 3 January 2012, which establishes the National Urban Mobility Policy (BRAZIL, 2012a).

According to Article 4, Subsection II of this legal document, the definition of urban mobility is the "condition of moving cargo and people in the urban space" (Ibid).

This law also makes clear, in Article 3, § 2, that urban transportation can be public or private in nature. It can be characterized as collective or individual and can move passengers or cargo.

The law makes only one fundamental distinction regarding urban transportation modes – motorized and non-motorized. According to the concepts presented in this law, motorized transportation is defined as a mode that uses automotive vehicles, while non-motorized transportation is a mode that uses human effort or animal traction.

This same reference document also makes important distinctions as to collective public transportation, individual public transportation and private collective transportation.

Collective public transportation is defined as a "public transportation service for passengers that is accessible to the entire local population through individual payment, with itineraries and prices set by the government" (Ibid). In turn, individual public transportation refers to a "service paid for by passengers, open to the public, through leased vehicles, for individualized trips" (Ibid).

Private collective transportation is a "transportation service for passengers that is not open to the public, with exclusive operational characteristics for each line and demand" (Ibid).

This law also presents important principles[1] for development of the National Urban Mobility Policy (PNMU). Particularly i) "equal access of citizens to collective public transportation"; ii) "efficiency, efficacy and effectiveness in the provision of urban transportation services"; iii) "fair distribution of the benefits and onus resulting from the use of different modes and services"; and iv) "equality in the use of public areas of transit and roadways" (Ibid.).

The guidelines[2] that inform this policy are also set forth in the law. Among those worth mentioning are: i) integration between urban development policies; ii) "non-motorized transportation takes priority over motorized, and collective public transportation services take priority over individual motorized transportation"; and iii) "prioritization of collective public transportation projects that structure the region and lead to integrated urban development" (Ibid).

Finally, the law also shows that efficient and effective urban mobility enables the achievement of relevant objectives[3], such as: i) reduction of inequality and promotion of social inclusion; ii) promotion of access to basic services and public equipment; and iii) improvement in the urban conditions of the population, primarily in terms of accessibility and mobility.

3. ROLE OF THE FEDERAL GOVERNMENT IN FUNDING OF URBAN MOBILITY PROJECTS

Law No. 12587/2012 defines various instruments to regulate collective public transportation services. The provision and regulation of this type of service in Brazil, with a few exceptions, is the responsibility of municipalities and the Federal District.

Therefore, except in the case of urban interstate transportation, the role of the Federal Government is to promote development and provide technical and financial assistance to the other federative entities, according to Article 16 of this law.

In this regard, the Ministry of Cities is the body of the Direct Federal Public Administration responsible for guiding policies related to urban transportation, such as the National Urban Mobility Policy, as established in Article 27, Subsection XI, of Law No 10683, of 28 May 2003, amended by Article 12 of Law No. 13341, of 29 September 2016.

Within the structure of this Ministry is the National Transportation and Urban Mobility Department (Semob), responsible for formulating and implementing the policy of sustainable urban mobility.

The federal programs led by Semob include Growth Acceleration Program (PAC), Medium-Sized Cities Mobility PAC, Large Cities Mobility PAC, Pavement and Road Improvement PAC and the Transportation and Urban Mobility Infrastructure Program, in addition to lines of funding from The Brazilian Development Bank (BNDES) related to urban mobility. It is also worth mentioning that the funding sources for the programs are heterogeneous. In various cases, the same project receives voluntary transfers of federal resources provided for by the federal Annual Budget Law as well as financing agreements signed with BNDES and Caixa Econômica Federal (cf. Ruling 2130/2016-TCU-Plenary).

In the case of programs that use federal resources – namely, the Large Cities Mobility PAC –Semob is responsible for selecting projects eligible to receive federal funding. After this selection, the federative entities need to start the process to sign the respective Agreement with Caixa Econômica Federal (Caixa), who is the official financial institution of the federal government for these arrangements, as per Ministry of Cities Ordinance No. 164, of 12 April 2013. At the federal level, Caixa is also responsible for the technical analyses of the basic design and project budget.

The tender process for public works should only be initiated after Caixa approves the project, in accordance with Ruling 2099/2011-TCU-Plenary. As a rule, the technical analyses by Caixa require various revisions to the basic design, until the minimum conditions for approval are met. It is also important to mention that it is not uncommon for parliamentary amendments to be included in the Annual Budget Law to allocate federal resources to urban mobility projects, while it is examined by Congress. The Ministry of Cities classifies these projects as "Non-PAC Amendments".

In view of the above, concerning the effectiveness of federal investments in urban mobility projects, it is worth noting that data recently collected by the TCU, published in Ruling 2327/2015-TCU-Plenary, concerning the execution of these programs in 2015, show the following situation:

- From 378 urban mobility projects under the Mobility PAC, 55 are either paralyzed or delayed. In relation to the Pavement PAC, the number of delayed or paralyzed projects is 152 out of 1,043. As far as "Non-PAC Amendments" projects, the total in this situation is 235 out of a total of 1,102;

- The percentage of urban mobility projects funded with federal resources that are either delayed or paralyzed in relation to the total number of planned projects, in each program, is:

  - Mobility PAC – 14.74%;

  - Pavement PAC – 14.57%;

  - Non-PAC Amendments – 21.32%; (BRAZIL, 2015d)

In addition, given the large number of projects not yet started, the TCU also calculated the proportion of delayed or paralyzed projects in relation to the number of started projects, in order to obtain a more reliable metric regarding the degree of efficiency of allocation of federal resources in urban mobility projects. The findings were as follows:

- The percentage of urban mobility projects funded with federal resources that are either delayed

or paralyzed in relation to the total number of projects started, in each program, is:

» Mobility PAC – 47.82%;

» Pavement PAC – 45.10%;

» Non-PAC Amendments – 27.26%; (BRAZIL, 2015d).

The Federal Court of Accounts made some qualifications regarding the origin of the data, which is the responsibility of the Ministry of Cities and was not validated by the TCU. The data related to "Non-PAC Amendments" had gaps in relation to the status of the project in 34.39% of the records, which affects the percentages informed of stages of the projects in this program.

Finally, the TCU gave important information that "funding for the Pavement PAC does not come from the Federal Government Budget, but from the Transportation and Urban Mobility Infrastructure Program (Pró-Transporte), that receives contributions from the Severance Pay Indemnity Fund (FGTS)" (BRAZIL, 2015d).

The amount of resources involved in these programs is substantial. The TCU Ruling shows a forecast of federal investments of BRL 27.9 billion in the Mobility PAC. The funds allocated to the Pavement PAC total around BRL 9.8 billion and in the Non-PAC, through legislative amendments, approximately BRL 15.8 billion.

Based on the data collected by the TCU, it is possible to see that, although major investments were planned for urban mobility projects, until 2015 execution of these projects was slow, with a large number of public works either paralyzed or delayed.

Combined with recent increase in demand for public transportation in certain cities around the country, this scenario further increases the pressure on existing urban mobility infrastructure.

Finally, aiming at an eventual acceleration in the execution of urban mobility projects, an important model that has been applied for execution and operation of urban mobility projects is the public-private partnership. This is a system created by Law No. 11079, of 30 December 2004. Since urban public transportation is a municipal or district mandate, the municipalities or Federal District, as a rule, are the public partners in such contractual relationships.

Notwithstanding, in Ordinance No. 262/2013, the Ministry of Cities issued rules and procedures for transferring funds from the Federal Government Budget to projects delegated to the private sector through public-private partnerships (PPP) selected in the Large Cities Mobility PAC 2.

4. BACKGROUND OF THE WORK OF THE TCU IN RELATION TO BRAZILIAN URBAN MOBILITY

Given the major relevance of this theme, the Federal Court of Accounts can contribute to and indicate possible improvements to public policies involving this issue.

Historically, TCU's involvement was greater regarding the regularity of the execution of urban mobility projects, within the scope of the TCU annual public works audits cycles, known as Fiscobras.

TCU audited various public work projects when monitoring the major expansion in the execution of projects, especially subways, in the late 1990s. Among them we highlight i) Brasília/DF Subway – Decision 469/1997-TCU-Plenary and 1265/2002-TCU-Plenary; ii) Belo Horizonte/MG Subway System – Calafate-Barreiro stretch – Decision 956/1999-TCU-Plenary and 1334/2002-TCU-Plenary; iii) Natal/RN Subway System – Decision 432/2001-TCU-Plenary, 840/2002-TCU-Plenary and Ruling 852/2003-TCU-Plenary; iv) Porto Alegre/RS Subway System – Assis Brasil-Centro-Azenha stretch – Decision 600/2001-TCU-Plenary; and v) Recife/PE Urban Train System – Decision 930/2001-TCU-Plenary and 978/2001-TCU-Plenary.

A significant portion of these oversight actions consisted of audits within the scope of Fiscobras – an annual cycle of audits of public works performed by the TCU, in compliance with the budgetary guideline laws (LDO) for each fiscal year. These laws require this Court of Accounts to send a consolidated report on the audits of public projects to the National Congress every year.

In view of this, many of the aforementioned audits, despite constituting an important effort to identify, prevent and correct serious irregularities, consist of individual audits per project, without allowing for a more overall view of the efficiency and effectiveness of federal resources invested in urban mobility projects.

Later, as a result of enhanced budget and public project analysis methodologies used since Fiscobras 2005, TCU carried out audits of certain subway projects considered symbolic due to the size and seriousness of the irregularities that were found. Some examples are: i) Salvador/BA Subway System – Lapa-Pirajá stretch – Rulings 1453/2006, 2065/2006, 2369/2006 and 2873/2008, all from the Court Plenary; and ii) Fortaleza/CE Subway System – South Line – Rulings 1444/2006, 3070/2008, 386/2009 and 2450/2009, all from the Court Plenary. In both cases, the TCU detected a variety of irregularities, particularly:

- absence of a budget spreadsheet for the basic and/or executive design, in violation of Article 7, § 2, Subsection II, of Law 8666/1993 and Article 6, Subsection IX, of the same law;

- serious irregularities in the tender process, such as the unjustified absence of dividing the object (pursuant to Article 23, § 1 of Law 8666/1993), absence in the tender invitation of acceptability criteria for unit prices in proposals by bidders and awarding of the contract to the company that received second place in the competition without respecting the conditions of the winning bid;

- payment for services not stipulated in the contract and/or not executed, including maintenance of the construction site at a fixed monthly amount in situations where the project was either paralyzed or proceeding slowly;

- improper signing of contractual amendments, due to the system for execution of the contracts being lump sum contracts, that, *a priori*, restrict the hypotheses of amendments to the contract;

- deficient design project;

- exceeding the legal limits for signing contractual amendments and/or absence of the formalization of these amendments; and

- over-invoicing resulting from excessive prices, compared to market prices, inappropriate quantities, excessive costs without breakdowns in regard to construction site maintenance or local administration.

In light of these irregularities, the TCU considered these cases of over-invoicing to be a misappropriation of public funds, corresponding to approximately BRL 50.5 million (historical values – base date of 1999). This amount referred to the public works of the Salvador/BA Subway. The amount for construction of the South Line of the Fortaleza/CE Subway was around BRL 51.3 million (historical values – base date of November 1997).

Both projects received federal funding through agreements signed between the *Companhia Brasileira de Trens Urbanos* (CBTU) and the City Hall of Salvador/BA (in the case of the Salvador Subway) and the state of Ceará (in the case of the Fortaleza Subway).

For these reasons, the Court carried out special rendering of accounts (TCE) to determine the amount of debt and identify those accountable. The merits of both cases have not yet been judged.

Therefore, we verify that TCU's work regarding this important topic needed improvement, in order to provide more input to improve Public Administration in this matter, primarily considering the risks identified in the execution of the aforementioned projects.

That is why a technical unit specialized in urban infrastructure was created within the Secretariat of the Court – the Department of External Control - Urban Infrastructure (SeinfraUrbana), whose responsibilities range from continuing the mentioned audits of public works projects within the scope of Fiscobras to more complex and structuring types of work, as we will see below.

5. CONTRIBUTIONS OF TCU AUDITS – NATIONAL URBAN MOBILITY POLICY

Urban mobility is the topic of various audits carried out by the TCU. Apart from the previously mentioned rulings, another worth noting is Ruling 2430/2015-TCU-Plenary.

This decision judged a performance audit whose goal was to assess governance aspects of the National Urban Mobility Policy at the federal level. The main criterion used was the "Framework to Assess Governance in Public Policies" published by the TCU through Ordinance-TCU 230, of 25 August 2014.

In this study, the concept of governance adopted was "the ability of governments to conceive, formulate and implement policies and carry out their duties. This concept also includes the capacity for interaction between various players, to express their interests and ensure transparency in the accountability of government performance" (BRAZIL, 2015e).

The components of governance evaluated in this ruling were: i) Institutionalization; ii) Plans and objectives; and iii) Coordination and consistency.

The "institutionalization" component refers to formal or informal aspects of the existence of the policy, related to organizational capacities, regulations, standards, procedures, jurisdictions and resources that enable the objectives and results of the public policy to be achieved" (BRAZIL, 2015e). It is expected that a public policy be legally and officially formalized, with defined rules, standards and procedures regarding decision-making bodies, mandates and duties of each agent involved.

In turn, the "Plans and objectives" component involves the definition of goals and objectives to be able to assess the relevance of the actions carried out and the expected results of the policy.

The "Coordination and consistency" component seeks to determine whether the public organizations act in a coordinated and concerted manner, to achieve set goals, or if they are acting in a scattered way, with overlapping of actions and efforts whose results may be contradictory.

The situation detected by the TCU in this paper revealed the following audit findings: i) Goals and indicators adopted are unable to assess and measure the progress and achievement of the National Urban Mobility Policy objectives; ii) Objectives and guidelines of the policy are not being clearly considered as selection criteria for the proposals of urban mobility projects submitted by federative entities to obtain federal resources; iii) Cooperative effort between spheres of government is insufficient for adequate implementation of the policy; and iv) "The actions of the Federal Government are not aligned in a way to prioritize non-motorized modes of transportation over motorized, as well as collective public transportation services over motorized individual transport" (BRAZIL, 2015e).

In light of the situation detected, various recommendations were made to the bodies involved, especially the Ministry of Cities, in order to mitigate these weaknesses and risks and for the National Urban Mobility Policy to adequately achieve its objectives. In other words, various improvement opportunities were identified which, if implemented, could make the Federal Government's performance more effective for the benefit of society.

Among the main recommendations, the following are worthy of note:

- adopt measures aimed at defining performance goals and indicators that enable measuring if, and to what extent, the desired results of the National Urban Mobility Policy are being achieved;

- improve the procedures for assessing and selecting urban mobility projects that will receive federal funding, to make explicit the reasons that permit selection of the proposal--object of analysis in relation to the objectives and guidelines of the National Urban Mobility Policy;

- establish mechanisms for coordination, communication and collaboration with other federative entities and stakeholders in the National Urban Mobility Policy that enable alignment of strategies and actions; and

- institute mechanisms that mitigate possible non-alignments between the public urban mobility policy and other policies.

6. CONTRIBUTIONS MADE BY TCU AUDITS – RECENT PUBLIC WORKS AUDITS

In addition to more structuring work, we continued with the audits of public works focused on urban mobility enterprises, since the materiality, relevance and risks involved in a significant number of projects for subways, light rail vehicle (LRV), bus

rapid transit (BRT), bus lanes and other modes, are high.

As of Fiscobras 2014, more urban mobility-related projects have been audited, involving not only subway systems, but also especially bus lanes.

One of the reasons for this is the increased investments in this type of urban mobility project. It is worth noting that data contained in Ruling 2327/2015-TCU-Plenary shows that around 70% of total federal resources for urban mobility projects are earmarked for investments to design, build or expand bus lanes and similar projects.

In 2014, according to Ruling 2981/2014-TCU-Plenary, there were audits of the following projects: i) allegations regarding possible irregularities in the tender for the North-South BRT bus lane in Goiânia/GO – TC 010.585/2014-1; ii) Salvador Subway – Line 1 – Lapa-Pirajá; and iii) Fortaleza Subway – South Line. The scope of the last two audits was to verify the completeness and regularity of the guarantees offered by the companies hired to carry out the projects, in accordance with decisions issued by the TCU in earlier audits.

In 2015, according to Ruling 2805/2015-TCU-Plenary, 10 urban mobility projects were inspected: i) Radial Leste bus lane – stretch 1; ii) Radial Leste bus lane – stretch 3; iii) Itaim Paulista – São Mateus perimeter BRT bus lane and São Mateus bus terminal; iv) M'Boi Mirim-Cachoeirinha bus lane; v) East Line of the Fortaleza/CE Subway; vi) West Line of the Fortaleza/CE Subway; vii) South Line of the Fortaleza/CE Subway; viii) Fortaleza/CE BRT – express beltway; ix) expansion and modernization of the Federal District Subway; and x) BRT – Federal District – West. The first four projects are located in São Paulo/SP.

While some of the abovementioned projects (M'Boi Mirim-Cachoeirinha bus lane, West Line of the Fortaleza/CE Subway, Fortaleza/CE BRT – express beltway, expansion and modernization of the Federal District Subway and BRT – Federal District – West) were in the initial stages, with no formalized bidding process. The contract for others had already been signed, but were proceeding at an extremely slow pace in terms of execution. Two of them were paralyzed (Radial Leste bus lane – stretch 1 and East Line of the Fortaleza/CE Subway) and two projects were in the bidding process at the time the audits were carried out (Radial Leste bus lane – stretch 3 and Itaim Paulista-São Mateus perimeter BRT).

A significant number of serious irregularities were detected in the projects. In at least three of them – Radial Leste bus lane – stretch 1, Radial Leste bus lane – stretch 3 and Itaim Paulista-São Mateus perimeter BRT – we proposed paralyzing the services due to findings related to overpricing and irregularities in the tender process. Some of the irregularities were serious and there was a the recommendation to stop

services (IG-P), in accordance with Article 112, § 1, Subsection IV, of LDO 2015 – Law 13080/2015, without prejudice to issuing an injunction to suspend the competition., in the case of projects in the tender stage.

In fact, in the Radial Leste bus lane – stretch 1, as shown in Ruling 1923/2016-TCU-Plenary, the percentage of overpricing detected was 20.93% in the sample studied and 10.58% in relation to the total price of the project. Furthermore, in that specific case, a prequalification procedure for the project was carried out simultaneously with 15 other projects, containing an express clause stating that a bidder could only win one of the future competitions. It should be noted that the competitions subsequent to those prequalifications did not occur on the same date, which could lead to market division because a winning bidder in a prior competition would already know in advance that it would not be able to win in a subsequent competition. This is undoubtedly an irregular bidding procedure, as evidenced by the judgment on the merits of the case.

In the case of the Radial Leste bus lanes – stretch 3 (Ruling 111/2016-TCU-Plenary) and Itaim Paulista-São Mateus perimeter BRT (Ruling 358/2016-TCU-Plenary), the percentage of overpricing was 16.43% and 15.68%, respectively, in the sample examined.

In 2016, we conducted audits of a wider geographic range covering the following projects: i) river transportation system in Recife/PE; ii) East Line of the Fortaleza/CE Subway; iii) Salvador/BA Subway – Lines 1 and 2; iv) Teresina/PI LRT (light rail transit); v) Salvador/BA BRT – Av. Pinto de Aguiar-Gal Costa and Av. Orlando Gomes; vi) Goiânia/GO North-South BRT; vii) BRT for the metropolitan region of Recife/PE; viii) Palmas/TO South BRT; ix) Senador Fernandes Távora/Expedicionários BRT in Fortaleza/CE; x) Campo Grande-Ouro Verde BRT and Perimetral VI in Campinas/SP; xi) Radial Leste bus lane – stretch 1 – São Paulo/SP; and xii) BRT Centro Cohab BRT – new beltway – stretch 1 – São Luís/MA.

The public work project where we detected the most serious irregularities was the Palmas/TO South BRT. This project was in the bidding stage and, according to the decision by the rapporteur of the case (BRASIL, 2016g), the technical and economic feasibility studies contained gaps and shortcomings. Thus, it was not possible to assess whether the project is feasible or not. Other evidence of irregularities found involved shortcomings in the preliminary engineering design and the justifications for choosing the integrated public procurement regime. Considering that the project was still in the bidding stages, the rapporteur, endorsed by the Plenary of the TCU, decided to issue an injunction to suspend the competition, in addition to notifying the National Congress about the occurrence of the IG-P, pursuant to Article 117, § 1, Subsection IV, of LDO 2016 – Law No. 13242/2015. The case was recently judged resulting in Ruling 460/2017-TCU-Plenary, in

which evidence of the aforementioned irregularities was confirmed.

7. DISCUSSION OF POSSIBLE NEW AUDITS AND FORMS OF APPROACH

The situation exposed by the audits of public works under Fiscobras 2015 and 2016 shows that many problems identified since 2005 in urban mobility projects persist, such as deficient basic designs, overpricing and restrictive tender processes, etc.

Due to the materiality, relevance and risk of these enterprises, it is extremely important that the internal controls of the entities responsible for allocating federal resources in these cases – the Ministry of Cities and Caixa Econômica Federal, acting as representatives of the Federal Government – be well designed and developed. This is especially important when it comes to their respective technical engineering staffs, addressing the main risks related to the project and their budgets.

With a qualified technical staff and a well-designed internal control structure, many of the risks uncovered by these TCU audits would be mitigated and it is possible that the persistent occurrence of serious irregularities would be avoided, which could make the actions of the Federal Government more effective in supporting the execution of these projects.

Therefore, to combat the recurrence of serious irregularities identified in the projects, it is suggested that the TCU verify and assess the internal control structure set up in these two entities – Ministry of Cities and Caixa. It is worth pointing out that the TCU also noted the importance of a study on this issue, as shown in Subsection 9.2 of Ruling 1737/2015-TCU--First Court.

8. CONCLUSION

In light of the above, it is clear that urban mobility is highly important for the Brazilian population. In this regard, it is the responsibility of the TCU, in its institutional mission to help improve Public Administration in benefit of society, to provide input and proposals that can enhance the state's performance in this area.

It was found that, in the past, the TCU largely focused its oversight actions on audits of specific urban mobility projects. At that time, we noted serious irregularities in most of the audits performed, which indicated a scenario of serious risks for the Public Administration.

Recently, in an effort to make more contributions that are more comprehensive, the Federal Court of Accounts has sought to carry out work that is more structuring and would highlight any weaknesses or improvement opportunities in the execution of the National Urban Mobility Policy. Following are some of the main recommendations made to the Ministry of Cities:

- adopt measures to define adequate and reliable performance goals and indicators; and

- improve the procedures for assessing and selecting urban mobility projects that will receive federal funding, in order to specify the reasons that for selection of the proposal-object under analysis in relation to the objectives and guidelines of the National Urban Mobility Policy.

As of Fiscobras 2014, more urban mobility--related projects have been audited, involving not only subway systems, but also especially bus lanes.

In addition, data contained in Ruling 2327/2015-TCU-Plenary shows that around 70%

of total federal resources for urban mobility projects are earmarked for investments to prepare designs, build or expand bus lanes and similar projects.

In this regard, recent audits of urban mobility projects by the TCU have revealed a situation of high risk concerning achieving the objectives for federal investments in the sector. Serious irregularities were noted in various cases, particularly overpricing, deficient basic designs and irregularities in tender procedures.

In some cases, the severity of the problems resulted in a recommendation to the National Congress to paralyze the public works, along with injunctions to suspend tender procedures.

Finally, a possible new approach to audits by the Court of Accounts was suggested aiming to assess internal controls designed to achieve the desired objectives for federal investments in the sector, in order to mitigate risks and prevent the occurrence of the persistent irregularities detected in TCU audits. As seen, this is a form of action seconded by the Federal Court of Accounts through Ruling 1737/2015-TCU-First Court.

NOTES

1 The principles underlying the National Urban Mobility Policy are found in Article 5 of Law No. 12587/2012.

2. The guidelines of this policy are contained in Article 6 of Law No. 12587/2012.

3. The objectives, in turn, are stated in Article 7 of Law No. 12587/2012.

REFERENCES

BRAZILIAN ASSOCIATION OF TECHNICAL STANDARDS. NBR 15570: technical specifications for the manufacture of vehicles with urban characteristics for public transportation of passengers. Rio de Janeiro: ABNT, 20 Mar. 2009. 19 p.

BARBOSA, B. Alívio na lotação do Metrô e CPTM deve ficar para 2017 (Ridership relief on the Subway and CPTM should occur in 2017). UOL, São Paulo, SP, 2016, p. 1-16, 11 January 2016. Available at: <https://goo.gl/P8oTmW>. Accessed on: 26 October 2016.

BRAZIL. Federal Constitution, of 5 October 1988. Text consolidated up until Constitutional Amendment No. 93, of 8 September 2016a. Brasília, DF, 5 October 1988. Available at: <https://goo.gl/ZuK7ON>. Accessed on: 23 October 2016.

_____. Brazilian Institute of Geography and Statistics. Synopsis of the Demographic Census 2010. Rio de Janeiro, RJ, 2011. Available at: <https://goo.gl/XwWJ4H>. Accessed on: 23 October 2016.

_____. Law No. 10683, of 28 May 2003. Provides for the organization of the Presidency of the Republic and Ministries, in addition to other provisions. Federal Official Gazette, Brasília, DF, 29 May 2003. Available at: <https://goo.gl/BW6wDl>. Accessed on: 23 October 2016.

_____. Law No. 11079, of 30 December 2004. Institutes general rules for public-private partnership bidding and contracting within the realm of the public administration. Federal Official Gazette, Brasília, DF, 31 December 2004. Available at: <https://goo.gl/fQqGGB>. Accessed on: 26 October 2016.

_____. Law No. 12587, of 3 January 2012. Institutes guidelines for the National Urban Mobility Policy; revokes provisions from Decree Laws No. 3326, of 3 June 1941, and 5405, of 13 April 1943, as well as the Labor Law Consolidation (CLT), approved by Decree Law No. 5452, of 1 May 1943, and Laws No. 5917, of 10 September 1973, and 6261, of 14 November 1975; in addition to other provisions. Federal Official Gazette, Brasília, DF, 4 January 2012. Available at: <https://goo.gl/LEvQd>. Accessed on: 23 October 2016.

_____. Law No. 13080, of 2 January 2015a. Provides guidelines for elaboration and execution of the Budget Law of 2015, in addition to other provisions. Federal Official Gazette, Brasília, DF, 2 January 2015. Extra edition. Available at: <https://goo.gl/vkEBj2>. Accessed on: 28 October 2016.

_____. Law No. 13242, of 30 December 2015b. Provides guidelines for elaboration and execution of the Budget Law of 2016, in addition to other provisions. Federal Official Gazette, Brasília, DF, 31 December 2015. Extra edition. Available at: <https://goo.gl/AfcXhA>. Accessed on: 28 October 2016.

_____. Law No. 13341, of 29 September 2016b. Amends Laws No. 10683, of 28 May 2003, that provides for the organization of the Presidency of the Republic and Ministries, and 11890, of 24 December 2008, and revokes Provisional Measure No. 717, of 16 March 2016. Federal Official Gazette, Brasília, DF, 30 September 2016. Available at: <https://goo.gl/X8rUQ6>. Accessed on: 23 October 2016.

_____. Ministry of the Cities. Ministry of the Cities Ordinance No. 164, of 12 April 2013. Federal Official Gazette, Brasília, DF, Year 150, No. 71. 15 April 2013. Section 1, p. 101.

_____. Ministry of the Cities. Ministry of the Cities Ordinance No. 262, of 7 June 2013. Federal Official Gazette, Brasília, DF, Year 150, No. 109. 10 June 2013. Section 1, p. 56.

_____. City Hall of São Paulo/SP. Public Transportation absorbs 80% more passengers in the last decade. Informes Urbanos, São Paulo, 2012, No. 11, p. 1-5, Aug. 2012. Available at: <https://goo.gl/xXHR0n>. Accessed on: 23 October 2016.

_____. Federal Court of Accounts Ruling No. 111/2016c. Plenary. Rapporteur: Minister Bruno Dantas. Session of 27 January 2016. Available at: <https://goo.gl/iiKCPT>. Accessed on: 31 October 2016.

_____. Federal Court of Accounts Ruling No. 358/2016d. Plenary. Rapporteur: Minister Bruno Dantas. Session of 24 Feb 2016. Available at: <https://goo.gl/K6FmP7>. Accessed on: 31 October 2016.

_____. Federal Court of Accounts Ruling No. 386/2009. Plenary. Rapporteur: Minister Aroldo Cedraz. Session of 11 Mar 2009. Available at: <https://goo.gl/DuhrTe>. Accessed on: 28 October 2016.

_____. Federal Court of Accounts Ruling No. 460/2017. Plenary. Rapporteur: Deputy Minister André Luís de Carvalho. Session of 15 Mar 2017. Available at: <https://goo.gl/cZxtmz>. Accessed on: 21 April 2017.

_____. Federal Court of Accounts Ruling No. 852/2003. Plenary. Rapporteur: Minister Lincoln Magalhães da Rocha. Session of 9 July 2003. Available at: <https://goo.gl/QngEaA>. Accessed on: 26 October 2016.

_____. Federal Court of Accounts Ruling No. 1444/2006. Plenary. Rapporteur: Minister Guilherme Palmeira. Session of 16 August 2006. Available at: <https://goo.gl/URsDqo>. Accessed on: 28 October 2016.

_____. Federal Court of Accounts Ruling No. 1453/2006. Plenary. Rapporteur: Deputy Minister Augusto Sherman Cavalcanti. Session of 16 August 2006. Available at: <https://goo.gl/wpFokg>. Accessed on: 28 October 2016.

_____. Federal Court of Accounts Ruling No. 1737/2015c. First Court. Rapporteur: Deputy Minister Weder de Oliveira. Session of 24 March 2015. Available at: <https://goo.gl/R9N6Dv>. Accessed on: 26 October 2016.

_____. Federal Court of Accounts Ruling No. 1923/2016e. Plenary. Rapporteur: Minister Bruno Dantas. Session of 27 July 2016. Available at: <https://goo.gl/z1aYHw>. Accessed on: 31 October 2016.

_____. Federal Court of Accounts Ruling No. 2065/2006. Plenary. Rapporteur: Deputy Minister Marcos Bemquerer Costa. Session of 16 August 2006. Available at: <https://goo.gl/5TQwSw>. Accessed on: 28 October 2016.

_____. Federal Court of Accounts Ruling No. 2099/2011. Plenary. Rapporteur: Deputy Minister Marcos Bemquerer Costa. Session of 10 August 2011. Available at: <https://goo.gl/J7hRrc>. Accessed on: 26 October 2016.

_____. Federal Court of Accounts Ruling No. 2130/2016f. Plenary. Rapporteur: Deputy Minister Marcos Bemquerer Costa. Session of 17 August 2016. Available at: <https://goo.gl/H8QUvu>. Accessed on: 23 October 2016.

_____. Federal Court of Accounts Ruling No. 2327/2015d. Plenary. Rapporteur: Deputy Minister Augusto Sherman Cavalcanti. Session of 16 September 2006. Available at: <https://goo.gl/TuPqgU>. Accessed on: 26 October 2016.

_____. Federal Court of Accounts Ruling No. 2,369/2006. Plenary. Rapporteur: Deputy Minister Augusto Sherman Cavalcanti. Session of 6 December 2006. Available at: <https://goo.gl/Qzz0ED>. Accessed on: 28 October 2016.

_____. Federal Court of Accounts Ruling No. 2430/2015e. Plenary. Rapporteur: Minister Augusto Nardes. Session of 30 September 2015. Available at: <https://goo.gl/sAUMAS>. Accessed on: 26 October 2016.

_____. Federal Court of Accounts Ruling No. 2,450/2009. Plenary. Rapporteur: Minister Aroldo Cedraz. Session of 21 October 2009. Available at: <https://goo.gl/0fw69x>. Accessed on: 28 October 2016.

_____. Federal Court of Accounts Ruling No. 2805/2015f. Plenary. Rapporteur: Minister Walton Alencar Rodrigues. Session of 4 November 2015. Available at: <https://goo.gl/F8O7u1>. Accessed on: 26 October 2016.

_____. Federal Court of Accounts Ruling No. 2873/2008. Plenary. Rapporteur: Deputy Minister Augusto Sherman Cavalcanti. Session of 3 December 2008. Available at: <https://goo.gl/gRoLHj>. Accessed on: 28 October 2016.

_____. Federal Court of Accounts Ruling No. 2,981/2014. Plenary. Rapporteur: Minister Bruno Dantas. Session of 5 November 2014. Available at: <https://goo.gl/RwHEeT>. Accessed on: 26 October 2016.

_____. Federal Court of Accounts Ruling No. 3,070/2008. Plenary. Rapporteur: Minister Aroldo Cedraz. Session of 10 December 2008. Available at: <https://goo.gl/1j379w>. Accessed on: 28 October 2016.

_____. Federal Court of Accounts Communication of precautionary measure to the full body of the TCU. Plenary. Rapporteur: Deputy Minister André Luís de Carvalho. Session of 21 September 2016 – Minutes 36/2016g. Federal Official Gazette, Brasília, DF, 30 September 2016. p. 97-98. Available at: <https://goo.gl/EsaVf0>. Accessed on: 31 October 2016.

_____. Federal Court of Accounts Decision No. 432/2001. Plenary. Rapporteur: Minister Marcos Vinicios Vilaça. Session of 11 July 2001. Available at: <https://goo.gl/ACxjfO>. Accessed on: 26 October 2016.

_____. Federal Court of Accounts Decision No. 469/1997. Plenary. Rapporteur: Minister Paulo Affonso Martins de Oliveira. Session of 6 August 1997. Available at: <https://goo.gl/5OHiQL>. Accessed on: 26 October 2016.

_____. Federal Court of Accounts Decision No. 600/2001. Plenary. Rapporteur: Minister Marcos Vinicios Vilaça. Session of 22 August 2001. Available at: <https://goo.gl/i089Hf>. Accessed on: 26 October 2016.

_____. Federal Court of Accounts Decision No. 840/2002. Plenary. Rapporteur: Minister Lincoln Magalhães da Rocha. Session of 10 July 2002. Available at: <https://goo.gl/vtBDkl>. Accessed on: 26 October 2016.

_____. Federal Court of Accounts Decision No. 930/2001. Plenary. Rapporteur: Minister Valmir Campelo. Session of 7 November 2001. Available at: <https://goo.gl/ksiilY>. Accessed on: 26 October 2016.

_____. Federal Court of Accounts Decision No. 956/1999. Plenary. Rapporteur: Minister Humberto Souto. Session of 15 December 1999. Available at: <https://goo.gl/VBUoLY>. Accessed on: 26 October 2016.

_____. Federal Court of Accounts Decision No. 978/2001. Plenary. Rapporteur: Minister Valmir Campelo. Session of 21 November 2001. Available at: <https://goo.gl/lK8lRT>. Accessed on: 26 October 2016.

_____. Federal Court of Accounts Decision No. 1,265/2002. Plenary. Rapporteur: Minister Adylson Motta. Session of 25 September 2002. Available at: <https://goo.gl/WgBbUb>. Accessed on: 26 October 2016.

_____. Federal Court of Accounts Decision No. 1,334/2002. Plenary. Rapporteur: Minister Marcos Vinicios Vilaça. Session of 9 October 2002. Available at: <https://goo.gl/9xHg9r>. Accessed on: 26 October 2016.

_____. Federal Court of Accounts Strategic Map TCU 2015-2021. Available at: <https://goo.gl/SBij3T>. Accessed on: 23 October 2016.

How to improve the management of waterways in the Federal System of Transportation

Alexandre Vaz Sampaio
is a civil servant from the Ministry of Planning assigned to perform his duties at the Ministry of Transportation; he holds a Bachelor's Degree in Civil Engineering from the Mackenzie University, and a specialization certification in City Management from FAAP/SP; and a specialization degree in Public Management from the Cruzeiro do Sul/SP University.

Rafael Seronni Mendonça
a civil servant from the Ministry of Planning assigned to perform his duties at the Ministry of Transportation; he holds a Bachelor's Degree in Civil Engineering from the Catholic University of Goiás, and graduate certification in Public Management and Traffic Standardization Management from the FACIBRA.

ABSTRACT

This study consists of performing an analysis of the Federal System of Transportation, focused on the Waterway Subsystem, and of proposing actions to improve the management of the sector. To do so, we will present the concepts of domain, jurisdiction and navigation, and a proposal on how the Federal Waterway Subsystem could be organized, presenting a list of the federal waterways with the corresponding naming rule. The principle for organizing the Federal Waterway System is listing the inland waterways under the competence of the Federal Government, taking into account the waterways either currently commercially navigable or potentially navigable.

Keywords: Waterway. Federal System of Transportation. Federal Waterway Subsystem.

1. INTRODUCTION

This paper will present an analysis of the Federal System of Transportation focused on the waterway modal, using as a yardstick for comparing the organization of the road modal, and putting forward a proposal for how the federal waterway subsystem could be organized, by presenting a list of federal waterways with the corresponding naming rule.

The issue concerning having or lacking a definition of federal waterways was probably raised before the enactment of Law 5,917, of November 10, 1973, but in carrying out our analysis our focus will be from that date on.

The National Plan for Transportation was approved with the publication of Law 5,917, of November 10, 1973, pursuant to Article 8, Subsection XI, of the Federal Constitution of 1967, which determined it is a matter for the Federal Government to set the National Plan for Transportation.

Article 10 of Law 5,917 sets "the states, territories, the Federal District and cities shall devise and review their Transportation Plans to achieve proper articulation and compatibility between their transportation systems and between those and the Federal Transportation Systems".

We noticed that the abovementioned Law mentions the existence of a diversity of transportation systems (federal, state, district and municipal). In its annex, however, there are, among others, the concepts of National Transportation System, National Road System, and National Waterway System, as described below:

> National Transportation System: What is meant by the expression "National Transportation Plan", as mentioned in Art. 8, Item XI, of the Federal Constitution, is the set of Fundamental Principles and Standards, listed in Art. 3 of said law, applicable to the National Transportation System as a whole, aimed to achieve the mentioned objectives (Art. 2), and also the specific set of the transportation infrastructures spelled out in the Descriptive Listing of this law, and the corresponding operational structures, as defined as follows.
>
> The National Transportation System is made up of the association of the National Systems: Road, Railroad, Port, Water and Air; and it encompasses:
>
> a) transportation infrastructure, which comprises the networks corresponding to the transportation modes abovementioned, including their ancillary and complementary premises;
>
> b) operational structure, including the array of state means and activities, directly exercised in each transportation mode, and which are necessary and sufficient to the proper use of the infrastructure mentioned in the previous paragraph.
>
> **National** Road System: it is made up of the association of the **Federal**, **State** and **Municipal** Road Systems; and it encompasses:
>
> c) road infrastructure, which comprises the road networks and their ancillary and complementary premise;
>
> d) operational structure, involving the array of state management activities and means, including oversight,

which work directly on the road transportation mode, and which allow for the proper use of roads.

The roads considered as part of the National Transportation Plan are those which make up the **Federal Road System**, described in this Annex.

National Waterway System: it is made up of the navigable waterways (rivers, lakes and channels), including their ancillary and complementary premises, and of the array of direct state activities and means, for operating waterway navigation, which allow for the proper use of the waterways mentioned for transport purposes.

The navigable waterways entailed in the National Transportation Plan **are the main ones, both in terms of length and traffic**, and they are the ones listed in Section 5.2 below.

From what has been described above, we can note that the Waterway System was not given the same level of consideration for defining the list of waterways pertaining to the **Federal** Waterway System as it was done with the Road System (where the federal roads were defined), and therefore we have only a list of waterways entailed in the **National** Waterway Plan.

Then, the Draft Bill 1,176 of 1995 (No. 18/00 in the Federal Senate), which provides on the National Transportation System, established a better descriptive listing of the Federal Waterway Subsystem (list laid down in Annex IV of said Law), and repealed Law 5,917/1973.

This Draft Bill is in line with Law 5,917/1973, but it sets out a better definition of the differences between the National Transportation System (SNV) and the Federal Transportation System (SFV), as described in the Articles 1, 2, 3 and 5 below:

Art. 1 – This law provides on the National Transportation System (SNV), its makeup, objectives and criteria for its implementation, pursuant to the Subsections XII and XXI of Art. 21 of the Federal Constitution.

Art. 2 – The SNV is made up of the physical and operational infrastructure of the diverse modes of transportation of people and goods, under the jurisdiction of the different entities of the Federation.

§ 1º – As regards the **jurisdiction**, the SNV is made up of the **Federal** Transportation System and the **transportation systems from the States, Federal District and Municipalities**.

§ 2º – As regards the transportation modes, the SNV comprises road, railroad, waterway and air subsystems.

Art. 3 – The Federal Transportation System (SFV) is made up of the following subsystems:

I – Federal Road Subsystem;

II – Federal Railroad Subsystem;

III – Federal Waterway Subsystem;

IV – Federal Air Subsystem.

[...]

Art. 5 – Pursuant to current legislation, the Federal Government is mandated to manage the SFV, which encompasses planning, building, maintaining, operating and exploiting the respective components.

It also laid out in Articles 25 to 33 the Federal Waterway Subsystem, as described below:

Art. 25 – The Federal Waterway Subsystem is made up of:

I –waterways;

II – river and sea ports;

III – locks and other mechanisms for raising or lowering to a different level;

IV – interconnection of river basin waterways;

V – facilities, premises and structures for the operation and safety of waterway navigation.

Art. 26 – Annex IV presents the descriptive listing of the current and planned navigable waterways pertaining to the Federal Waterway Subsystem, according to the basin or river they are located in.

Art. 27 – Annex V presents the descriptive listing of river and sea ports pertaining to the Federal Waterway Subsystem, according to their location; and as for the river ports, the basin or river they are on.

Art. 28 – Annex VI presents the descriptive listing of locks and other mechanisms for raising or lowering to different levels, both actual and planned, pertaining to the Federal Waterway Subsystem, according to the location and the basin or river they are on.

Art. 29 – The use of navigable waters owned by a State or the Federal District, for navigation of federal interest, under Paragraph d of Subsection XII of Art. 21 of the Federal Constitution shall be governed by agreement entered into between the Federal Government and the owner of the navigable waters.

Art. 30 – Any intervention meant to bring about improvements in traffic condition on navigable inland waterways shall comply with the principles and objectives of the National Policy on Water Resources, set by Law 9,433, of January 8, 1997.

Art. 31 – (Vetoed).

Art. 32 – The exploitation of organized ports and port facilities shall comply with the provisions of Law 8,630, of Fe-

> bruary 25, 1993, and Law 10,233, of June 5, 2001, regardless of the adopted administrative system.
>
> Art. 33 – The exploitation of waterway crossing along federal roads or railroads shall always be under the responsibility of the Federal Government.

However, the Executive Power vetoed some articles before signing the mentioned Draft Bill into Law 12,379, of January 6, 2011, among them the article, which would repeal Law 5,917. It also repealed the annexes of the Draft Bill, including Annex IV, and it stated as reasons for the vetoes the following arguments:

> Annexes I to VII of the Draft Bill contain the descriptive listings of the components of the subsystems making up the subsystems pertaining to the Federal Transportation System (SFV). Notwithstanding the merit of searching for the necessary organization of the list of projects that are part of the PNV, such listing does not reflect the current state of the national transportation planning. In fact, the Annexes have failed to include projects which today are part of the PNV and that are fundamental for the development of the country, some of which are also part of the Growth Acceleration Plan (PAC).
>
> The veto to the Annexes, along with the veto to Art. 45, **allows for maintaining the descriptive listings contained in Law 5,917, of September 10, 1973 as well the laws which updated them, avoiding harming the planning and the investments by the Federal Government in national transportation infrastructure**, and it enables re-studying the matter and the timely submission of a new draft legislation.

As we see it, the veto was correct, as the descriptive listing of the federal waterways contained in its scope comprised waterways enshrined in the domain of states, such as, for example, the Tietê Waterway.

As for the reasons given for the veto, the lack of definition concerning the Federal Waterway System originally featured in the PNV/SNV was still there (Which are the federal waterways?).

Such lack of definition gives rise to consequences, according to Law 10,233, of July 5, 2001, which addresses the restructuring of land and water transportation, the National Transportation System (SNV) is made up of the transportation infrastructure and operational structure of the different means of transportation of people and goods, under the **jurisdiction of the Federal Government, states, Federal District and municipali-**

ties, and that the Federal Government has jurisdiction over the Federal Transportation System.

It also establishes that the National Water Transportation Agency (Antaq) is responsible for exploiting the **Federal** waterway infrastructure and that the scope of operation of the National Transport Infrastructure Department (DNIT) corresponds to the infrastructure of the **Federal** Transportation System, under the jurisdiction of the Ministry of Transportation.

Therefore, the following question arises: Out of the list contained in Law 5,917/1973, which are federal waterways? What is the rule adopted for naming the waterways?

In this regard, we will present below a diversity of concepts, which helped us put forward a suggestion of how the Federal Waterway Subsystem could be organized and a proposal for listing the federal waterways with the corresponding naming rule.

2. NAVIGATION

According to the DICTIONARY OF PORTUGUESE LANGUAGE, 2003-2015, navigation means "a trip or transportation on or in sea waters, on the surface of rivers and lakes or in the atmosphere".

In its turn, the Maritime Authority Standards, Normam 28, of the Brazilian Navy, defines navigation as the "process of planning, monitoring and controlling the movement of a vessel from one point to another safely. To achieve that, the navigator makes use of available information on cartography, oceanography, meteorology, aids to navigation, remote sensing, positioning systems, existing dangers and others".

This standard also defines inland navigation as the navigation on navigable inland waterways and on sea areas considered sheltered and can be divided up into two types: I) the one on sheltered waters, such as lakes, lagoons, bay, rivers and channels, where waves considerably large are not regularly seen, which do not pose difficulties to the traffic of crafts; and II) the one on waters partially sheltered, where waves considerably large and/or adverse combinations of environmental factors, such as the wind, currents or tides, can be occasionally experienced, and which hamper the traffic of vessels. (BRAZIL, 2011).

It is important to stress that the purpose of the Navy is to set standards and procedures to ensure safe navigation, and also to safeguard human life on the sea and to prevent environmental pollution by vessels from any country.

As we can see, there is a diversity of concepts and interpretations of what navigation is, but the concept of navigation we will adopt in this work is not the same as the ones described above, as we mean the **navigation service** under the responsibility of the Federal Government, as described in Item "d" of Subsection XII, of Art. 21 of the Federal Constitution: the Federal Government is responsible for exploiting, directly or through authorization, concession or permit **the** railroad **and water transportation services between Brazilian ports and national borders, or which cross the borders of a State or Territory**.

Therefore, this is the concept we will use in our analysis to define navigation, and whenever we mention the word navigation, of whatever type (inland, coastal, ocean or any other), we mean the **federal** service of waterway transportation.

3. DOMAIN OF WATER (WATER COURSE)

Water is one of the natural elements of the environment, and it falls in the category of diffuse rights, that is, those rights belonging to an undetermined community, and which transcends the traditional classification of private law and public law, and the concept of water domain cannot be determined from the viewpoint of private law (SOUZA, 2009).

Article 20, Subsection III of the Federal Constitution establishes that the Federal Government owns lakes, rivers and any other water flows in lands it owns, or which flow through more than one state, form a common border with other countries, or which flow into or from foreign lands, as well as lands adjacent to rivers systems and river beaches. It also sets in Subsection VIII that the Federal Government owns potential waterpower.

Article 26, Subsection I, establishes that among the properties of the states are the surface or underground waters, flowing, emerging or stored, except in this case, **as set by law**, those generated from public works by the Federal Government.

Also, Article 29 of Decree 24,643, of July 10, 1934, in its Subsection I, Item "e" establishes that public waters of communal use, as well as their bed, belong to the Federal Government when they form a common border with two or more states; and in its Item "f" when they flow through the lands of two or more states.

Subsection II, Item "a", sets that public waters of communal use, as well as their bed, belong to the states when they form a common border with two or more municipalities; and in Item "b" when they flow through the territories of two or more municipalities.

Paragraph 1 of Subsection II establishes that the domain of states and municipalities of any currents is limited, the Federal Government has title over industrial exploitation of waters and water power, and over navigation.

That guarantees that even when a river is the property of a state, if the water transportation system is between Brazilian ports and national borders, or cross the borders of a state of territory; such service is under the responsibility of the Federal Government, and it shall exploit it directly or through authorization, concession or permit.

Law 9,433, of January 8, 1997, which set up the National Policy on Water Resources, establishes the National System for **Water Resource Management**, stipulates in its Article 14 that the granting of rights to use water resources will be implemented by an act by a competent authority from the **Federal Executive branch, states or the Federal District**.

Therefore, the concept of domain of a river or water resource is related to the competence over the management of the water resource by the different entities of the Federation.

4. WATERWAY JURISDICTION

Jurisdiction is the power the government has to administer law to a given case, to solve conflicts of interests, and thus to protect the legal order and the authority of the law. Jurisdiction comes from Latin; from "juris" and "dicere", which means "to speak the law".

However, the concept we look for is the one spelled out by Law 12,379, of January 6, 2011, which addresses the National Transportation System (SNV), whose Article 2 says the SNV is made up of the **physical and operational infrastructure** of the varied modes of transportation of people and goods, **under the jurisdiction of the different government entities**.

It also establishes that as regards jurisdiction, the SNV is made up of the Federal Transportation System and of the transportation systems of the states, Federal districts and municipalities; and as regards the transportation modes, the SNV comprises the road, railroad, waterway and air subsystems.

In its turn, Article 5 establishes that the **Government is responsible**, pursuant to current law, for managing the Federal **Transportation** System, which encompasses planning, building, maintaining, operating and exploiting the respective components.

Therefore, the concept of jurisdiction is related to the administrative purview of the Federation entity in charge of planning, building, maintaining, operating, and exploiting the physical and operational infrastructure of the waterway.

5. RIVER OR WATERWAY?

From the etymological viewpoint, inland waterway or navigable course are common names for navigable rivers, lakes or lagoons. The waterway uses the available water body to transport people and goods.

The meaning of waterway, according to the DICTIONARY OF PORTUGUESE LANGUAGE 2003-2015 is "a river or sea route, etc., meant for transportation and communication".

The Maritime Authority Standard, Normam 28, from the Brazilian Navy (BRAZIL, 2011), also features the concepts of navigable course, inland navigable course and waterway as: navigable course is the physical space, either **natural or not**, on the waters of oceans, seas, rivers, lakes and lagoons, used for navigation; inland navigable course is a navigable waterway located within land areas, such as rivers, lakes, lagoons and channels, etc; and waterway is an inland navigable waterway with standard characteristics for certain types of vessels, through engineering works and regulation, featuring signals and devices to aid navigation.

It is worth remembering again that the purpose of the Navy is to set standards and procedures to ensure safe navigation, and also to safeguard human life on the sea and to prevent environmental pollution by vessels from any country.

From the viewpoint of the Federal Government, the interpretation of the concept of waterway cannot be

the same as that of river or even navigable course. The criteria defining waterway is not its intrinsic capacity of allowing navigation. A river or navigable course turn into a waterway through a statement act from the Public Power, which thus expresses a current and future intention of **keeping or providing it** with conditions enabling its use as transportation infrastructure. With that statement act, **a waterway becomes an integral part of the adopted transportation grid**. This way, a river becomes a **federal waterway**, and consequently, becomes part of the network of transport infrastructure (BRAZIL, 1989).

Also note that this concept is the same used for defining federal roads. Please answer the following question: What makes a road a federal or a state road?

The answer to that question is the same for any federal subsystem. What makes a route (road, railroad or waterway) federal is when it is featured in the descriptive listing of the PNV or SNV (statement act) and what makes a route a state route is when it is featured in the State Transportation Plans. Then, we will use this concept to define what a federal waterway is.

Based on the above considerations, we can see the need to improve the federal transportation system, especially the federal waterway subsystem.

6. PROPOSAL

By analyzing the adopted concepts of domain, jurisdiction and navigation, we can say a river is related to the domain/ management of the water resource just as a waterway is related to jurisdiction/ statement act. In its turn, navigation is linked to a service under the responsibility of the Federal Government, regardless of river domain or jurisdiction over the waterway.

Thus, due to the complexity regarding the federal waterway sector, we will present further a proposal of how the federal waterway subsystem could be organized, by advancing a listing of federal waterways with the corresponding naming rule.

Since the descriptive listing of federal waterways must be a statement act from the federal government, which expresses its current and future intention of keeping or providing the waterway with conditions such as transport infrastructure, it is recommendable such intention be justified and grounded on some criteria.

The initial list we will present at the end of this study will be based on the main results of the study carried out by the Ministry of Transportation called Strategic Waterway Plan (PHE).

Also, we will use as a precondition for making the waterway listing the water courses owned by the Federal Government, thus avoiding conflicts with the use of rivers owned by states, Federal District or municipalities.

It is also noteworthy that the use of rivers owned by the Federal Government as part of a state waterway is valid and cannot be ruled out, as long as: it is not on the list of federal waterways; the stretch of the waterway is within the geopolitical borders of a state

and is featured in its respective transportation system; and also there is the proper articulation between the different concerned entities and bodies of the federation.

We will also present improvements to the text on the Federal Waterway Subsystem, enabling the Federal Government to apply financial resources in the waterway systems of states, Federal District and municipalities, provided it is of relevant interest to the federal navigation service (Paragraph "d" of Subsection XII of Art. 21 of the Federal Constitution).

6.1 PROPOSAL OF WORDING AND ANNEX IV OF LAW 12,379/2011 RELATED TO THE FEDERAL WATERWAYS FEATURED IN THE FEDERAL WATERWAY SUBSYSTEM.

Of the Federal Waterway Subsystem

Art. XX – The Federal Waterway Subsystem encompasses all navigable waterways administered by the Federal Government, either directly or indirectly, in accordance with Articles 5 and 6 of this Law, which will be from now on named as Federal Waterways.

Art. XX – The waterways pertaining to the Federal Waterway Subsystem will be identified by the "HF" initials, followed by 4 (four) digits, as follows:

I – the first two digits indicate the River Basin District (RH) where the waterway is located; and they are:

a) 01 (one), for the Amazon RH;

b) 02 (two), for the Tocantins-Araguaia RH;

c) 03 (three), for the Northeast Atlantic - Western Part RH;

d) 04 (four) for the Parnaíba RH;

e) 05 (five) for the Northeast Atlantic - Eastern Part RH;

f) 06 (six) for the São Francisco RH;

g) 07 (seven) for the East Atlantic RH;

h) 08 (eight) for the Paraguay RH;

i) 09 (nine) for the Paraná RH;

j) 10 (ten) for the Southeast RH;

k) 11 (eleven) for the Uruguay RH; and

l) 12 (twelve) for the South Atlantic RH.

II – the other 2 (two) digits refer to the order in which the waterway is listed in the descriptive listing of the respective river basin district.

Art. XX. – The Federal Waterway Subsystem is made up of:

I – Federal Waterway: made up of the transportation infrastructure, including locks, facilities and structures for its maintenance, operation and for the safety of waterway navigation;

II – rivers and seaports;

Art. XX – Annex IV presents the descriptive listing of federal waterways pertaining to the Federal Waterway Subsystem.

§1º The descriptive listing referred to in the head of this article shall feature the waterways made up only of water courses owned by the Federal Government.

§2º The inclusion of waterways in the descriptive listing mentioned in the head of the article shall be duly justified by the Federal Government, which can adopt technical, economic, geopolitical or any other criteria representing the interest of the Federal Government in pronouncing the navigable or potentially navigable waterway as a federal waterway.

§3º Water courses owned by the Federal Government not contained in the descriptive listing mentioned in the head of the article may be used by states, Federal District and Municipalities as state, district and municipal waterways, as long as they are included in their respective transportation systems and the waterway length is within their lands.

ANNEX IV :

DESCRIPTIVE LISTING OF FEDERAL WATERWAYS

HF	REFERENCE NAME OF THE WATERWAY	WATER BODY	SEGMENT[1]	LENGTH (Km)
AMAZON RIVER BASIN DISTRICT				
0101	Madeira Waterway	Madeira river	From the mouth of Madeira river (AM), on the Amazon river, to Porto Velho (RO), on the Madeira river	1,086
0102	Amazonas/Solimões Waterway	Amazonas and Solimões rivers	From the mouth of Amazon river, on the Atlantic Ocean, to Benjamin Constant (AM), on the Solimões river	3,108
0103	Tapajós/Teles Pires	Tapajós e Teles Pires rivers	From the mouth of river Tapajós (PA), on the Amazon river, to Apiacás (MT), on the Teles Pires river.	960
0104	Xingu waterway	Xingu river	From the mouth of river Xingu (PA), on the Amazon river, to São Félix do Xingu (PA), on the Xingu river.	770
TOCANTINS – ARAGUAIA RIVER BASIN DISTRICT				
0201	Araguaia waterway	Araguaia river	From the mouth of river Araguaia, on the Tocantins river, to Baliza (GO), on the Araguaia river.	1,800
0202	Tocantins waterway	Tocantins river	From the mouth of river Tocantins (PA), on the Pará river, to Peixe (TO), on the Tocantins river.	1,700
0203	Guamá/Capim waterway	Guamá and Capim rivers	From Belém (PA), on the Guamá river, to PK 156 (PA), on the Capim river.	156
PARNAÍBA RIVER BASIN DISTRICT				
0401	Parnaíba waterway	Parnaíba river	From the mouth of river Parnaíba (PI), on the Canárias bay, to Santa Filomena (PI), on the Parnaíba river.	1,176
SÃO FRANCISO RIVER BASIN DISTRICT				
0601	São Francisco waterway	São Francisco river	From Petrolina (PE) / Juazeiro (BA), on the São Francisco river, to Pirapora (MG), on the São Francisco river.	1,371
PARAGUAI RIVER BASIN DISTRICT				
0801	Paraguai waterway	Paraguai river	From the mouth of river Apa (MS), on the Paraguai river, to Cáceres (MT), on the Paraguai river.	
PARANÁ RIVER BASIN DISTRICT				
0901	Paranaíba/Paraná waterway	Paranaíba and Paraná rivers	From Foz do Iguaçu (PR), on the Paraná river to downstream of São Simão dam (GO), on the Paranaíba river.	1,012
ATLÂNTICO SUL RIVER BASIN DISTRICT				
1201	South waterway	Lake Mirim and São Gonçalo Channel	From the mouth of São Gonçalo Channel (RS), on the Patos Lake to the mouth of São Miguel stream (RS), on the Lake Mirim.	250

[1]Direction: from downstream to upstream. Approximate length

Art. XX – Annex V presents the descriptive listing of river and seaports pertaining to the Federal Waterway Subsystem, according to their location; and as for the river ports, the basin or river they are on.

Art. XX – The Federal Government may apply financial resources in the waterway systems of states, Federal District and municipalities, provided there is relevant interest for the service of federal navigation, pursuant to Paragraph d of Subsection XII of Art. 21 of the Federal Constitution; by signing a proper instrument between the Federal Government and the entity with jurisdiction over the waterway.

Art. XX – Any intervention on federal waterways shall comply with the principles and goals of the National Policy on Water Resources set by Law 9,433, of January 8, 1997.

7. CONCLUSION

Based on the above considerations, the improvement to the existing law should enhance the management of the federal waterway sector, as it will make clear which waterways the Federal Government will have jurisdiction over, thus allowing for more focus on federal investments, besides distinguishing and consolidating the varied concepts concerning the sector (river, waterway, federal waterway, state waterway, jurisdiction, etc.).

As a result, it will also contribute to an increased involvement from states and municipalities in the water issue, enabling greater expansion and integration of the state and municipal networks with the federal network.

REFERENCES

BRAZIL. Decree 24,643, of July 10, 1934. Enacts the Water Code. Available at: <http://bit.ly/2paDDNI>. Accessed on April 11, 2017.

_____. Law 5,917, of November 10, 1973. Approves of the National Transportation Plan and sets forth other provisions. Brasília, DF, September 10, 1973. Available at: <https://goo.gl/RlpsNz>. Accessed on April 11, 2017.

_____. Federal Constitution, of October 5, 1988. Consolidated text up to the Constitutional Amendment 93, of September 8, 2016. Brasília, DF, October 5, 1988. Available at: <https://goo.gl/ZuK7ON>. Accessed on April 11, 2017.

_____. Law 9,433, of January 8, 1997. Establishes the National Policy on Water Resources, creates the National System for Water Resource Management, regulates the Subsection XIX of Art. 21 of the Federal Constitution, and modifies Art. 1 of Law 8,001, of March 13, 1990, which modified Law 7,990, of December 28, 1989. Federal Official Gazette, Brasília, DF, January 8, 1997. Available at: <https://goo.gl/AkYoMp>. Accessed on April 11, 2017.

_____. Law 10,233, of July 5, 2001. Provides on the restructuring of the water and land transport, creates the National Council for the Integration of Transportation Policies, the National Agency for Land Transportation, the National Agency for Water Transportation and the National Department of Transportation Infrastructure, and sets forth other provisions. Federal Official Gazette, Brasília, DF, January 8, 1997. Available at: <https://goo.gl/7UYyk1>. Accessed on April 11, 2017.

_____. Law 12,379, of January 6, 2011. Provides on the National Transportation System (SNV). Federal Official Gazette, Brasília, DF, January 8, 1997. Available at: <https://goo.gl/ybyHTm>. Accessed on April 11, 2017.

_____. Ministry of Transportation. National Plan for Navigable Inland Waterways. Brasília, DF, 1989. v. 2.

_____. Ministry of Transportation. Secretariat for the National Policy on Transportation. Strategic Waterway Plan. Brasília, DF, 2013.

_____. Brazilian Navy. Maritime Authority Standards for Navigation and Nautical Charts (Normam-28/DHN). 2011. Available at: <http://bit.ly/2oEIEuH>. Accessed on August 5, 2015.

NAVIGATION. In: DICIONÁRIO infopédia da língua portuguesa com acordo ortográfico [Infopedia Portuguese Dictionary with Orthographic Agreement]. Porto: Porto, 2003-2015. Available at: <https://goo.gl/qiRVZm>. Accessed on February 19, 2015.

SOUZA, M. M. S. A dominialidade das águas e a questão das fontes situadas em propriedade privada [Water domain and the issue of springs located in private properties]. Rio Grande: Âmbito Jurídico, 2009. v. 63.

NAVEGAÇÃO. In: DICIONÁRIO infopédia da língua portuguesa com acordo ortográfico. Porto: Porto, 2003-2015. Disponível em: <https://goo.gl/qiRVZm>. Acesso em: 19 fev. 2015.

SOUZA, M. M. S. A dominialidade das águas e a questão das fontes situadas em propriedade privada. Rio Grande: Âmbito Jurídico, 2009. v. 63.

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Distrito Federal
Telephone: (61) 3316-5338
Fax: (61) 3316-5339
E-mail: segepres@tcu.gov.br
Address: Tribunal de Contas
da União – TCU
Secretaria-Geral da Presidência
Setor de Administração Federal
Sul, Quadra 04, Lote 01
Edifício-Sede, Sala 153
ZIP CODE: 70042-900, Brasília – DF

Acre
Telephones: (68) 3321-2400/
3321-2406
Fax: (68) 3321-2401
E-mail: secex-ac@tcu.gov.br
Address: Tribunal de Contas
da União – TCU
Secretaria de Controle
Externo no Estado do Acre
Rua Guiomard Santos,
353 – Bosque
ZIP CODE: 69900-724,
Rio Branco – AC

Alagoas
Telephone: (82) 3221-5686
E-mail: secex-al@tcu.gov.br
Address: Tribunal de Contas
da União – TCU
Secretaria de Controle Externo
no Estado de Alagoas
Avenida Assis Chateaubriand,
nº 4.118 – Trapiche da Barra
ZIP CODE: 57010-370, Maceió – AL

Amapá
Telephones: (96) 2101-6700
E-mail: secex-ap@tcu.gov.br
Address: Tribunal de Contas
da União – TCU
Secretaria de Controle Externo
no Estado do Amapá
Rodovia Juscelino Kubitschek,
Km 2, nº 501 – Universidade
ZIP CODE: 68903-419, Macapá – AP

Amazonas
Telephones: (92) 3303-9800
E-mail: secex-am@tcu.gov.br
Address: Tribunal de Contas
da União – TCU
Secretaria de Controle Externo no
Estado do Amazonas
Avenida Joaquim Nabuco,
nº 1.193 – Centro
ZIP CODE: 69020-030, Manaus – AM

Bahia
Telephone: (71) 3341-1966
Fax: (71) 3341-1955
E-mail: secex-ba@tcu.gov.br
Address: Tribunal de Contas
da União – TCU
Secretaria de Controle
Externo no Estado da Bahia
Avenida Tancredo Neves,
nº 2.242 – STIEP
ZIP CODE: 41820-020, Salvador – BA

Ceará
Telephone: (85) 4008-8388
Fax: (85) 4008-8385
E-mail: secex-ce@tcu.gov.br
Address: Tribunal de Contas
da União – TCU
Secretaria de Controle
Externo no Estado do Ceará
Av. Valmir Pontes, nº
900 – Edson Queiroz
ZIP CODE: 60812-020, Fortaleza – CE

Espírito Santo
Telephone: (27) 3025-4899
Fax: (27) 3025-4898
E-mail: secex-es@tcu.gov.br
Address: Tribunal de Contas
da União – TCU
Secretaria de Controle Externo
no Estado do Espírito Santo
Rua Luiz Gonzalez Alvarado,
s/ nº – Enseada do Suá
ZIP CODE: 29050-380, Vitória – ES

Goiás
Telephone: (62) 4005-9233 /
4005-9250
Fax: (62) 4005-9299
E-mail: secex-go@tcu.gov.br
Address: Tribunal de Contas
da União – TCU
Secretaria de Controle
Externo no Estado de Goiás
Avenida Couto Magalhães,
Qd. S-30 lt.03 nº 277
Setor Bela Vista
ZIP CODE: 74823-410, Goiânia – GO

Maranhão
Telephone: (98) 3232-9970/
3232-9500/ 3313-9070
Fax: (98) 3313-9068
E-mail: secex-ma@tcu.gov.br
Address: Tribunal de Contas
da União – TCU
Secretaria de Controle Externo
no Estado do Maranhão
Av. Senador Vitorino Freire, nº 48
Areinha – Trecho Itaqui/ Bacanga
ZIP CODE: 65010-650, São Luís – MA

Mato Grosso
Telephone: (65) 3644-2772/
/ 3644-8931/ 36443164
Fax: (65) 3644-3164
E-mail: secex-mt@tcu.gov.br
Address: Tribunal de Contas
da União – TCU
Secretaria de Controle Externo
no Estado de Mato Grosso
Rua 2, Esquina com Rua C,
Setor A, Quadra 4, Lote 4
Centro Político
Administrativo (CPA)
ZIP CODE: 78049-912, Cuiabá – MT

Mato Grosso do Sul
Telephones: (67) 3382-7552/
3382-3716/ 3383-2968
Fax: (67) 3321-2159
E-mail: secex-ms@tcu.gov.br
Address: Tribunal de Contas
da União – TCU
Secretaria de Controle Externo

no Estado de Mato Grosso do Sul
Rua da Paz, nº 780 –
Jardim dos Estados
ZIP CODE: 79020-250,
Campo Grande – MS

Minas Gerais
Telephones: (31) 3374-7277/
3374-7239 / 3374-7233
Fax: (31) 3374-6893
E-mail: secex-mg@tcu.gov.br
Address: Tribunal de Contas
da União – TCU
Secretaria de Controle Externo
no Estado de Minas Gerais
Rua Campina Verde, nº 593
– Bairro Salgado Filho
ZIP CODE: 30550-340,
Belo Horizonte – MG

Pará
Telephone: (91) 3366-7453/
3366-7454/ 3366-7493
Fax: (91) 3366-7451
E-mail: secex-pa@tcu.gov.br
Address: Tribunal de Contas
da União – TCU
Secretaria de Controle
Externo no Estado do Pará
Travessa Humaitá,
nº 1.574 – Bairro do Marco
ZIP CODE: 66085-220, Belém – PA

Paraíba
Telephones: (83) 3208-2000
Fax: (83) 3533-4055
E-mail: secex-pb@tcu.gov.br
Address: Tribunal de Contas
da União – TCU
Secretaria de Controle Externo
no Estado da Paraíba
Praça Barão do Rio
Branco, nº 33 – Centro
ZIP CODE: 58010-760,
João Pessoa – PB

Paraná
Telefax: (41) 3218-1350
Fax: (41) 3218-1350
E-mail: secex-pr@tcu.gov.br
Address: Tribunal de Contas
da União – TCU
Secretaria de Controle Externo
no Estado do Paraná
Rua Dr. Faivre, nº 105 – Centro
ZIP CODE: 80060-140, Curitiba – PR

Pernambuco
Telephone: (81) 3424-8100 /
3424-8109
Telefax: (81) 3424-8109 E-mail:
secex-pe@tcu.gov.br
Address: Tribunal de Contas
da União – TCU
Secretaria de Controle Externo
no Estado de Pernambuco
Rua Major Codeceira,
nº 121 – Santo Amaro
ZIP CODE: 50100-070, Recife – PE

Piauí
Telephones: (86) 3301-2700
Fax: (86) 3218-1918
E-mail: secex-pi@tcu.gov.br
Address: Tribunal de Contas
da União – TCU
Secretaria de Controle
Externo no Estado do Piauí
Avenida Pedro Freitas, nº 1.904
Centro Administrativo
ZIP CODE: 64018-000, Teresina – PI

Rio de Janeiro
Telephones: (21) 3805-4200 /
3805-4201 / 3805 4206
Fax: (21) 3805-4206
E-mail: secex-rj@tcu.gov.br
Address: Tribunal de Contas
da União – TCU
Secretaria de Controle Externo
no Estado do Rio de Janeiro
Avenida Presidente
Antônio Carlos, nº 375
Ed. do Ministério da Fazenda,
12º andar, Sala 1.202 – Centro
ZIP CODE: 20030-010,
Rio de Janeiro – RJ

Rio Grande do Norte
Telephones: (84) 3092-2500 /
32118753
Fax: (84) 3201-6223
E-mail: secex-rn@tcu.gov.br
Address: Tribunal de Contas
da União – TCU
Secretaria de Controle Externo
no Estado do Rio Grande do Norte
Avenida Rui Barbosa, 909 – Tirol
ZIP CODE: 59015-290, Natal – RN

Rio Grande do Sul
Telephone: (51) 3228 0788 /
3778-5600 / 3778-5601
Fax: (51) 3778-5646
E-mail: secex-rs@tcu.gov.br
Address: Tribunal de Contas
da União – TCU
Secretaria de Controle Externo
no Estado do Rio Grande do Sul
Rua Caldas Júnior, nº 130
Ed. Banrisul, 20º andar – Centro
ZIP CODE: 90018-900,
Porto Alegre – RS

Rondônia
Telephones: (69) 3223-1649 /
3223-8101 / 3224-5703 /
3224-5713 / 3301-3602 / 3301-3604
Fax: (69) 3224-5712
E-mail: secex-ro@tcu.gov.br
Address: Tribunal de Contas
da União – TCU
Secretaria de Controle Externo
no Estado de Rondônia
Rua Afonso Pena,
nº 345 – Centro

ZIP CODE: 76801-100,
Porto Velho – RO

Roraima
Telephones: (95) 3623-9411/
3623-9412 / 3623 9414
Telefax: (95) 3623-9414
E-mail: secex-rr@tcu.gov.br
Address: Tribunal de Contas
da União – TCU
Secretaria de Controle Externo
no Estado de Roraima
Avenida Getúlio Vargas
nº4570-B – São Pedro
ZIP CODE: 69306-700, Boa Vista – RR

Santa Catarina
Telephone: (48) 3952-4600
Fax: (48) 3952-4624/ 3952-4636
E-mail: secex-sc@tcu.gov.br
Address: Tribunal de Contas
da União – TCU
Secretaria de Controle Externo
no Estado de Santa Catarina
Rua São Francisco,
nº 234 – Centro
ZIP CODE: 88015-140,
Florianópolis – SC

São Paulo
Telephone: (11) 3145-2600 /
3145-2601 / 3145-2626
Fax: (11) 3145-2602
E-mail: secex-sp@tcu.gov.br
Address: Tribunal de Contas
da União – TCU
Secretaria de Controle Externo
no Estado de São Paulo
Avenida Paulista, nº 1842
Ed. Cetenco Plaza Torre
Norte 25º andar – Centro
ZIP CODE: 01310-923, São Paulo – SP

Sergipe
Telephones: (79) 3301-3600
Fax: (79) 3259-3079
E-mail: secex-se@tcu.gov.br
Address: Tribunal de Contas
da União – TCU
Secretaria de Controle Externo
no Estado de Sergipe
Avenida Dr. Carlos Rodrigues
da Cruz, nº 1.340
Centro Administrativo
Augusto Franco – CENAF
ZIP CODE: 49080-903, Aracaju – SE

Tocantins
Telephone: (63) 3232-6700
Fax: (63) 3232-6725
E-mail: secex-to@tcu.gov.br
Address: Tribunal de Contas
da União – TCU
Secretaria de Controle Externo
no Estado do Tocantins
302 Norte, Av. Teotônio Segurado
Lote 1A – Plano Diretor Norte
ZIP CODE: 77001-020, Palmas – TO

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