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ConstruBusiness

12th Brazilian Construction Congress

INVESTING WITH **ACCOUNTABILITY**

December, 2016 | 12th Edition

Brazil 2022: planning, building, growing

FIESP | DEPARTAMENTO DA INDÚSTRIA DA CONSTRUÇÃO

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12th ConstruBusiness – Brazilian Construction Congress
Investing with accountability

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Contents

I gladly see, once more, a pertinent initiative of the Federation of Industries of the State of São Paulo to present to discussion subjects that concern the country´s present and future. Indeed, holding the ConstruBusiness - Brazilian Construction Congress - 12th Edition is a unique undertaking to discuss one of the main topics of public management we are developing in Brazil, since the current government took office.

We have a course. The Constitutional Amendment Proposal 241, which sets forth a public expense limit, is essential for the new times Brazil is required to face. One can already notice a positive expectation reversal, with a solid rise in the economic agent confidence levels.

This proposal approval shall be the blending of tax accountability with social accountability. We shall surely foster the public account adjustment. We are setting forth an expense limit, which shall be recorded in the Constitution itself, providing the conditions for Brazil to be on the right track.

We have huge tasks ahead of us and rely on the private initiative participation. Even before adopting the public expense limit, our government adopted modern means for the public service concession. We are certain that the new rules shall attract local and foreigner investors, and, more than that, they shall create new jobs. This is our greatest challenge: giving priority for a generation of new jobs.

We are committed to developing the Investment Partnership Program. Thus, the government shall foster the public power interaction with the private initiative to induce the economic development. It is about time that we leave some dogmas behind, which, for decades, hindered our development. Let us be clear: the public power cannot do everything. What we need is relying on the private initiative presence, as a development and job inducing agent.

In order to overcome the worst economic crisis of its history, Brazil needs, more than ever, to improve its infrastructure and unlock the investments. Brazil has only one path ahead: growing.

Michel Temer
President of Brazil´s Federative Republic

The Brazilian Construction Congress, ConstruBusiness, is here to stay. In its 12th Edition, one of the most relevant public policy debate national forums concerning the construction manufacturing chain has an essential role in its field. It relies on the participation of businessmen and private initiative representatives, of the public power, academic environment and society.

The event is a wide-reaching reference source, with diagnostics and forecasts, and it also provides guidelines and proposals to improve the business environment and the business competitiveness increase.

In the last ConstruBusiness edition, held in March, 2015, the main actions required for Brazil to reach optimal infrastructure levels, decrease its housing deficit, the logistic costs and Brazil Cost in general were presented.

A propositional agenda was also introduced to improve the work cycle - Fiesp's Compete Brazil Program -, with actions forecast in the following fields: construction management, planning and process, funding and manufacturing chain.

This ConstruBusiness edition focus on this agenda, which is essential to recover an ongoing undertaking flow in the country. We need to resume the investments, work in priority actions so that this new work cycle is led by the private sector, a favorable and transparent business environment, and conditions so that companies of all sizes can participate, resulting, this, in a much more positive effect on the economy.

Paulo Skaf
President of the Federation of Industries of the State of São Paulo, Fiesp, and the Industry Center of the State of São Paulo, Ciesp

The Construction has a multiplying effect. It stands for 8% of Brazil´s GDP, creates direct and indirect jobs, helps to urbanize cities, provide basic sanitation and the consequent health quality increase in the surroundings, helps to decrease the housing deficit and improve the country´s infrastructure. The construction market in Brazil and the world has been one of the main growth and job generation fosterers.

Every Brazilian wants a place to live, and with the new family structure, in which more youngsters are forming families, there is a repressed demand for new houses. It is repressed as, due to the economic crisis, few Brazilians take changes with loans, as they do not know if they will keep in their jobs.

The downfall of the economy, caused the construction local demand decrease, led to the customer default and to rescissions, and also affected the company working capital that, with no cash flow, had no cash for daily operations.

Because of the current government of Michel Temer, and also of the immediate signs of industry and consumer confidence recovery, the economic and political crisis this country withstood is about to be overcome. For instance, the International Monetary Fund (IMF) estimates the Gross Domestic Product (GDP) will grow in 2017, the inflation rate seems to be decreasing, the effective activity level index compared to the usual rose 1.6 from June to July, 2016, and the job index rose 1.6 in the same period.

Nevertheless, we still have to overcome the Brazil Cost, simplify the tax setting and decrease the interest rate. There were major investment cuts in works all over the country. More than that, the country´s infrastructure and housing projects were paralyzed or still remain in the implementation stage.

Only new national and international, private and public, investments, by means of infrastructure concessions, new biddings, the continuity of the tendered works with accountability and creation of more credits, can generate a new work cycle and heat the economy, with the consequent Brazilian life standard improvement, and also the necessary job generation.

In this ConstruBusiness 12th Edition, the private initiative and the representative agencies, along with the public power, are united to progress in Compete Brazil 2022 program. In this program, government and society receive a State project proposal, Brazil´s project, along with an improvement propositional technical notebook in competitiveness, housing, infrastructure and urban mobility.

Engineer José Carlos de Oliveira Lima
Vice-president of the Federation of Industries of the State of São Paulo (Fiesp)
President of the Construction Industry Senior Council (Consic-Fiesp)
President of the Decision Making Councils of National Cement Product Market Union (Sinaprocim)/ Cement Product Market Union of the State of São Paulo (Sinprocim)

ConstruBusiness - Brazilian Construction Congress - has an essential role in the public policy development and discussion to strengthen the manufacturing chain, which, consequently, enable Brazil´s growth. We restate our understanding that the improvement of the market business environment shall create conditions to invest in urban development and economic infrastructure, solid inducers to job and revenue recovery.

In order to contribute to the current setting, the Department of the Construction Industry of the Federation of Industries of the State of São Paulo (Deconcic-Fiesp) launches the 12th ConstruBusiness - Investing with Accountability.

This edition updates and enhances the common work agenda that engages the various manufacturing chain links, by means of Fiesp's Compete Brazil Program, that sets forth actions in the construction management, planning and process, funding and manufacturing chain fields, and points out the investment needs up to 2022 to increase the competitiveness, with positive impacts in the Brazilian economy.

Moreover, it points a direction to resume investments and the start of a new undertaking cycle, as it provides emergency measures and actions that this government and the next must take into account to reach optimal levels in housing, sanitation, urban mobility, logistics and transports, power and telecommunications.

This edition´s theme reinforces the private initiative and public power engagement relevance so that the undertakings are contracted and completed with efficiency, productivity and accountability.

The Brazilian construction, following its call, is committed with this new cycle and willing to collaborate with new paths to development.

Carlos Eduardo Pedrosa Auricchio
Vice-president of the Construction Industry Senior Council (Consic-Fiesp)
Senior Director of the Department of the Construction Industry (Deconcic-Fiesp)

Foreword

12th ConstruBusiness - Investing with Accountability presents the construction manufacturing chain economic and financial statistics update, its development from 2007 on and the recent crisis. Based on last years´ economic development, scenarios for the economic growth, urban development and infrastructure expansion needs in the country from 2017 to 2022 are sketched. Moreover, the issue also discusses the obstacles that decrease the work speed, approaching its origins, consequences to society and what is required to overcome them. Finally, the notebook presents the lines of work and the proposals of Compete Brazil Program of the Federation of Industries of the State of São Paulo (Fiesp) for construction, approaching subjects and paths to increase the market competitiveness.

Chapter 1 opens a discussion on the role of the productive chain of construction in the Brazilian economy, the investment resumption in the 2000's and the recent economic crisis. Besides that, it summarizes the investment needs in the urban development and economic infrastructure fields, which shall be justified in detail in the next chapters. The challenges are great, but the capital formation effort is a necessary condition for economic and social development, as the international comparison provided in the chapter shows.

Chapter 2 performs the Brazilian construction chain economic and financial accounts, providing information on work and service investment values, the Gross Domestic Product (GDP) and jobs, among other indexes, for the construction manufacturing chain fields. In this edition, similar to what was done in the 11th ConstruBusiness, the information is the most current ones. The Brazilian Geography and Statistics Institute (IBGE) data, mostly related to 2013 and 2014, were supplemented with estimates to 2016 performed based on information available up to October 20, reinforcing the effort to make the construction manufacturing chain fields as updated as possible.

The Brazilian economy perspectives from 2017 to 2022 are introduced in **Chapter 3**. The compatible investment requirement forecasts with the macroeconomic trends are discussed and introduced in **Chapters 4** and **5**. The urban issues - housing, sanitation and mobility - are dealt with in integrated form, thinking of the life standard balanced improvement in Brazilian cities. The issues related to economic infrastructure – the power, transports and telecommunications - are highlighted separately and in integrated form to the investment requirement analysis in such fields.

Chapters 6 and **7** provide the analyses of what is necessary to be done to develop the construction chain, speeding up the undertakings and enhancing its manufacturing field competitiveness. Such issues were debated in several work groups organized by the Department of the Construction Industry (Deconcic): Fiesp's Compete Brazil Program; Accountability with Investment, Industrialized Construction; Civil Construction Materials and Components (that is part of the Brazilian Cycle of life Assessment Program); Building Information Modeling (BIM); Building Safety; and Real Estate Market Business Environment. Each group listed the main challenges related to the subjects, prioritizing them and pointing out the paths to solve them. Moreover, the groups debated successful experiences in some fields. This broad debate among leaders resulted in this policy and action set supported in the 12th ConstruBusiness.

It should be highlighted, finally, that this edition provides a case analysis substrate on delays and interruptions in urban development undertakings and economic infrastructure. The Mário Covas Ring Road Northern section assessment, performed by Fiesp's Construction Observatory, discloses the undertaking delay, which start-up should take almost double of the time required. Next, a country´s sanitation work progress assessment is introduced, which was developed by Trata Brazil Institute and is summarized in this edition in order to point out the harsh situation this essential area to urban development is now.

1. Construction, competitiveness and economic and social development

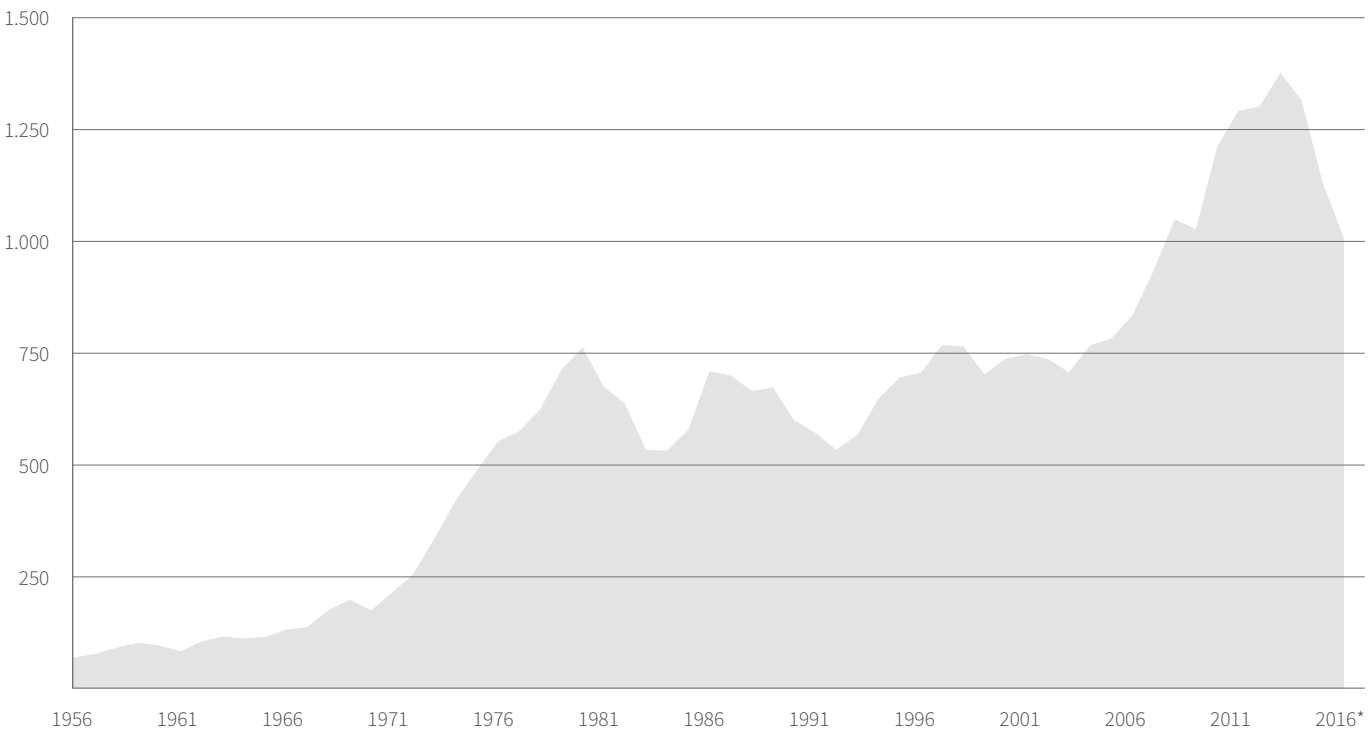
Economic recovery in the 2000's

The economic growth and stability resumption were Brazilian society achievements, which created the social development bases of the last twenty years. The inflation rate containment within acceptable levels, the recovery of the State's investment capacity and the institutional changes introduced in the economic order created the conditions for investment increase in the Brazilian economy.

From a historical standpoint, the fund volume invested in the last years was greater than in the early 2000's. For instance, in 2003, the gross capital formation reached BRL702 billion1, a value that corresponds to only 51.4% of what was invested in 2013, the record year of capital formation in the country (BRL1.366 trillion). The change took place gradually, but from 2007 on, with the long-term credit expansion and the federal government contribution increase for investment projects, the fixed capital gross formation level has changed in the country, as the Graph 1.1 shows.

Within such recovery, the civil construction activity expansion took place. As the construction manufacturing chain consolidated data introduced in Chapter 2 point out, the work investment, at 2016 prices, rose from BRL545.5 billion in 2007 to BRL733.8 billion in 2014, indicating an actual 4.3% growth rate a year.

The values invested in works were transformed into wages, taxes and construction company profits, into construction material and service purchase, generating effect in all construction chain. The construction manufacturing chain Gross Domestic Product (GDP) reached a historical record of BRL593.8 billion (values at 2016 prices) in 2014.



Graph 1.1. Fixed capital gross formation, in billion reais, at 2016 prices. *Estimate. Source: Brazilian Geography and Statistics Institute (IBGE). Elaboration: Ex Ante Consultoria Econômica.

[1] Values at 2016 prices. Source: Brazilian Geography and Statistics Institute (IBGE, 2015b).

More important than the business recovery was such work effect over social welfare and competitiveness. The real estate market expansion and the subsidized program creation provided families access to housing. The Minha Casa, Minha Vida program had contracted around 3.755 million houses by the end of 2014, what is equivalent to an annual average of 626 thousand houses to families with a monthly income of up to BRL5 thousand from 2009 to 2014.

This investment volume caused Brazil´s housing deficit to drop. According to João Pinheiro Foundation (FJP, 2016), based on the 2014 National Household Sample Survey (Pnad) and the 2010 Demographic Census, the deficit decreased from 6.941 million families, in 2010, to 6.068 million, in 2014. That means there were a 873-thousand family reduction from 2010 to 2014, or yet, a 3.3% deficit decrease a year in the period. There was a housing deficit retraction in all country´s regions, especially in the Northern region, where there was a 6.4% drop a year, with an absolute reduction of roughly 191 thousand families. The country´s Northeastern region also faced a meaningful housing deficit drop, especially the state of Bahia, where 84 thousand families were no longer part of the housing deficit, what is equivalent to a 4.3% decrease a year from 2010 to 2014 (see data on Table 4.3, Chapter 4).

Up to 2014, the economic infrastructure also rose, which reached values of BRL114.0 billion in the period average from 2007 to 2014 (see data on Table 5.10, Chapter 5). This value is equivalent to 2.7% of Brazil´s GDP, pointing a meaningful recovery concerning the values invested in the 1980's and 1990's. If they are ongoing, the impacts of such investments over competitiveness will be huge, as they will assure the transport, power and telecommunications service offer at competitive prices.

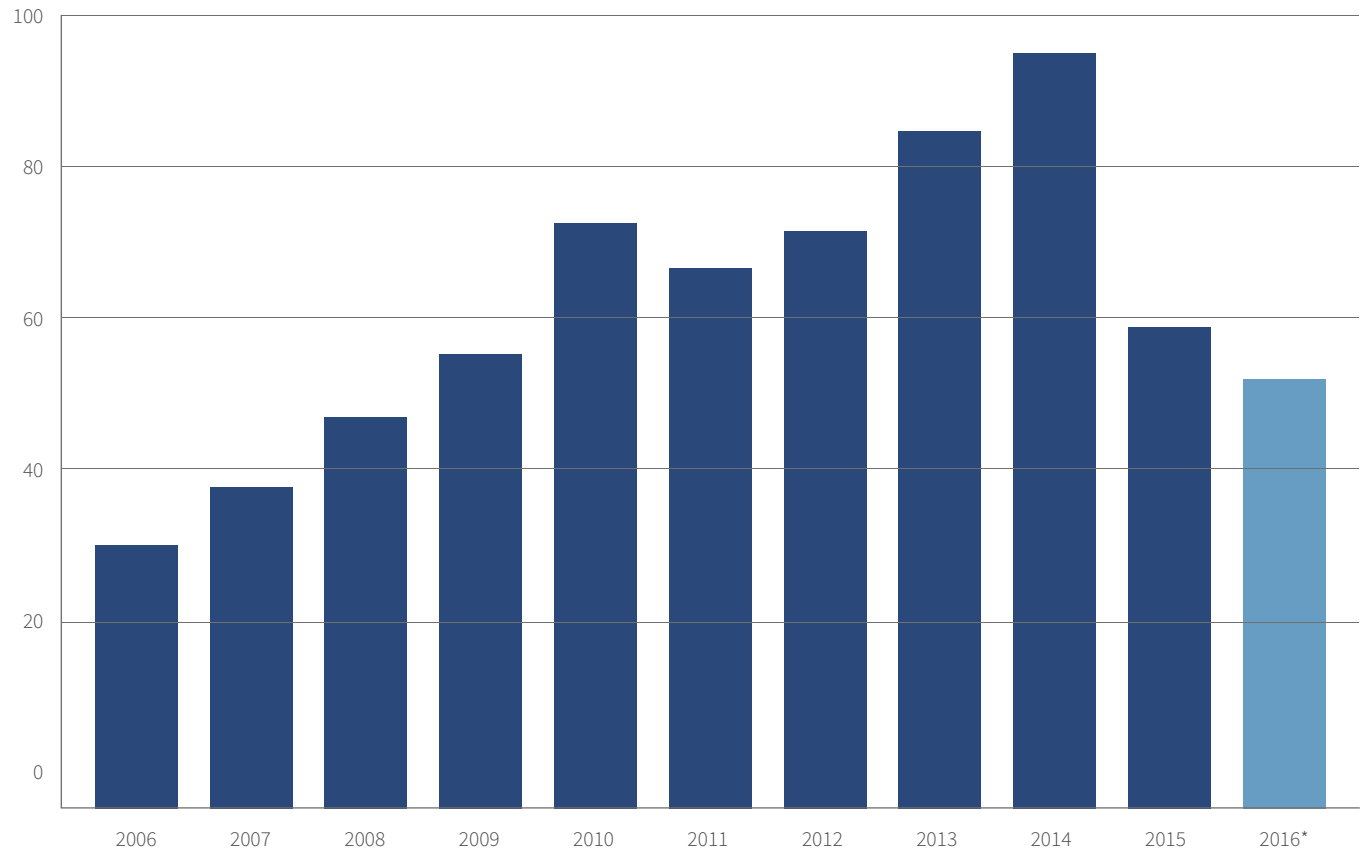
That means that, besides contributing to job generation during the works, the infrastructure investments will increase, as it has already happened in recent years, the competitiveness and productivity of all economy, with mid- and long-term effects. The infrastructure relevance to the economy is acknowledged in several academic articles that confirmed its positive effect on economic growth and development of the nations. The main studies include the articles of Calderón and Servén (2004), Estache, and Garsous (2012).

Tax and economic crisis

Despite the impressive economic investment levels and economic growth recovery concerning the previous decades, since 2014 Brazil has experienced an also outstanding economic crisis, which has provoked investment retraction, recession and unemployment. In the core of this movement, we find the Brazilian industry, what led to the tax collection dynamism loss and tax crisis.

From 2014 to 2016, the fixed capital gross formation will experience a 23.4% retraction, reducing the construction investment value from BRL733.8 billion, in 2014, to BRL529 billion, in 2016 - 19.3% drop. Thus, the construction chain GDP shall end 2016 with an accumulated fall of approximately 16% in two years and closing of over a 1 million jobs with work card registration.

In the last two years, the industrial production fell intensely and there was a tax collection retraction, mainly the ones associated with the processing industry - Tax on the Circulation of Goods and Services (ICMS), for instance. That led to an expense retraction, with serious consequences of the government investment in all areas. Graph 1.2, which provides information on the federal government investments, is a good hint of such phenomenon. The capital expenses, that had increased from BRL31.9 billion, in 2006, to BRL91.4 billion, in 2014, should return to the 2008 level in 2016 (BRL50 billion), i.e., the drop should reach around 45% in two years.



Graph 1.2. Federal government capital investments, in billion reais, at 2016 prices. *Estimate. Source: National Treasury Secretary and Brazilian Geography and Statistics Institute (IBGE). Development: Ex Ante Consultoria Econômica.

At this time of crisis, it is deeply relevant to highlight the fact that the public investment cuts, in spite of contributing to the tax adjustment, are worsening it, as the tax crisis takes place with meaningful collection losses. Along with the public investment and subsidy cuts for urban development and infrastructure fields, there are credit and private investment cuts. That deepens the recession, leading to federal, state and municipal government revenue drops. As pointed out in Chapter 2, at every BRL100.00 of construction investments, the direct tax collection is BRL25.00. Considering the construction manufacturing chain multiplying effects, the tax and contribution collection retraction can reach BRL54.00, i.e., the government cuts BRL100.00 in expenses and loses BRL54.00 in collection, leading to an actual adjustment of only 46% of the target.

Investment need

It is with the competitiveness increase and Brazilian population life standard improvement perspective that 12th ConstruBusiness introduces the needs for urban development investments and economic infrastructure expansion for the 2017 to 2022 horizon. Such estimates were performed considering the Brazilian society needs and the possibilities in technical and funding terms, being a long-term sustainable trajectory. As the data of Table 1.1 point out, such two-area investments should be roughly BRL682 billion a year, what is equivalent to 10.6% of Brazil´s GDP in this period average.

Table 1.1. Urban development and economic infrastructure investment needs, in billion reais*, from 2017 to 2022

	Period total	Annual average	GDP (%)
Urban development	2,325.694	387.616	**6.1%**
Housing	2,166.155	361.026	**5.5%**
New houses	1,233.492	205.582	**3.1%**
Reforms and maintenance	932.662	155.444	**2.4%**
Sanitation	78.887	13.148	**0.2%**
Mobility	80.652	13.442	**0.2%**
Other urban works**	66.074	11.012	**0.2%**
Economic infrastructure	684.490	114.082	**1.7%**
Transports**	408.433	68.072	**1.0%**
Electric power	105.519	17.586	**0.3%**
Mineral assets (Oil and Gas)[a]	123.983	20.664	**0.3%**
Telecommunications	46.555	7.759	**0.1%**
Other construction service works[b]	1,083.334	180.556	**2.8%**
Total	4,093.517	682.253	**10.6%**

*At 2016 prices. **It includes the street and pavement construction, draining, hazardous areas care, etc. ***It includes all means of transportation, works of art, power facilities and shipment stations. alt includes oil and ore pipelines. bNon-residential buildings (hospitals, schools, offices, business centers, etc.), industrial and storage facilities. Source: Ex Ante Consultoria Econômica.

In the urban development field, a great welfare increase frontier to the Brazilian society, it is necessary to foster and grant credit to housing, sanitation and urban mobility fields. In the housing field, it is necessary to expand investments, subsidies and real estate credit of the Minha Casa, Minha Vida Program to 750 thousand units a year from 2017 to 2022. The housing investment needs total BRL205 billion a year to new houses and BRL155 billion to reforms, expansions and business building construction.

The expansion of water supply and sewage collection networks of sewage treatment and solid waste treatment plants should require BRL13 billion a year. In the mobility field, BRL13.4 billion a year are required for projects in subways, urban trains, bus rapid transit (BRT), light rail vehicle (LRV), bicycle lanes and other public transportation solutions. Moreover, it will be necessary to foster the fund development for real estate business funding (offices, warehouses, etc.). There is also the need for BRL11 billion a year in investments in other urbanization works, which include the construction and expansion of streets and sidewalks, squares and parks, urban soil draining, hazardous area care, etc.

In order to assure a sustained growth path, it will also be essential to foster and grant credit for investments in cargo and passenger transport, power and telecommunications fields, aiming at the national infrastructure development and the service expansion with cost cutting. For that matter, it is necessary to expand the subsidized investments and the credit in the investment programs in the infrastructure sector, from 2017 to 2022. The transport investment requirements total BRL68.1 billion a year to expand and maintain highways, railways, ports and airports. Besides that, BRL17.6 billion are required to the electricity generation, transmission and distribution system, and BRL20.6 billion to mineral exploitation expansion projects, including the oil and gas production and distribution.

The telecommunications market needs a BRL7.8 billion investment a year for the next six years. What is more, the Brazilian economy growth requires BRL180.6 billion in non-

residential buildings, that include the construction and maintenance of hospitals, schools, offices, business centers, industrial and storage facilities.

Table 1.2 provides an international comparison[2] of construction investment, highlighting the construction expenditure and housing reforms and infrastructure and other building investments. The values are in North-American dollars per inhabitant, at 2011 prices, adjusted at purchase power parity, and as per capita GDP percentage of the countries. The countries are ordered from the highest to the lowest per capita expenditure with construction investment.

It should be noted that Brazil had, in 2014, the second worst ranking in the sample nation set. It is worth mentioning that was the year the country invested more in constructions, getting closer to the required capital volume. While such country average invested USD 3,287.10 by inhabitant, Brazil invested USD 1,124.49 per person, i.e., one third of the sample average pattern. Even developing countries, including Mexico and Russia, invested much more than Brazil. Thus, the need to, at least, recover the economic conditions to resume the investment at a compatible volume to the long-term path that was interrupted in 2014 is notorious.

In terms of revenue commitment, Brazil used around 10% of its GDP (adjusted at purchase power parity) for civil construction capital asset purchase. Such percentage is similar to the country sample average, but one should take into account that most of these nations already had larger and with greater quality building and infrastructure stocks compared to Brazil. In order to reach the developed country level, it would be necessary to invest a greater national revenue percentage, as Mexico (14.5%) and South Korea (14.7%) did.

However, in the country macroeconomic setting until 2022 (see Chapter 3), Brazil will not be able to achieve such commitment due to its tax, social security and competitiveness issues. The target of achieving 10.6% of the GDP in construction investments, even though it does not enable a faster convergence to the developed country standards, is already a challenge that, if met, will put the country back on the growth track with long-term social development.

[2] The sample was selected by the data availability. This country group had, in 2014, a 1.5 billion people population (20% of the world population, approximately) and a USD 51.8 trillion GDP, which would be equivalent to the world income two-thirds in this year.

Table 1.2. Construction investments, countries selected, in USD *per capita**, 2014.

Country	Construction investment			*GDP per capita*	Construction investment as GDP share (%)
	Houses	Other buildings and structures	Total		
Norway**	4,821.10	10,239.92	**15,061.03**	94,735.13	15.9%
Luxembourg	3,648.92	6,395.54	**10,044.46**	107,829.93	9.3%
Australia	3,104.87	6,255.24	**9,360.11**	57,765.74	16.2%
Canada	3,332.55	4,670.98	**8,003.53**	47,706.29	16.8%
Switzerland	3,827.12	3,644.28	**7,471.40**	79,667.68	9.4%
Finland	2,625.52	2,676.41	**5,301.93**	47,284.73	11,2%
Sweden***	1,981.40	3,196.32	**5,177.73**	57,453.53	9.0%
Austria	2,039.36	3,017.21	**5,056.57**	47,183.73	10.7%
New Zealand	2,558.04	2,424.88	**4,982.92**	40,106.03	12.4%
Belgium	2,632.13	2,333.95	**4,966.08**	44,772.73	11.1%
Denmark	2,366.90	2,505.67	**4,872.57**	57,550.11	8.5%
France	2,424.96	2,432.24	**4,857.20**	40,559.71	12.0%
Germany	2,661.51	1,825.42	**4,486.93**	44,968.04	10.0%
Iceland	1,442.92	2,857.43	**4,300.35**	48,805.43	8.8%
Netherlands	1,537.00	2,694.52	**4,231.52**	49,362.72	8.6%
South Korea	1,186.03	2,953.46	**4,139.49**	28,175.18	14.7%
Great Britain	1,642.74	2,427.75	**4,070.49**	43,962.62	9.3%
United States	1.622.19	2,303.10	**3,925.29**	51,789.71	7.6%
Japan	1,137.98	2,526.02	**3,664.01**	35,177.36	10.4%
Israel	2,175.10	1,309.10	**3,484.20**	34,812.09	10.0%
Ireland**	1,035.48	2,233.82	**3,269.30**	54,415.01	6.0%
Italy	1,555.55	1,277.99	**2,833.54**	33,289.84	8.5%
Spain	1,231.85	1,594.82	**2,826.67**	28,070.65	10.1%
Estonia	731.64	1,587.25	**2,318.89**	18,827.19	12.3%
Slovenia	491.97	1,543.44	**2,035.42**	22,248.00	9.1%
Czech Republic	610.03	1,220.39	**1,830.41**	18,156.07	10.1%
Latvia	338.46	1,452.18	**1,790.64**	14,695.44	12.2%
Lithuania	385.66	1,330.74	**1,716.39**	15,389.33	11.2%
Portugal**	495.96	1,062.95	**1,558.91**	20,135.36	7.7%
Russia***	353.08	1,188.11	**1,541.19**	14,008.62	11.0%
Slovakia	454.45	1,056.15	**1,510.60**	17,376.21	8.7%
Mexico***	623.03	850.61	**1,473.64**	10,157.35	14.5%
Hungary	212.88	1,121.63	**1,334.51**	13,364.65	10.0%
Brazil	503.53	620.96	**1,124.49**	11,328.83	9,9%
Greece	202.25	810.29	**1,012.54**	19,832.84	5.1%
Total	1,353.23	**1,933.87**	**3,287.10**	**33,190.38**	**9,9%**

*Values at 2011 prices, adjusted at currency purchase power parity. **2013 values. ***2012 values. Source: Organization for Economic Co-operation and Development (OECD) and World Bank. Development: Ex Ante Consultoria Econômica.

Proposals

The 12th ConstruBusiness provides, besides construction manufacturing chain analyses and estimates of investments required to keep the urban development and economic infrastructure paces seen in the last years, a proposal set to speed up the construction work cycle and increase the country´s competitiveness. The proposals are listed below.

Emergency measures

Supporting actions that lead to the tax adjustment, the fast interest rate drop and the private sector credit expansion, in order to recover the investments to levels that resume the path interrupted in 2014. Such actions will enable opening over 1 million jobs, the revenue and consumption recovery and the tax collection expansion, contributing to tax adjustment and recession end.

Urban development

Assuring the funding of construction and reform of 1.5 million houses a year, what is equivalent to BRL361 billion investments a year. Such investment funding should rely on long-term stable sources and public resources to provide housing and urban service to the low-income population. Reformulating the national housing, sanitation and mobility plans and adequate the regulatory framework, aiming at expanding the urban development investments, and also fostering the land regularization of the current real estate stock.

Economic infrastructure development

Assuring the BRL114 billion funding a year in economic infrastructure undertakings. Reforming the institutional bases and granting credit to foster investments in cargo and passenger transport field, in all means, power and telecommunications. The investment expansion is a necessary condition to resume the national infrastructure development and service expansion, with cost cutting. Fostering the private participation expansion in investment programs, and also complying the regulatory framework to attract investors and expand the funding sources.

Accountability with investment

Reducing the country undertaking cycle, removing the obstacles that create unpredictability to business and compromise the fair undertaking progress. Developing mechanisms to ensure the legal security of contracts, reducing the risks that drive away investments. Improving the institutions in order to assure the investment accountability, meeting deadlines and financial schedules.

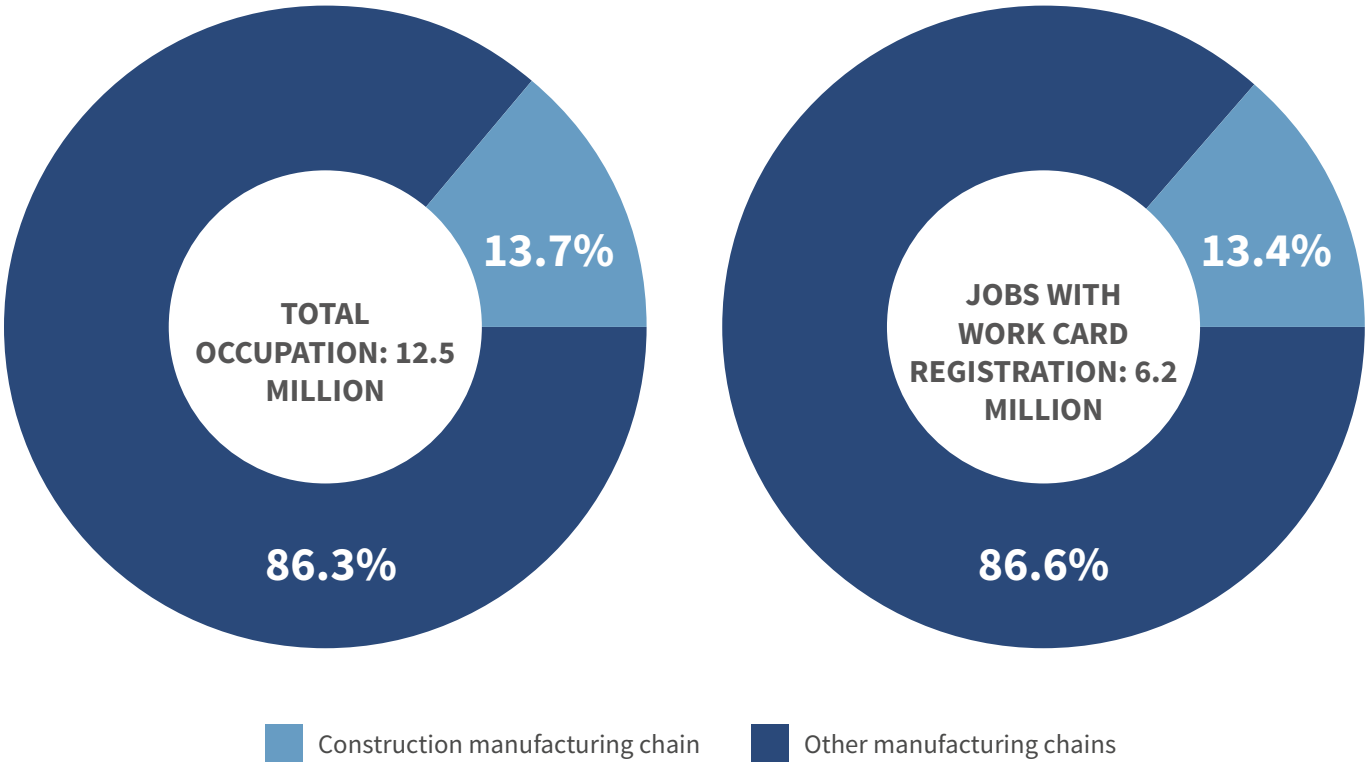
Competitiveness increase

Fostering actions that lead to technological innovation, cut costs, and expand the construction manufacturing chain productivity, and also fostering private and public management, aiming at company efficiency gains. Such goals can be achieved by means of fostering the management and planning tool use (*building information modeling [BIM]* platform and Work Licensing Integrated System [Silo]; for instance), fostering the industrialized construction systems, power cost cutting and professional qualification. Supporting the institutional development, in order to improve the construction business environment..

2. Construction manufacturing chain: construction investment development and job and revenue generation

The construction chain gathers companies of all manufacturing stages and investors in any asset type produced by construction. The investors are in the edge of this chain, demanding houses, offices, business centers, roads, metropolitan train networks, airports and all sorts of buildings and infrastructure assets. Companies design and build properties and infrastructure works, manufacture or sell construction materials, fund operations, among other activities.

In Brazil, it is estimated that this company set gathers around 6.2 million workers with work card registration in 2016, what stands for 13.4% of the country´s workforce. Considering the entrepreneurs, independent workers, workers with no work card registration and construction chain apprentices, the working people number should reach 12.5 million in 2016, or 13.7% of the working population in the country (Graph 2.1).

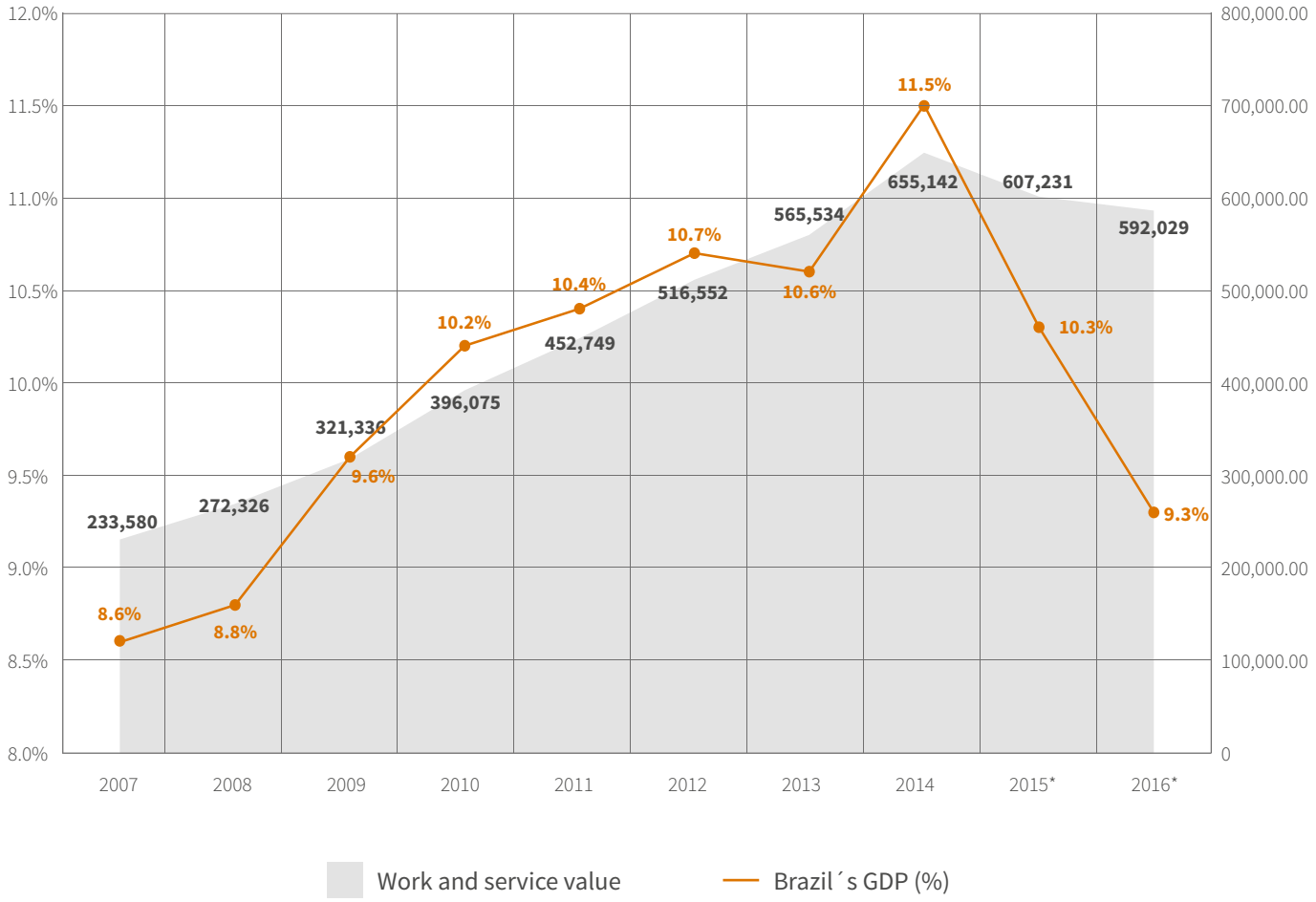


Graph 2.1. Construction manufacturing chain shares in occupation and jobs with work card registration, Brazil, 2016. Forecasts performed based on job, manufacturing, wage, and field price progress, as per Brazilian Geography and Statistics Institute (IBGE), Brazilian Construction Industry Chamber (CBIC) and Ministry of Labor. Source: Ex Ante Consultoria Econômica.

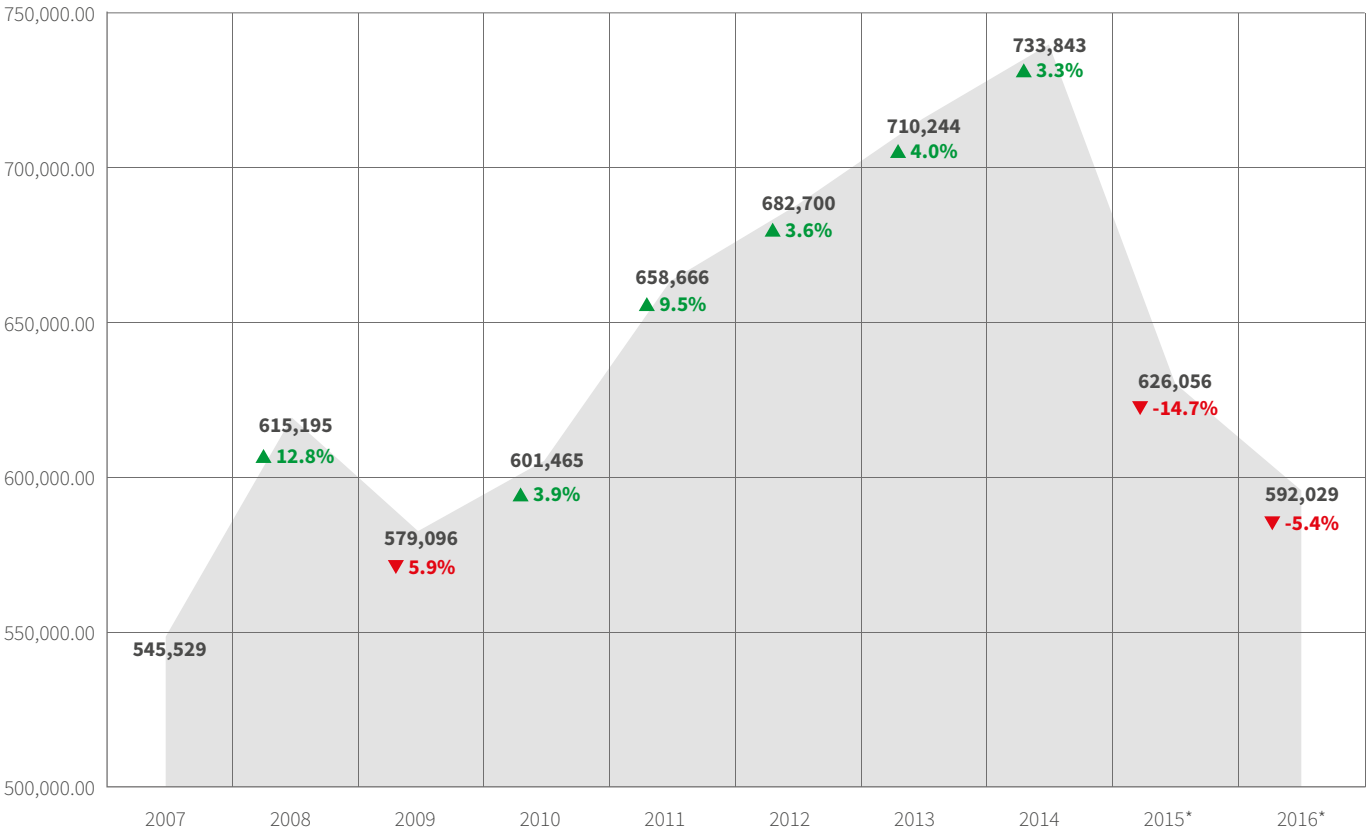
Work investment

It is estimated that construction investments will reach BRL592 billion in 2016, what is equivalent to around 60% of the fixed capital gross formation and 9.3% of the country´s Gross Domestic Product (GDP) in 2016 (Graph 2.2). In the quantity the value of works executed by the construction companies is included, what should amount to roughly BRL347 billion, and the value of works performed by independent workers and reforms, at the value of BRL245 billion. That means that, in 2016, the total of investments performed in the country in roads, airports, sewage network, schools, hospitals, residential and business buildings, industries, maintenance works and reforms is close to BRL2.9 thousand by inhabitant.

Although the data point out a better situation to the observed in the middle of the last decade, the performance seen in the last years is troublesome. The construction investment value performed in 2016 should be approximately 10% lower than the works executed value in 2014, the year the construction investments reached 11.5% of Brazil´s GDP. That is equivalent to an approximately 20% drop in actual terms over the last two years. Such work actual value progress since 2007 is introduced in Graph 2.3.



Graph 2.2. Construction investments in million reais and Brazil´s Gross Domestic Product (GDP) share. *Estimates and forecasts based on field job, manufacturing, wage and price progress, as per data of Brazilian Geography and Statistics Institute (IBGE), Brazilian Construction Industry Chamber (CBIC) and Ministry of Labor. Source: Ex Ante Consultoria Econômica.



Graph 2.3. Construction investments, in million reais, at constant 2016 prices (values adjusted for inflation by the civil construction price index). *Estimates and forecasts based on field job, manufacturing, wage and price progress, as per data of Brazilian Geography and Statistics Institute (IBGE), Brazilian Construction Industry Chamber (CBIC) and Ministry of Labor. Source: Ex Ante Consultoria Econômica.

Value of the works performed by construction companies

According to the Annual Construction Industry Survey (Paic) of the Brazilian Geography and Statistics Institute (IBGE), out of the works executed in 2014, BRL191.6 billion corresponded to the building construction value. The urban infrastructure works reached BRL12.9 billion investments. It is estimated that the construction technical services associated with such two activities totaled BRL26.7 billion investments. Thus, urban development investments performed in 2014 reached BRL231.2 billion, what corresponded to 59.4% of the construction work and service value in that year.

The economic infrastructure works - that include the construction of highways, railways, special works of art, port works, pipe transport, electric power and telecommunications infrastructure - added BRL102.3 billion in 2014. The construction specialized services used in these works reached the BRL35 billion value. Moreover, there were BRL14.6 billion of investments in industrial erections and facilities. Thus, the economic infrastructure works totaled BRL151.9 billion in 2014, i.e., 40.6% of the construction work and the service value total performed by the construction companies.

Adding to the BRL5.9 billion value with single revenues (demolition material sale, parking lot property rental, real estate rental in negotiation, etc.), the work and service value performed by the construction companies reached BRL389 billion in 2014, a very close value to the technical notebook forecast of 11th ConstruBusiness, which was BRL387 billion. Using the same method, it is possible to forecast the value of works executed by the construction companies in 2016, considering as a basis the manufacturing, job and construction price progress from 2014 on. It is estimated that such work value dropped 11.8% since 2014, reaching BRL347 billion in 2016. So, there was a reduction of BRL42.4 billion in construction investment value performed by the construction companies. That is equivalent to an actual 20.4% retraction of the investments in the period.

Manufacturing stages

Manufacturing is seen in the worksites all over the country. There, the workers operate machines, equipment and tools that assemble, aggregate and transform several construction materials. The material industry manufactures the inputs used at the works: cement and mortar; concrete and cement and fiber cement artifacts; rebars and metal products; asphalt products; sections and squares; bricks, tiles and ceramic products; pipes, fittings and plastic products; glass; metal toilet fittings and valves; elevators and escalators, etc.

These industrial products, on the other hand, use raw materials from other industries, like the mining industry. Examples are the rebar manufacturing, that uses pig iron produced from iron ore, and the aluminum square manufacturing, made from sections that come from metal manufactured from bauxite. It is worth noting that most industrial chain that manufacture construction materials are energy intensive - as they use large natural gas or electric power volumes - or the power expense weight is high in the industrial processing cost.

Part of the construction materials is aimed at industrialized systems, and other share is forwarded to the gross and retail market, responsible for directing the materials to real estate construction and heavy construction (infrastructure), according to their demands. The industrialized systems are formed by work component pre-manufacturing divided into modules, which construction incorporation is performed with a specific technique, comprising the industrial construction.

The construction market integrates to real estate service and maintenance and reform fields. The real estate market is responsible for marketing the houses and buildings produced. On the other hand, the maintenance and reform field is responsible for expanding the building lifecycle. Finally, incorporations, demolitions and reconstructions take place.

Within the chain in its various stages, there is a need for labor in different levels, and also specialized technical services, including engineering, facilities and building systems. Analyzing the construction chain from the sustainability point of view, it is possible to set forth the specialized technical services as the first chain agent, regardless of the life cycle stage the undertaking is in. The sustainability approach requires that all activity performed in the construction chain is preceded by a comprehensive planning. The choice of the undertaking place, the material type, quantity and quality to be used and the user welfare are variables that should be considered, assessed and validated before proceeding with any other link in the chain. This is the work of engineers, architects, geologists, biologists, managers, economists, among other professionals, who have to work together to assure that any initiative results in the best net effects, i.e., the best benefit with the lowest possible cost and waste.

There is also a large service providing company set of mining services, in material, trade and construction industry. They are professional service companies (law, accounting, marketing and consulting, for instance), logistic services, financial services (insurance and funding) and economic activity support services (safety, feeding, information technology, communications, etc.).

The construction chain manufacturing also supports the machine and equipment industry activities, as all manufacturing stages use capital goods to manufacture their products. They include transportation trucks, material industry boilers, trade computers or construction company cranes (Figure 2.1).

Main manufacturing chain figures

In 2016, the investments estimated in construction works and services should reach BRL592 billion and generate a BRL502.1 billion GDP in the construction manufacturing chain. Such activities should engage 12.5 million people in the year average, generating a payroll of BRL269 billion, or 54% of the revenue generated in the manufacturing chain. The revenue in all chain links should exceed BRL1.1 trillion this year.

The largest manufacturing chain revenue or GDP share - 64.5%, totaling BRL321 billion - shall be generated in the construction market this year, which considers the construction company manufacturing, that executes engineering works or work stages, and self-management, self-construction and reform works. The construction material, machine and equipment industry should generate a BRL58.4 billion GDP in 2016, or 10.8% of the chain GDP, employing 772 thousand people. The construction material sale - represented by the gross and retail trade - should employ 1.054 million people and generate an added value of roughly BRL43 billion, 8.7% of the total generated in the construction manufacturing chain in 2016.

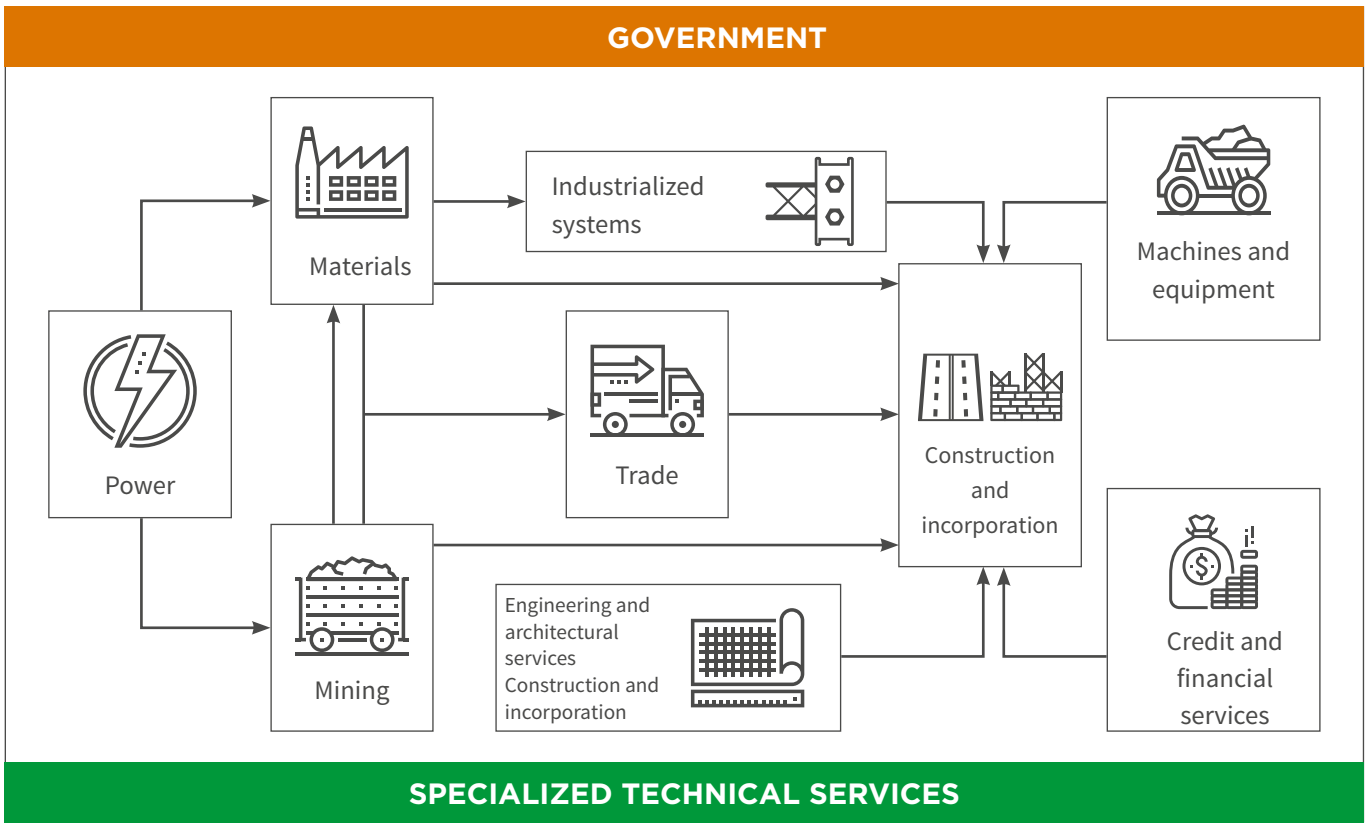


Figure 2.1. Construction manufacturing chain.

The service provision activities include incorporation, real estate purchase and sale, machinery and equipment rental and professional technical services, including engineering and architecture projects. The building maintenance services are also included, like conservation of elevators and other building machines and equipment. Such activity GDP should reach BRL79.6 billion in 2016, or 16% of the chain GDP, and should employ around 1.9 million people (Tables 2.1 and 2.2).

Graph 2.4 presents the GDP progress at constant prices of the construction manufacturing chain, considering the each chain link deflators. It should be highlighted the fact that this revenue should decrease 15.4% in actual terms from 2014 to 2016, pointing out solid retractions of paid wages, tax collection and profit assessed by the companies. It is noted, according to Graph 2.5, the relative decrease of works executed by construction companies. The construction GDP generated by construction companies and real estate developers, which was over 60% in 2012, is close to 50% in 2016.

Table 2.1. Revenue, manufacturing, income and occupation in the construction manufacturing chain, 2016*.

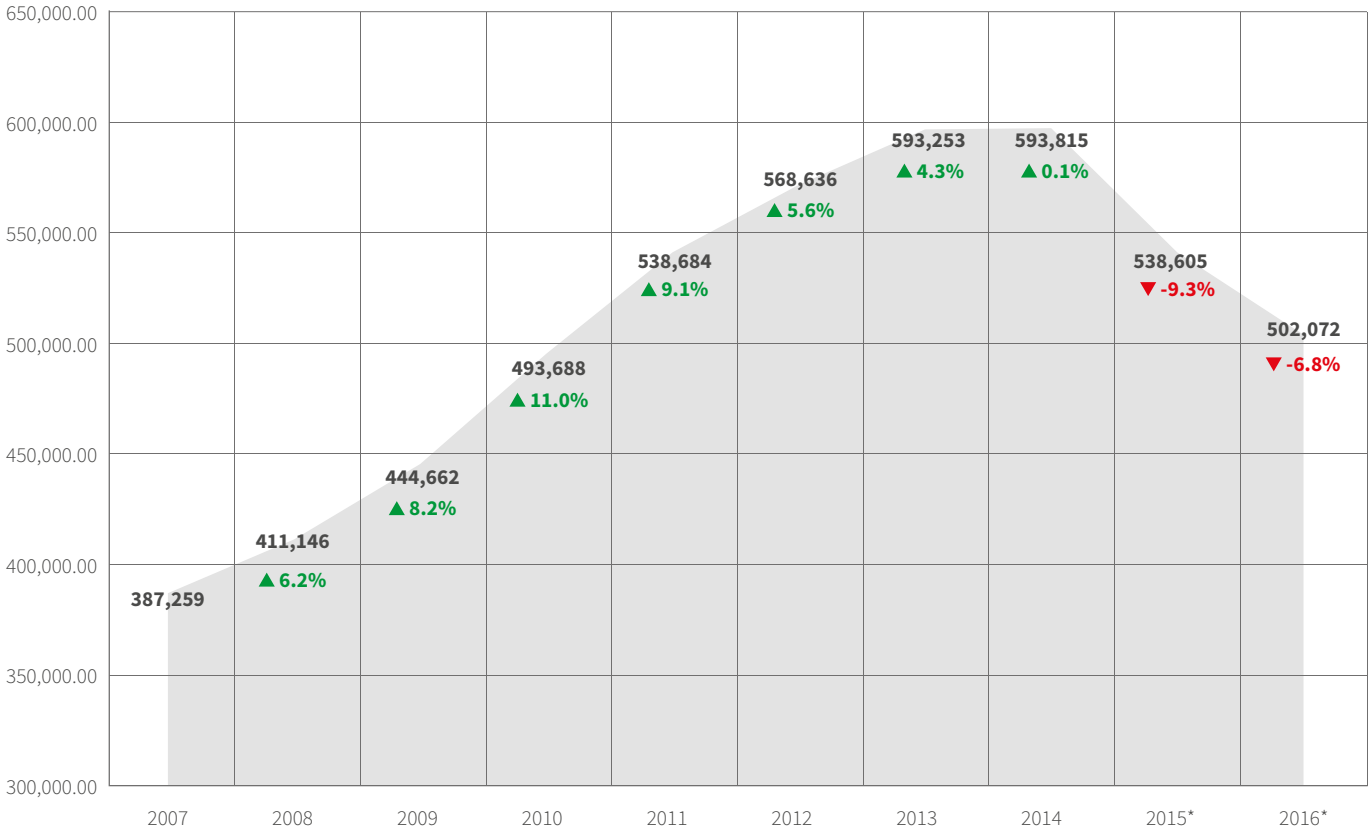
	Manufacturing chain links				Chain total
	Industry	Construction	Trade	Services	
Added value, GDP (BRLmillion)	58,373.20	320,950.18	43,142.46	79,606.56	502,072.39
Payroll (BRLmillion)	39,664.40	156,164.62	22,122.85	56,150.15	274,102.02
Manufacturing value (BRLmillion)	167,551.85	634,132.96	168,582.03	116,955.15	1,087,221.99
Occupation (people)	843,337.51	8,756,254.83	1,054,187.92	1,874,305.08	12,528,085.33
Revenue** (BRLmillion)	219,885.82	592,029.08	187,210.75	159,084.15	1,158,209.81

*Forecasts performed based on job, manufacturing, wage, and field price progress, as per Brazilian Geography and Statistics Institute (IBGE), Brazilian Construction Industry Chamber (CBIC) and Ministry of Labor. **Gross revenue. Source: Ex Ante Consultoria Econômica.

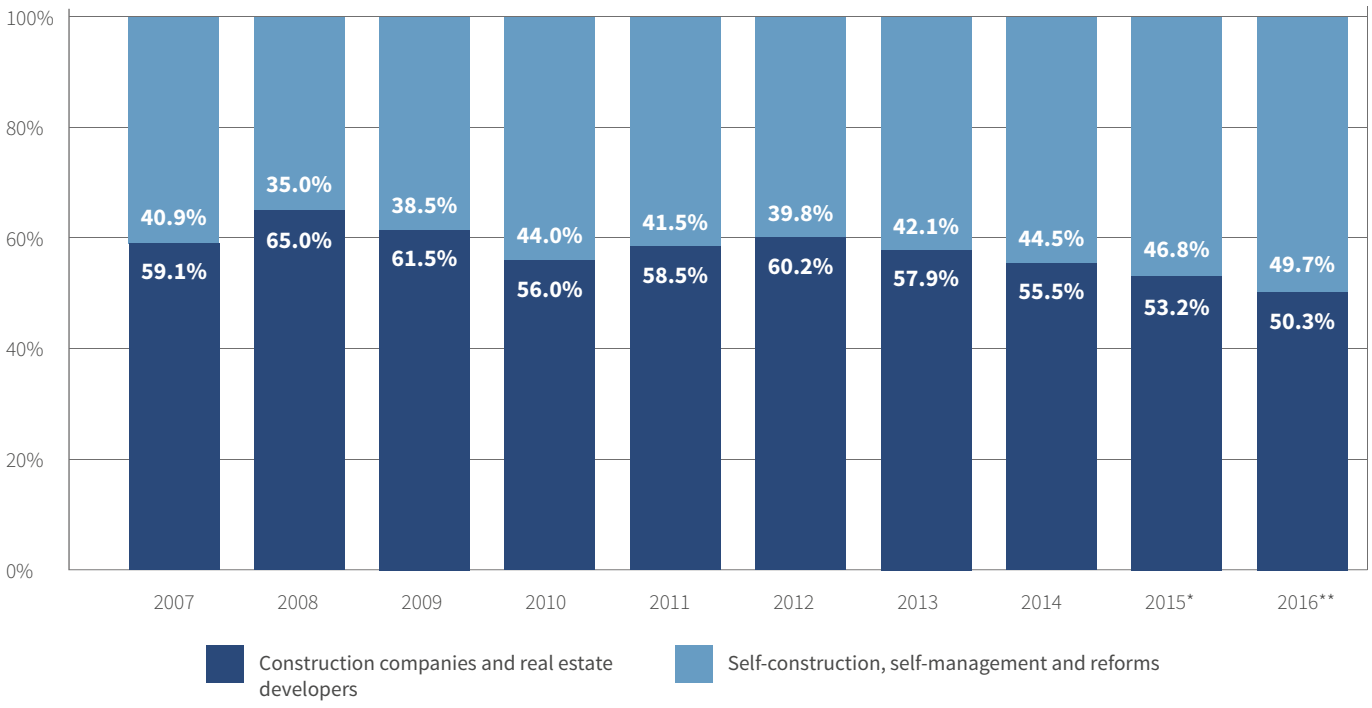
Table 2.2. Construction manufacturing chain revenue, manufacturing, income and occupation*. Percentage distribution by chain link.

	Manufacturing chain links				Chain total
	Industry	Construction	Trade	Services	
Added value, GDP (BRLmillion)	10.8%	64.5%	8.7%	16.0%	100.0%
Payroll (BRLmillion)	13.0%	58.0%	8.2%	20.8%	100.0%
Manufacturing value (BRLmillion)	14.4%	59.0%	15.7%	10.9%	100.0%
Occupation (people)	6.2%	70.3%	8.5%	15.0%	100.0%
Revenue** (BRLmillion)	17.8%	51.9%	16.4%	13.9%	100.0%

*Forecasts performed based on job, manufacturing, wage, and field price progress, as per Brazilian Geography and Statistics Institute (IBGE), Brazilian Construction Industry Chamber (CBIC) and Ministry of Labor. **Gross revenue. Source: Ex Ante Consultoria Econômica.



Graph 2.4. Construction manufacturing chain Gross Domestic Product (GDP) progress, in million reais, at 2016 prices and variation rate (%) in relation to the previous year. *Values adjusted for inflation separately to each manufacturing chain link. Source: Ex Ante Consultoria Econômica.



Graph 2.5. Construction Gross Domestic Product (GDP) distribution (%) in manufacturing fields. * Estimates and ** forecasts performed based on job, manufacturing, wage, and field price progress, as per Brazilian Geography and Statistics Institute (IBGE), Brazilian Construction Industry Chamber (CBIC) and Ministry of Labor. Source: Ex Ante Consultoria Econômica.

Tax load

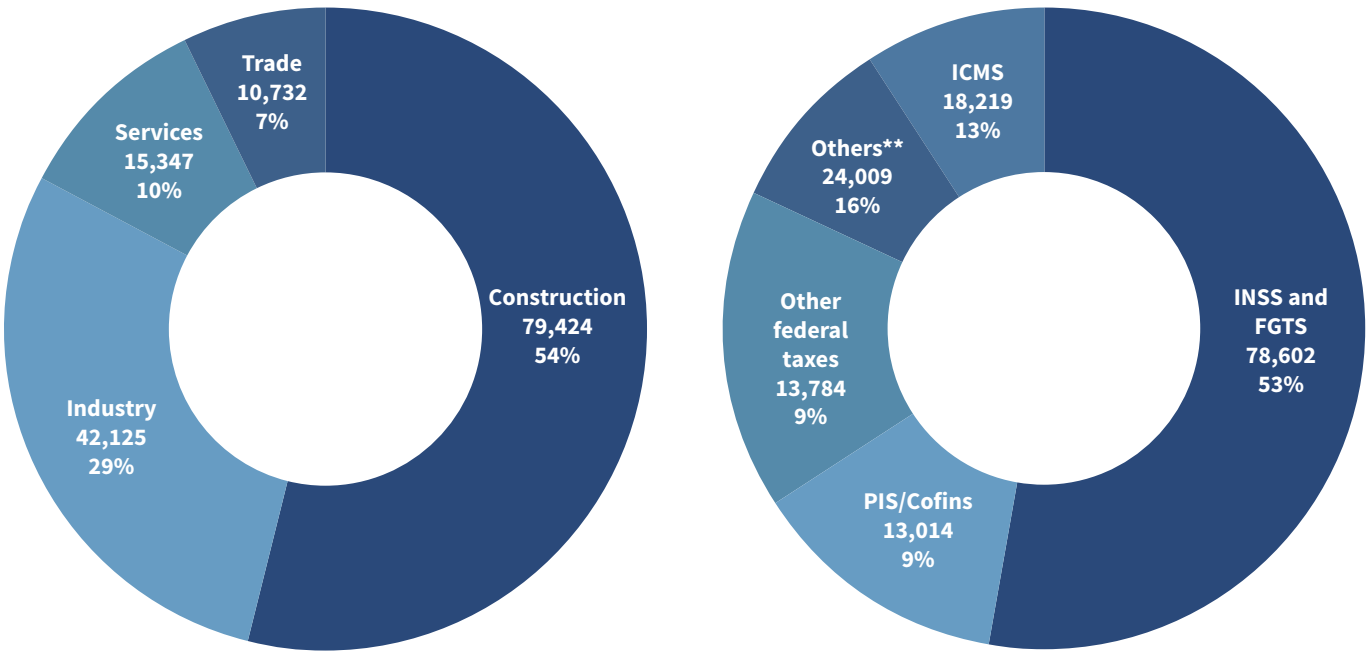
The statistical information of the Federal Income Office, state income offices, the Ministry of Labor and IBGE allow estimating the tax load incurring on the construction manufacturing chain products and services. In 2016, it is estimated that, in net terms, i.e., after tax credits and subsidies, it will be collected to the three government levels around BRL148 billion in taxes and contributions. That means that at every BRL1.00 invested in buildings or infrastructure works, BRL0.25 return to the public accounts.

As the data in Table 2.3 and Graph 2.6 point out, the tax collection will be strongly focused on the civil construction activity, in which there is a major weight of collections to the National Social Security Institute (INSS) and to the Employment Security Fund (FGTS). It is estimated that the construction market should collect BRL79.4 billion of taxes and contributions in 2016, the equivalent to 54% of the construction manufacturing chain total collection. Out of this value, BRL59.4 billion are related to labor contributions. The construction material, machine and equipment industry should account for 29% of the tax and contribution collection in 2016, with estimated 42.1 billion value.

Table 2.3. Construction manufacturing chain tax load by manufacturing link and tax type in 2016*, in million reais.

	Manufacturing chain links				Chain total
	Industry	Construction	Trade	Services	
ICMS	18,218.86	-	-	-	18,218.86
INSS and FGTS	5,272.25	59,443.42	4,192.12	9,693.96	78,601.76
PIS/Cofins	1,315.75	7,154.10	2,653.26	1,890.91	13,014.02
Other federal taxes	1,219.77	7,419.85	2,879.26	2,264.79	13,783.67
Other taxes and fees**	16,098.54	5,406.35	1,007.62	1,496.95	24,009.46
Total	42,125.18	**79,423.72**	10,732.26	**15,346.62**	**147,627.78**

*Forecasts performed based on job, manufacturing, wage, and field price progress, as per Brazilian Geography and Statistics Institute (IBGE), Brazilian Construction Industry Chamber (CBIC), Ministry of Labor and Federal Income Office.**State and Municipal. Source: Ex Ante Consultoria Econômica. Cofins = Contribution for Social Security Financing; FGTS = Employment Security Fund; INSS = National Social Security Institute; PIS = Social Integration Program.



Graph 2.6. Tax load distribution by tax type and construction manufacturing chain in million reais and in percentage of the total, Brazil, 2016*. *Forecasts performed based on job, manufacturing, wage, and field price progress, as per Brazilian Geography and Statistics Institute (IBGE), Brazilian Construction Industry Chamber (CBIC), Ministry of Labor and Federal Income Office. **Other state and municipal taxes and fees. Source: Ex Ante Consultoria Econômica. Cofins = Contribution for Social Security Financing; FGTS = Employment Security Fund; ICMS = Tax on the Circulation of Goods and Services; INSS = National Social Security Institute; PIS = Social Integration Program.

Material, machinery and equipment industry

The construction material, machine and equipment industry revenue, GDP, payroll and job information in 2016 are detailed in Table 2.4. According to the estimates, three major manufacturing chains will account for almost three quarters of the material, machine and equipment industry revenue: non-metallic mineral products (37.9%), metallurgy and metal products (21.3%), and chemical products (14.1%). In terms of productivity, four fields stand out: asphalt and emulsions, with added value by worker of BRL1.971 million; non-ferrous metallurgy, with BRL240.4 thousand productivity by the worker; cement, with BRL204.6 thousand added value by the worker; and iron and steel industry, with BRL197.1 thousand by the worker.

Table 2.4. Construction material, machinery and equipment industry revenue, manufacturing, income and formal occupation, 2016*.

Field	Revenue** (BRLmillion)	GDP (BRLmillion)	Payroll (BRLmillion)	Occupation (people)	Productivity*** (*BRLper capita*)
Rock, sand and clay extraction	11,665.43	5,361.34	2,527.35	67,064	79,943.26
Wood resawing	1,024.07	433.99	230.49	9,182	47,264.41
Wooden product manufacturing	7,676.48	2,260.67	1,347.26	40,178	56,266.47
Asphalt and emulsions	5,463.72	1,232.20	294.09	625	1,971,310.73
Paints, varnishes, enamels, lacquer and products alike	9,058.85	1,772.87	1,075.63	14,442	122,762.11
Plastic material products	16,577.44	3,667.52	2,486.51	56,904	64,450.73
Flat and safety glass	4,131.92	1,060.04	710.36	13,249	80,010.68
Cement	21,613.40	5,819.27	2,740.20	28,440	204,618.27
Concrete, cement and fiber cement artifacts	23,686.89	6,260.91	4,641.30	122,257	51,210.88
Ceramic products	19,051.81	6,018.57	4,367.47	153,642	39,172.78
Rocks and other non-metallic mineral products	14,807.32	4,285.31	2,252.19	53,122	80,669.85
Pig iron and ferroalloy	1,802.46	670.98	289.37	3,904	171,885.89
Iron and steel industry	14,881.24	3,166.96	1,785.44	16,069	197,083.30
Iron and steel pipes	3,252.59	652.96	429.98	4,941	132,139.36
Non-ferrous metals (squares and metal toilet fittings)	9,866.45	1,831.93	709.76	7,619	240,441.93
Cast	792.08	233.66	202.63	4,447	52,544.00
Metal structures and heavy boiler works	14,599.80	4,700.16	4,736.72	112,291	41,857.07
Tanks, boilers and metallic reservoirs	651.13	201.63	187.34	3,389	59,487.89
Various metal products	1,056.20	234.95	148.14	3,138	74,875.28
Electric power distribution and control equipment	16,010.06	2,703.38	2,835.38	43,617	61,979.30
Lamps and other lightning equipment	871.41	185.23	211.18	4,547	40,739.84
Motors, pumps and compressors	4,267.55	1,108.86	748,25	8,924	124,262.14
Construction material subtotal	**202,808.33**	**53,863.39**	**34,956.75**	**771,990**	**69,772.17**
Tools	3,202.75	1,087.52	772.28	16,945	64,179.30
General use machines and equipment	6,787.46	1,715.64	2,274.27	37,069	46,282.69
Construction use machines and equipment	7,087.29	1,706.65	1,611.11	17,334	98,459.26
Machine and equipment subtotal	**17,077.49**	**4,509.81**	**4,707.66**	**71,347**	**63,209.26**
Industry total	**219,885.82**	**58,373.20**	**39,664.40**	**843,338**	**69,216.89**

*Forecasts performed based on job, manufacturing, wage, and field price progress, as per Brazilian Geography and Statistics Institute (IBGE), Brazilian Construction Industry Chamber (CBIC) and Ministry of Labor data. **Gross revenue. ***Added value in reais by worker. Source: Ex Ante Consultoria Econômica.

The actual variations of such indexes from 2007 to 2016 are presented in Table 2.5. It is seen that the construction material, machine and equipment industry had an actual revenue growth of 1.5% a year, with an actual GDP increase of 2.0% a year. The industry set employment rose 1.8% a year, indicating a very low productivity variation (added value by the worker): only 0.1% a year.

Table 2.5. Material, machinery and equipment industry revenue, manufacturing, income and formal occupation - actual growth rate from 2007 to 2016*, in percentage a year.

Field	Revenue	Manufacturing value	GDP	Occupation	Productivity
Rock, sand and clay extraction	3.0%	2.8%	6.1%	2.6%	3.5%
Wood resawing	-3.2%	-3.8%	-1.6%	-6.2%	4.8%
Wooden product manufacturing	0.8%	0.3%	0.6%	-3.9%	4.7%
Asphalt and emulsions	4.4%	2.3%	1.6%	0.7%	0.9%
Paints, varnishes, enamels, lacquer and products alike	4.4%	4.6%	6.0%	3.2%	2.7%
Plastic material products	7.4%	6.8%	8.5%	6.3%	2.0%
Flat and safety glass	0.7%	0.2%	-0.4%	3.4%	-3.7%
Cement	1.9%	1.0%	6.9%	5.7%	1.2%
Concrete, cement and fiber cement artifacts	5.2%	5.0%	6.3%	4.8%	1.4%
Ceramic products	3.2%	2.6%	3.7%	1.1%	2.5%
Rocks and other non-metallic mineral products	4.3%	3.1%	4.1%	3.4%	0.7%
Pig iron and ferroalloy	-5.0%	-4.9%	-1.9%	-1.4%	-0.5%
Iron and steel industry	-2.5%	-2.5%	-5.3%	1.3%	-6.5%
Iron and steel pipes	-5.0%	-4.2%	-4.2%	-4.2%	0.0%
Non-ferrous metals (squares and metal toilet fittings)	3.4%	3.2%	0.9%	1.5%	-0.6%
Cast	-4.6%	-5.4%	-5.4%	-4.0%	-1.5%
Metal structures and heavy boiler works	1.0%	0.1%	1.1%	1.3%	-0.2%
Tanks, boilers and metallic reservoirs	-1.0%	-2.1%	-1.3%	2.8%	-3.9%
Various metal products	-1.1%	-1.2%	-1.0%	-1.7%	0.7%
Electric power distribution and control equipment	-0.9%	-1.8%	-1.3%	1.5%	-2.8%
Lamps and other lighting	-11,9%	-12,5%	-12,6%	-7,8%	-5,2%
equipment	-11.9%	-12.5%	-12.6%	-7.8%	-5.2%
Motors, pumps and compressors	**3.8%**	**2.8%**	**4.7%**	**1.3%**	**3.4%**
Construction material subtotal	1.9%	1.4%	2.5%	1.8%	0.7%
Tools	2.6%	2.3%	2.8%	4.9%	-2.0%
General use machines and equipment	0.3%	-0.9%	-0.2%	4.5%	-4.5%
Construction use machines and equipment	**-7.5%**	**-8.0%**	**-5.8%**	**-3.5%**	**-2.5%**
Machine and equipment subtotal	**-3.5%**	**-4.4%**	**-2.2%**	**2.0%**	**-4.1%**
Industry total	**1.5%**	**0.9%**	**2.0%**	**1.8%**	**-3.1%**

Source: Ex Ante Consultoria Econômica.

Table 2.6 provides the construction material, machine and equipment industry tax load estimates. In industry average, the tax and contribution collection reached BRL42.1 billion in 2016, what stood for 19.2% of this industry group gross revenue.

In some fields, however, the tax load exceeds 20% of the revenue, reaching 31% in the case of pumps, motors and compressors; 29.3% in flat glass; 24.5% in cement; and 24.4% in plastic material.

Table 2.6. Construction manufacturing chain tax load by manufacturing link and tax type, 2016*, in million reais

Field	ICMS (BRLmillion)	Labor contributions* (BRLmillion)	Other taxes*** (BRLmillion)	Total tax load	
				(BRLmillion)	Income (%) **
Rock, sand and clay extraction	690.43	501.48	631.19	1,823.10	15.6%
Wood resawing	36.36	39.47	40.45	116.28	11.4%
Wooden product manufacturing	612.53	303.34	652.76	1,568.63	20.4%
Asphalt and emulsions	642.60	138.17	318.79	1,099.56	20.1%
Paints, varnishes, enamels, lacquer and products alike	1,047.03	280.41	689.99	2,017.44	22.3%
Plastic material products	1,722.93	574.00	1,748.56	4,045.48	24.4%
Flat and safety glass	480.40	154.42	574.82	1,209.65	29.3%
Cement	3,213.51	636.79	1,438.33	5,288.63	24.5%
Concrete, cement and fiber cement artifacts	1,687.71	852.55	1,847.25	4,387.51	18.5%
Ceramic products	1,726.62	757.96	1,639.22	4,123.80	21.6%
Rocks and other non-metallic mineral products	213.40	372.43	277.24	863.06	5.8%
Pig iron and ferroalloy	74.77	58.37	77.93	211.07	11.7%
Iron and steel industry	1,278.65	563.29	1,024.02	2,865.96	19.3%
Iron and steel pipes	259.73	115.15	222.44	597.32	18.4%
Non-ferrous metals (squares and metal toilet fittings)	543.15	260.37	594.50	1,398.02	14.2%
Cast	78,79	36.10	60.23	175.12	22.1%
Metal structures and heavy boiler works	949.71	760.64	1,263.33	2,973.67	20.4%
Tanks, boilers and metallic reservoirs	46.20	28.28	45.85	120.33	18.5%
Various metal products	104.60	53.92	103.36	261.88	24.8%
Electric power distribution and control equipment	1,534.94	551.47	1,568.89	3,655.31	22.8%
Lamps and other lighting equipment	75.49	28.08	64.03	167.60	19.2%
Motors, pumps and compressors	554.74	195.40	572.63	1,322.77	31.0%
Construction material subtotal	**17,574.28**	**7,262.10**	**15,455.82**	**40,292.20**	**19.9%**
Tools	276.12	138.43	260.26	674.80	21.1%
General use machines and equipment	22.87	175,78	60.85	259.49	3.8%
Construction use machines and equipment	345.60	231.47	321.62	898.69	12.7%
Machine and equipment subtotal	**644.59**	**545.67**	**642.72**	**1,832.98**	**10.7%**
Industry total	**18,218.86**	**7,807.77**	**16,098.54**	**42,125.18**	**19.2%**

*Forecasts performed based on job, manufacturing, wage, and field price progress, as per Brazilian Geography and Statistics Institute (IBGE), Brazilian Construction Industry Chamber (CBIC), Ministry of Labor and Federal Income Office data. **State and Municipal. ***National Social Security Institute (INSS), Employment Security Fund (FGTS), Social Integration Program (PIS), Tax on the Circulation of Goods and Services (ICMS), Import Tax (II), Industrialized Product Tax (IPI), Contribution for Social Security Financing (Cofins), Net Profit Social Contribution (CSLL), Income Tax - Legal Person and Municipal Taxes (IRPJ). Source: Ex Ante Consultoria Econômica.

Eighteen highlighted fields

Rock and sand extraction

- ▲ The field revenue should overcome BRL10.0 billion in 2016, a rated increase of 9.7% a year since 2007.
- ▲ The rock and sand extraction field GDP should be BRL5.4 billion, indicating 13.3% rated growth a year from 2007 to 2016.
- ▲ Based on estimates for 2016, a 2.6% expansion a year of the workforce in the period and a 12.1% rated growth a year of wages.
- ▲ The Rock and sand extraction field GDP actual growth should be 6.1% a year, with 3.5% work productivity increase a year from 2007 to 2016.
- ▼ In the last two years, however, the field should have accumulated an actual GDP drop of 19.4% and 7.5 thousand jobs closing was registered in the field.

Asphalt and emulsions

- ▲ The field revenue should reach BRL5.5 billion in 2016, accumulating rated increase of 12.0% a year since 2007.
- ▲ The asphalt manufacturing field GDP should be BRL1.232 billion, with 9% annual average rated increase.
- ▲ A small workforce growth is expected in the period (0.7% a year), with more solid wage growth, that should have progressed 10.1% a year in rated terms.
- ▲ The asphalt manufacturing field GDP actual growth should be 1.6% a year, with 0.9% work productivity increase a year.
- ▼ In the last two years, however, the field should have registered an actual GDP drop of 13.2%, a very unfavorable result, as there was a 74.6% asphalt price increase in the period.

Plastic material

- ▲ The field revenue should reach BRL12.2 billion in 2016, accumulating rated increase of 11.9% a year since 2007.
- ▲ This industry GDP should be BRL3.7 billion, indicating 13.6% annual average rated increase.
- ▲ A 6.3% increase is expected to have happened in the field, with 14.2% growth a year in the paid wage bulk from 2007 to 2016.
- ▲ The plastic material field GDP actual growth should be 8.5% a year from 2007 to 2016, with 2.0% work productivity increase a year.
- ▼ As in the other construction manufacturing chain field, the field GDP is expected to drop heavily in the last two years, accumulating an actual 20.7% loss.

Paints and varnishes

- ▲ The paint and varnish industry revenue should overcome BRL9.0 billion in 2016, indicating a rated increase of 7.5% a year since 2007.
- ▲The field GDP should be BRL1.8 billion, with 9.2% annual average rated increase from 2007 to 2016.
- ▲ Concerning the employment, a 3.2% workforce expansion is estimated since 2007 and 9.9% a year of the payroll in rated terms.
- ▲ The paint field GDP actual growth should be 6.0% a year, with 2.7% work productivity increase a year from 2007 to 2016, a higher level to the construction material industry average.
- ▼ In the last two years, the paint industry GDP should have presented a 13.4% actual retraction, with 1.4 thousand job closing on the field.

Flat glass

- ▲ The flat glass industry revenue with products applied to construction should reach BRL2.9 billion in 2016, indicating a rated increase of 5.5% a year since 2007.
- ▲ The field GDP should be BRL1.1 billion, with 4.9% annual average rated increase.
- ▲ The workforce used in the field should have registered 3.4% expansion a year since 2007, with a 9.8% wage increase a year in rated terms.
- ▼ The flat glass field GDP actual variation should be -0.4% a year, with 3.7% work productivity loss a year from 2007 to 2016.
- ▼ In the last two years, an actual GDP loss of 15.5% is estimated in this industry, with the closing of 1.5 thousand jobs in the field.

Cement

- ▲ The cement field revenue should overcome BRL21.6 billion in 2016, indicating a rated increase of 7.1% a year since 2007.
- ▲ The field GDP should be BRL5.8 billion, with 12.4% annual average rated increase.
- ▲ There has been a 5.7% workforce expansion a year since 2007 and the wages increased 13.4% a year in rated terms.
- ▲ The cement field GDP actual growth should be 6.9% a year, with 1.2% work productivity increase a year from 2007 to 2016.
- ▼ In the last two years, the cement industry actual GDP drop should reach 24.6%, with the expectation of 2.2 thousand job closing on the field.

Concrete, cement, fiber cement artifacts

- ▲ The concrete, cement, and fiber cement field revenue should reach BRL19.4 billion in 2016, indicating a rated increase of 11.7% a year since 2007.
- ▲ The field GDP should be BRL6.3 billion, with 13.0% annual average rated increase.
- ▲ Since 2007, a 4.8% workforce increase a year is estimated, and of 15.0% a year of the payroll in rated terms.
- ▲ The concrete, cement and fiber cement artifact field GDP actual growth should be 6.3% a year, with 1.4% work productivity increase a year from 2007 to 2016.
- ▼ However, the concrete, cement and fiber cement artifact industry should have had an actual GDP loss of 27.4% in the last two years, and 21 thousand job closing should take place in the field.

Ceramic products

- ▲ The ceramic product industry revenue should reach BRL19.1 billion in 2016, indicating a rated increase of 7.0% a year since 2007.
- ▲ The field GDP should be BRL6.0 billion, with 7.5% annual average rated increase.
- ▲ From 2007 to 2016, a 6.3% workforce increase a year is expected, with the wages paid in the ceramic product industry growing 9.0% a year in rated terms since 2007.
- ▲ The ceramic product field GDP actual growth should be 3.7% a year, with 2.5% work productivity increase a year from 2007 to 2016.
- ▼ The expectation is that the economic crisis the country faces led to a 14.6% drop in this industry actual GDP in the last two years, a period in which, according to the estimates, there have been 21.6 thousand job closing on the field.

Iron and steel industry

- ▲ The iron and steel industry field revenue aimed at construction chain should overcome BRL11.8 billion in 2016.
- ▲ The expected expansion is 1.3% a year of employment in the period and 7.9% a year of the wage bulk in rated terms.
- ▼ From 2007 to 2016, the revenue has risen only 0.5% a year in rated terms.
- ▼ The Iron and steel industry GDP should be of BRL3.2 billion, with annual avarage drop of 2.4% per year since 2007 in nominal terms.
- ▼ The iron and steel industry GDP actual drop should be 5.3% a year from 2007 to 2016, with 6.5% work productivity decrease a year.
- ▼ In the last two years, the industrial crisis in this field worsened: the field should accumulate an actual 22.4% GDP drop and close 1.8 thousand jobs.

Non-ferrous metallurgy

- ▲ The non-ferrous metallurgy product industry revenue should reach BRL9.9 billion in 2016, accumulating rated increase of 7.8% a year since 2007.
- ▲ This industry GDP should be BRL1.8 billion, with 5.3% annual average rated increase.
- ▲ According to such estimates, a 1.5% job increase in the field is expected, with 8.4% rated growth a year in the wage bulk paid since 2007.
- ▲ Unlike the other construction manufacturing chain fields, the expectation is that the non-ferrous metallurgy GDP has grown in the last two years, accumulating actual 3.5% gain.
- ▼ The field actual GDP growth should be only 0.9% a year from 2007 to 2016, with actual work productivity drop of 0.6% a year.

Metallic structures

- ▲ The metallic structure industry revenue should reach BRL14.6 billion in 2016, indicating a rated increase of only 4.7% a year since 2007.
- ▲ The field GDP should be BRL4.7 billion, with 4.8% annual average rated increase.
- ▲ Concerning employment, a 1.3% workforce increase is estimated, but with more meaningful increase of the wages paid by this industry, of 10.8% a year since 2007 a year in rated terms.
- ▼ The metallic structure field GDP actual growth should be small, only 1.1% a year, with 0.2% work productivity drop a year from 2007 to 2016.
- ▼ The crisis impact this field strongly, so that an actual 39.2% GDP drop is expected in this industry in the last two years, a period in which 33.3 thousand jobs in the field should have been closed.

Electric power distribution equipment

- ▲ The electric power distribution equipment field gross revenue should reach BRL16 billion in 2016, indicating a rated increase of only 3.0% a year since 2007.
- ▼ The field GDP should be BRL2.7 billion, with only 2.6% annual average rated increase.
- ▼ A small job increase (1.5% a year) is expected, but also 9.7% payroll rated increase a year since 2007.
- ▼ There was a small actual GDP drop of 1.3% a year, with 2.8% work productivity decrease a year from 2007 to 2016.
- ▼ The electric power distribution equipment industry should have had an actual GDP drop of 28.3% in the last two years, a period in which 8.7 thousand jobs in the field are expected to be closed.

Construction machines and equipment[1]

- ▲ The machinery and equipment industry revenue should reach BRL17.1 billion in 2016.
- ▼ From 2007 to 2016, the revenue rose only 0.9% a year in rated terms.
- ▼ The machinery and equipment field aimed at construction chain GDP should be BRL4.5 billion, with an annual average increase of only 1.9% a year since 2007 in rated terms.
- ▼ A 2.2% job expansion a year is expected in the period, a progress relatively more meaningful of the wage bulk, with 9.3% rated growth a year, a higher rate than the rated GDP expansion.
- ▼ The actual drop on the GDP of these industries shall be 2.2% a year between 2007 and 2016, with reduction of work priductivity of 4.1% a year
- ▼ In the last two years, the construction crisis impacted this field heavily: it is estimated that field GDP dropped 39.4% in actual terms, with 18.9 thousand job closing..

Material trade

- ▲ The construction material trade revenue should reach BRL187 billion in 2016, indicating a rated increase of only 4.2% a year since 2007.
- ▲ The field GDP should be BRL43.1 billion, with 10.9% annual average rated increase since 2007.
- ▲ The estimates indicate 3.8% increase a year of the workforce employed in the field, with 11.9% rated growth a year of the wages paid by the material trade since 2007.
- ▲ The field GDP actual growth should be 4.7% a year, with 3.8% work productivity increase a year from 2007 to 2016.
- ▼ The crisis, according to the 2016 estimates, should have led to a 20.3% actual GDP drop in the trade in the last two years, a period that a 69.4 thousand job closing on the field should be observed.

Construction companies and real estate developers

- ▲ The real estate development and construction company gross revenue should overcome BRL347 billion in 2016, indicating a 11.2% rated increase a year since 2007.
- ▲ The field GDP should be BRL161.4 billion, with 11.1% annual average rated increase since 2007.
- ▲ The field workforce expected growth is 3.6% a year, with wages paid by the construction companies growing 14.2% a year in rated terms.
- ▼ The field GDP actual growth should be 1.1% a year, with 2.4% work productivity drop a year from 2007 to 2016.
- ▼ The crisis of the last two years should have led to the 19.8% drop in the real estate developer and construction company actual GDP, a period in which the 681.5 thousand job closing on the field are expected.

[1] This industry is formed by three fields: (i) cutlery, sawing goods and manual tools; (ii) general use machines and equipment; and (iii) mineral extraction and construction use machines and equipment.

Engineering and architectural services

- ▲ The engineering and architecture service company revenue should reach BRL34.3 billion in 2016, indicating a rated increase of 16.4% a year since 2007.
- ▲ The field GDP should be BRL24.2, with 16.7% annual average rated increase since 2007.
- ▲ The field workforce growth should increase 4.2% a year, while the wages paid by the engineering and architecture offices should grow 16.9% a year in rated terms since 2007, based on the current year estimates.
- ▲ The field GDP actual growth should be 8.4% a year, with 4.0% work productivity increase a year from 2007 to 2016.
- ▼ The crisis of the last two years, according to the current year estimates, should have led to the 19.6% drop in the field company actual GDP, with the estimated 66.6 thousand job closing on the field.

Building maintenance services

- ▲ The building maintenance service company revenue should reach BRL26.6 billion in 2016, indicating a rated increase of 12.6% a year since 2007.
- ▲ The field GDP should be BRL21.7 billion, with 12.6% annual average rated increase since 2007.
- ▲ According to the estimates, there should have been a 3.3% increase a year of the workforce and the wages paid by the field companies should have increased 9.4% a year in rated terms since 2007.
- ▲ The field GDP actual growth should be 4.6% a year, with 1.3% work productivity increase a year from 2007 to 2016.
- ▼ The crisis of the last two years did not impact the building maintenance field companies: the actual GDP should have remained stagnated, while only 5.6 thousand job closing is estimated (0.6% of the employee total in 2014).

General services provided in the construction chain

- ▲ The construction chain general service provider company gross revenue should reach BRL101.6 billion in 2016, indicating a rated increase of 8.1% a year since 2007..
- ▲ The field GDP should be BRL33.7 billion, with 7.3% annual average rated increase since 2007.
- ▲ Such field employment should have grown 3.9% a year, while such company payroll, according to the estimates, should have registered a rise in rated terms of 13.7% a year since 2007.
- ▼ The construction chain general service provider company GDP actual variation should reach -0.3% a year, with a 4.0% reduction a year of the labor productivity from 2007 to 2016.
- ▼ The crisis of the last two years impacted heavily the construction chain general service provider companies: according to the estimates, the actual GDP should have dropped 20.2% with the 43.3 thousand job closing.

3. Macroeconomic scenario: Potential for growth of Brazilian economy from 2016 to 2022

The Brazilian economy had a satisfactory macroeconomic performance between 2000 and 2012. This was achieved by the achievement of economic stability, the recovery of credit conditions and the consequence of the expansion of investments in some segments of the economy. Social policies, on the other hand, played an important role in reducing misery, while at the same time providing social mobility. During this period, real estate investment, household consumption and exports increased, with the opening of new markets for Brazilian products.

However, in recent years, perceptions of the country's actual growth potential have fluctuated considerably. In 2010, for example, when Brazil had already overcome the worst moment of the international financial crisis, the Brazilian economy grew by 7.5%, exceeding the best market expectations, although part of this growth was derived from the negative result recorded in the previous year. At that time, there were promising prospects about industrial policy and gradual improvement in external conditions, which ultimately inflated expectations of growth for the coming years. Average growth scenarios between 4% and 5% per year were consistent with the present domestic macroeconomic conditions and with a global expansion of between 2% and 3% per year in the following decade.

Nevertheless, the medium and long-term prospects for the Brazilian economy were gradually changing, leaving a rather optimistic picture regarding the growth potential and moving towards a more conservative view, until arriving at a new reality quite different from the 2010 framework. In 2012, the most optimistic growth projections for 2012 were 3.5% or 4.0% per year between 2012 and 2017. In early 2015, the debate on the conjuncture and the potential for growth began to bring disparate views, but most analyzes already pointed to a potential for growth that was actually lower than expected years ago. The worsening of industrial and fiscal crisis that has taken place since then led to a sharp deterioration of the country's economic performance and prospects for the coming years. In order to outline this new scenario, which supports the medium- and long-term projections, it is necessary, first of all, to analyze what happened to the Brazilian economy from 2000 onwards, with special attention to the last years, and assess how and in what scope recent events have conditioned the trajectory of the country in the coming years.

In order to outline this new scenario, which supports the medium- and long-term projections, it is necessary, first of all, to analyze what happened to the Brazilian economy from 2000 onwards, with special attention to the last years, and to assess how and in what extension the recent events have conditioned the trajectory of the country in the coming years. The main facts were the fiscal crisis and the loss of dynamism of the industry, two processes that contained the economic growth of several sectors and caused the economy as a whole to lose force.

Economic recovery of the 2000's

Between 2000 and 2014, gross domestic product (GDP) grew by 3.3% per year. This rate is not as high as the rate observed for of other developing economies, but it was about 30% higher than the expansion between 1990 and 2003 (2.3% per year). As the demographic growth rate fell dramatically from 2000 onwards, the difference between the growth trajectories in the two periods had an even greater impact on the per capita income expansion. Between 2000 and 2014, the Brazilian GDP per capita growth was 1.9% per year, a much higher level than the one observed between 1990 and 2003 (of 0.9% per year).

The three main factors explaining this performance of the Brazilian economy in the period are the recovery of investment, the increase in household consumption and the expansion of exports. The economy's gross capital formation grew at an accelerated pace in those years. The average expansion was 4.2% per year in the comparison between 2000 and 2014. In the same comparison, household consumption grew by 3.7% per year and external demand by 4.9% per year. Together, these elements accounted for 87% of the increase in aggregate demand in the Brazilian economy between 2000 and 2014. The increase in investment and consumption had as preconditions economic stabilization and inflation control, processes started in 1994 and consolidated in 2004.

Behind each of these movements, there are changes in distinct conditions that maintained each of the trajectories. In the case of investments, the main change was the recovery of credit. The Brazilian Development Bank (BNDES) received contributions to expand and diversify its investment portfolio. The expansion of the resources came from the growth of reserve funds in revenue (Worker Protection Fund [FAT]) and on the payroll (Service Time Guarantee Fund [FGTS]), which grew significantly in the period. The federal government has increased the bank's capital to allow for an increase in the credit leverage capacity. There was also an increase in corporate credit provided by banks in general. As a result, the balance of corporate loans rose from BRL486 billion in the last quarter of 1999 to BRL1.465 trillion in December 2014. This gives a credit increase of 7.7% per year in real terms.

The increase in household consumption was fueled by the expansion of the labor market, with increased employment and real wages increase, and by the rise in consumer credit. The continuous growth in the demand for labor was, during those years, increasing the occupation. According to data from the Monthly Employment Survey of the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística, IBGE), which includes the evolution of the labor market in the six main metropolitan regions of the country, the number of employed persons rose from 18.4 million in December 2002 to 23.9 million in December 2014, indicating an increase of more than 5.4 million jobs.

On the other hand, there was a decrease in unemployment, which promoted real wage growth. In 2002, 11.7% of the workforce was unemployed, which fell to 4.8% in the average of 2014. Consequently, the usual remuneration in the main work of these people went from BRL1,907.90 to BRL2,237.21 per month in this comparison, pointing to a real increase of 17.3%, or 1.3% per year. The mass of incomes paid grew both as a result of the increase in employment and the expansion of real wages, reaching an expansion of 52.3% between 2002 and 2014 - an average increase of 3.6% per annum, a value very close to the growth of household consumption.

Loans to households also rose significantly: the balance of loans to individuals reached BRL1.487 trillion at the end of 2014. This amount was equivalent to almost 9 times the balance of loans to individuals in December 1999, considering inflation of the period. As in this period, credit to individuals grew well above the Brazilian economy - 13.4% a year versus 3.0% a year - the ratio of household debt to GDP hit a record, reaching 23.2%. This money mainly financed the purchase of housing, durable goods (automobiles, furniture and appliances) and domestic and international travel - all emerging markets during that period.

The value of Brazilian exports in dollars grew 10.6% per year between 2000 and 2014, which is equivalent to a rate of more than 8% per year in real terms (constant dollars). As a result, the volume of foreign revenues increased from USD 55.1 billion in 2000 to USD 225.1 billion in 2014. It is important to note that this growth occurred even in an environment of appreciation of the exchange rate and international crisis. What influenced on the good export performance of the country was the growth in demand for minerals and food, mostly destined for China, the country with the highest economic growth in the period. The trajectories of international prices also helped for a time this expansion of Brazilian exports.

Industrial crisis

Despite Brazil's positive response to the 2008 international financial crisis, when the country chose to encourage investment in construction and reduce taxes to promote consumption, the Brazilian industry entered a bad route from 2011 onwards. The rapid advance of imports and the continuous increase of costs imposed considerable losses on Brazilian manufactures, with significant effects on production. The industrial investment, in turn, suffered a sharp contraction in most sectors, which further aggravates this scenario, indicating permanent losses for several segments.

From 2008 to 2014, the GDP of the Brazilian manufacturing industry registered a decrease of -2.1%, which is equivalent to a decrease of 0.3% per year. This performance contributed to the country's reduced economic growth, which was 2.7% per year in this comparison. As a result, the participation of the manufacturing industry, in the total Brazilian economy, increased from 16.5% in 2008 to 11.7% in 2014.

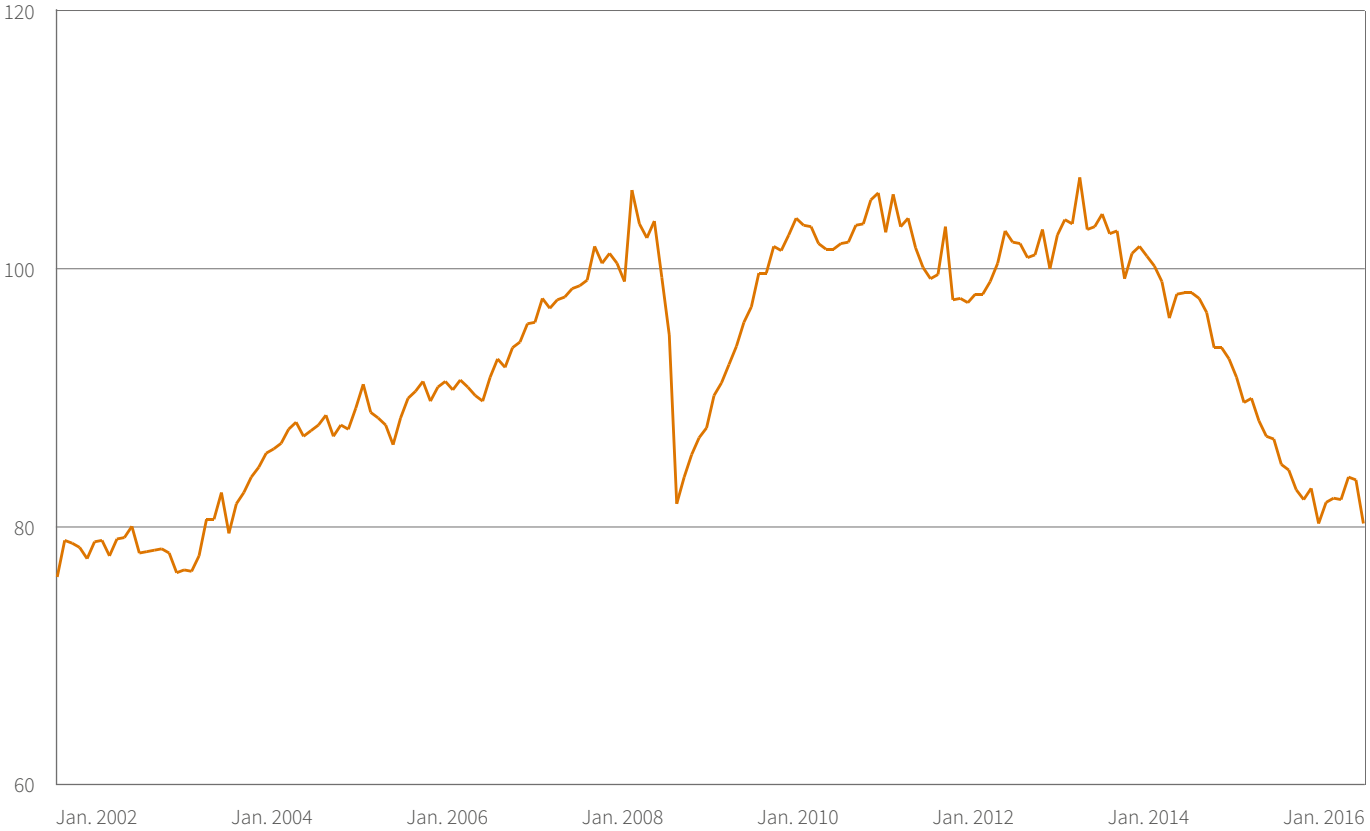
The trajectory of the GDP of the manufacturing industry reveals a performance far below expectations, even considering that in most developed economies the manufacturing industry has been systematically reducing its weight. In these countries, the reduction of the weight of the manufacturing industry reflects the processes of internationalization of production (offshoring) and outsourcing. These changes bring productivity gains and cost savings, boosting companies' returns and boosting investment.

In Brazil, this did not happen, as the study of Rangel and Freitas (2015) pointed. Quiet conversely, in Brazil there was a great loss of productivity and cost increase from 1995 onward, reducing quickly the companies return.

Some data of this study are overwhelming and reveals an industry in crisis. The productivity - know as added value per unit of capital and work - reduced to the tax of 1.4% by year, in the average of Brazilian transformation industry, meanwhile the productivity increased 2.7% per year to the thirty biggest industry economies. The Chinese manufacturing industry, which gives the great part of the Brazilian import of industrial products increase, had 5.2% of the productivity raise per year. Besides that, the cost with raw material and services decreased at a rate of 0.33% per year in that country.

This has strongly affected the return of companies and, consequently, investment. The study data indicate that the gross return on capital invested in the Brazilian manufacturing industry was 23.9% in 1995. By 2008, this rate had already fallen to 6.9%, falling even more in 2009 with the international crisis. In US manufacturing industry - a reference for technology, logistics, and production scale - the gross return on capital grew in the second half of the 2000's, reaching 40 percent of the capital invested in 2009 (the year of the crisis).

The lack of dynamism permeates almost all industrial sectors with a fall in production. The IBGE's Monthly Industrial Survey indicates that between 2008 and 2014, manufacturing output fell 1.0% (seasonally adjusted index). This process has continued to accelerate since then: in the year to August 2016, the physical production index of the seasonally adjusted manufacturing industry had already lost 15.9% in relation to the same period of 2014 (Graph 3.1).



Graph 3.1. Production of manufacturing industry. Seasonally adjusted index, average base of 2012 = 100. Source: Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística, IBGE).Prepared by: Ex Ante Consultoria Econômica

Tax crisis

Much of the country's economic difficulties came from the fiscal mismatch of the Union, states and municipalities. This process began in 2011, with the increase in expenses, and accelerated in 2014, with the fall in the rhythm of growth of fiscal revenues. The industrial crisis itself was responsible for the rapid fall in the collection of the Social Integration Program (PIS), Contribution for Social Security Financing (Cofins) and Tax on Circulation of Goods and Services (ICMS). In parallel, the increase in inflation led to a systematic non-compliance with the inflation targets, which put the stability of the real in check.

The fiscal and monetary policy adopted in 2015 to combat the two problems ended up, by its inconsistency, aggravating them:

- In order to reduce expenses, taxes on electricity were increased, which had been reduced in 2012, which ended up having an immense impact on the inflation of 2015 and accelerated the industrial retraction.
- Public spending cuts focused on investment spending (Growth Acceleration Program [PAC] and Minha Casa Minha Vida Program [PMCMV]). The country should close the year 2016 with a nominal reduction of federal public investment in the order of 45% compared to that observed in 2014. This deepened the recession, with negative effects on the collection.
- The basic interest rate of the economy was raised systematically, with the aim of encouraging the migration of funds to public financing. This has increased central government spending on debt services. At the same time, the migration of funds to finance public debt has made credit scarce, leading to even sharper declines in investment and consumption. The impact on revenue was once again negative.

The most recent National Treasury information shows that the fiscal mismatch increased during 2016. Gross federal government revenues, including social security revenues, increased only by 2.1% in nominal terms in the year to 2016 (until August). As accumulated inflation for the year was 9.4%, revenues fell by 6.7% in real terms between 2015 and 2016. Expenses, on the other hand, grew by 10.7% in nominal terms, which is equivalent to a growth Increase of 1.1% in the year to August 2016 (Graph 3.2).

Graph 3.2. Primary outcome of the federal government. Accumulated in the last 12 months in billions of reais. Source: National Treasury Secretariat. Prepared by: Ex Ante Consultoria Econômica.

Therewith, the central government's primary result (without considering methodological adjustments and statistical discrepancies) went from a deficit of BRL14.0 billion in the accumulated from 2015 to August to a primary deficit of BRL71.4 billion in the accumulated amount of 2016 until August. This result points to a primary deficit in 2016 that may exceed the BRL170 billion approved by the National Congress - in the accumulated 12 months until August this year, the primary deficit is already at BRL172 billion. Thus, the nominal deficit should be close to BRL475 billion in 2016 (primary deficit plus interest payments).

With the increase of the primary deficit and interest rates and inflation at levels still high, the cost of public debt financing has grown enormously. Federal public debt held by the public rose from BRL2.122 trillion in December 2013 to BRL2.957 trillion in July 2016, indicating nominal growth of 39.3%. The average cost of federal public debt, in turn, went from 11.32% per year to 13.33% per year in this time comparison. The consequence of these two moves was the increase in the cost of debt financing from BRL236 billion per year in December 2013 to almost BRL400 billion per year in July 2016. This implied a cost increase for the National Treasury of BRL164 billion per year, i.e. a cost increase of almost 70% with the rollover of the federal public debt (Graph 3.3).

Graph 3.3. Cost of federal public debt in billions of reais per year. Source: National Treasury Secretariat. Prepared by: Ex Ante Consultoria Econômica.

Possibilities towards 2022

In this context, there was a sharp contraction of the investment rate from 20.9% of GDP in 2013 to 16.8% of GDP in the first half of 2016, indicating a decrease of more than 4 percentage points in this rate. This is a reflection of the reduction of industrial investment due to the reduction of the profitability of the industrial sectors, as well as the decline in investments in construction (urban development and economic infrastructure).

There was, in the period, an increase in the need for public sector financing, as discussed above. This has imposed new limits on the reduction of the interest rate, which makes it impossible for a rapid and sharp resumption of credit to the private sector - both to households and to companies. Thus, the space to grow is smaller.

Social mobility, which increased the purchasing power of a significant portion of the low-income population between 2003 and 2012, introduced a large contingent of people into the consumer goods markets. This mobility was achieved through the reduction of unemployment, the increase of real wages and social subsidy programs. From 2015 onwards, however, unemployment increased significantly, reaching 11.8% of the economically active population in August 2016. With this, real wages fell.

For these reasons, it is no longer possible to think of a GDP expansion rate of 3% a year for the next six years (2017 to 2022). Even so, some external and internal conditions make it possible to foresee minimal growth, with somewhat more significant advances in some areas of the economy.

In the world context, it is expected a growth of 2.7% per year between 2016 and 2022, a sufficient level to bring about a good expansion of Brazilian exports. This figure is relatively lower than the historical standard (from 3.0% per year between 1995 and 2015), due to the unfolding of the international financial crisis, which keeps the European Union economies in a still slow recovery. The slowdown in China's pace of expansion also has an effect on this lower rate of economic growth.

Regarding Brazil, the more balanced conduct of public expenditures from mid-2016 onwards and the gradual reduction of interest rates could create conditions that are more appropriate in the medium term. These conditions include:

- Employment expansion of 1.4% per year, with an increase in labor productivity around 0.6% per year between 2016 and 2022.
- Job income growth around 2.0% per year between 2016 and 2022, a slower pace than that observed from 2006 to 2015, which was 4.0%, but sustainable.
- With the favorable evolution of productivity, the inflation rate can return to the level of 5.5% per year in the average for the period of 2016 and 2022. However, inflation should be relatively higher until 2017 (6.0% to 7, 5%).
- Increase of 2.5% in credit to the private sector. Growth is expected to be lower than that observed between on 1995 and 2015 (8.1% per year), due the increase in the need for public sector financing and higher household indebtedness.
- In the period, the exchange rate should be higher than BRL/ USD 2.205, in the average of the period from 2010 to 2015 to BRL/ USD 3.724, in average from 2017 to 2022.
- With inflation rates within the parameters of the target system, it will be possible to accommodate capital costs, with real interest rates falling to a relatively low level.
- The level of investments should be lower than in the period between 2006 and 2014 as a consequence of the fiscal crisis.

Table 3.1 shows the set of production projections, prices and external trade for the period between 2017-2022. The projected growth for the country is 2.5% per year, which will raise the Brazilian GDP from BRL6.123 trillion in 2016 to BRL7.101 trillion in 2022 - a 16% increase in 6 years. GDP per capita is expected to grow 1.8% per year in the period.

Table 3.1. Long-term scenario of the Brazilian economy, from 2016 to 2022.

Indicators	Background			Perspective
	2006-2010	2010-2014	2014-2016	2016-2022
Growing				
GDP*	4.6%	2.2%	-3.7%	2.5%
Population	1.1%	0.9%	0.8%	0.7%
GDP per capita	3.5%	1.3%	-4.5%	1.8%
Investments				
Investments rate (GFCF /GDP)	20.1%	21.5%	17,3%	19,0%
Inflation				
CPI	5.1%	6.2%	10.1%	5.5%
GPI	6.6%	5.6%	11.0%	6.5%
Exchange				
Exchange rate R$/USD	1.943	1.980	3.446	4.508
Real exchange rate* R$/USD	3.336	2.685	3.603	3.713

*At 2016 prices. Source: Ex Ante Consultoria Econômica. GFCF = Gross Fixed Capital Formation; GPI = General Price Index; CPI = Consumer Price Index; GDP = Gross Domestic Product.

4. Urban Development

The past twelve years have been marked by considerable progress in the field of urban development, an area that had been cushioned since the mid-1980s. The breakthrough was grounded in a series of institutional changes, which affected the country's urban development investment and was sustained with the expansion of public and private funds for financing.

At the institutional level, Law No. 10,931, of August 2, 2004, established the principles of the uncontroversial and the equity of affectation, which reestablished the housing finance system by reducing credit risk for Banks and the risk of investors in real estate.

The regulatory framework for sanitation, governed by Law No. 11,445 of January 5, 2007, established the national guidelines for the sector, which proposed universal access, integrity, efficiency, adequacy to public health and protection of the environment, the articulation with urban and regional development policies and the transparency of actions. It was established the principle that public basic sanitation services must have the economic-financial sustainability assured by remuneration for the collection of services, which can be done in the form of tariffs, taxes or tributes.

On the other hand, Law No. 12,587, of January 3, 2012, established the guidelines of the National Policy on Urban Mobility, which has the objective of universal and facilitated access to cities. The law established the general principles of urban mobility, the role of tariffs in public transport and the regulation of services, based the rights of users and pointed out the competencies of each sphere of power.

With the new laws and regulatory milestones, investments have returned, giving new impetus to these markets. In a context of credit recovery, the Minha Casa Minha Vida Program (PMCMV) was launched in 2009, one of the fronts adopted at the time, in order to combat the international economic crisis and reduce the housing deficit in the country.

However, the scarcity of public resources and the rationing of credit, with a strong reduction of investments, marked the years 2015 and 2016. This movement took place in the context of the fiscal crisis discussed in Chapter 3 and came at a time when the needs are still immense and the future demand generated by demographic pressures and the growth of cities is still gigantic. This poses major challenges for the next six years, which imply the need to revise the funding frameworks with a view to recovering investments in the country's urban development.

Challenges for 2022

Urban services

In the urban policy design, the analysis of the demographic factors and the socioeconomic dynamics that condition the formation of families is fundamental for dimensioning the needs of housing and sanitation. Developments in the labor market and education are additional factors affecting urban mobility. In general, housing and urban needs occur from four main processes::

- **Family dynamics:** process of formation of new families, which is influenced by the demographic profile and the economic evolution of the society.
- **Housing and sanitation deficit:** lack of adequate housing due to the lack of meeting needs over the years and lack of sanitation services.
- **Urban mobility:** transport needs and displacement in cities resulting from workers' and students' activities and the family's needs (shopping, leisure, etc.).
- **Depreciation:** the need to replace the housing stock, the sanitation structure and the transport and street infrastructure, which are constantly worn out by use.

Family dynamics are characterized by the process of formation of new families. In quantitative terms, this is the main component of housing needs in Brazil. The rhythm of family formation is influenced by population growth, age profile of the population, social habits and income evolution.

Population growth stems from the balance between population fertility, mortality and migratory flows. Nevertheless, there are two aspects equally important in this issue: the urbanization process and the evolution of the age structure. Historically, the departure of the countryside to the city has led to an increase in the demand for housing, as well as to cultural changes, among which the reduction of the number of children per family stands out. On the other hand, the maturing of the population has been changing the configuration of housing needs. The number of families has also been favored by economic conditions, which has benefited from the early formation of families and has postponed the decision to have children.

The need for sanitation infrastructure is due to the urbanization process itself, which concentrates large population groups in relatively small spaces. Without these services, urban agglomeration causes negative externalities and environmental degradation, with direct consequences on the quality of life.

The need for displacement in urban areas is due to population growth and the spread of labor, commercial and educational activities in the territory of cities. The strong growth of the labor market and the supply and demand of education, at all levels, has greatly increased demand for transportation in Brazilian cities.

Demographic Trends

Between 2000 and 2010, the Brazilian population grew at an average rate of 1.20% per year, rising from 173.4 million in 2000 to 195.5 million in 2010. Between 2010 and 2016, population growth declined compared to previous years, reaching a rate of 0.88% per year. The expectation for the next 6 years is that this rate will decrease further. It is expected an increase by 0.69% per year between 2016 and 2022.

Therewith, the population will reach 214.745 million in 2022, with an average demographic expansion rate of 0.72% per year. It is important to note that this expected decrease in the growth rate associated with increased income and falling fertility rates will be lower than the estimated years ago.

Table 4.1 shows the projected trajectory of the Brazilian population in the period from 2010 to 2022, according to the methodology of the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística, IBGE, 2013). The South and Southeast regions will have demographic expansion rates around 0.70% per year and the populations of the North and Center-West regions will grow above average: 1.33% per year and 1.40% per year, respectively. The Brazilian Northeast is the region which population is expected to grow at a slower rate in this time comparison.

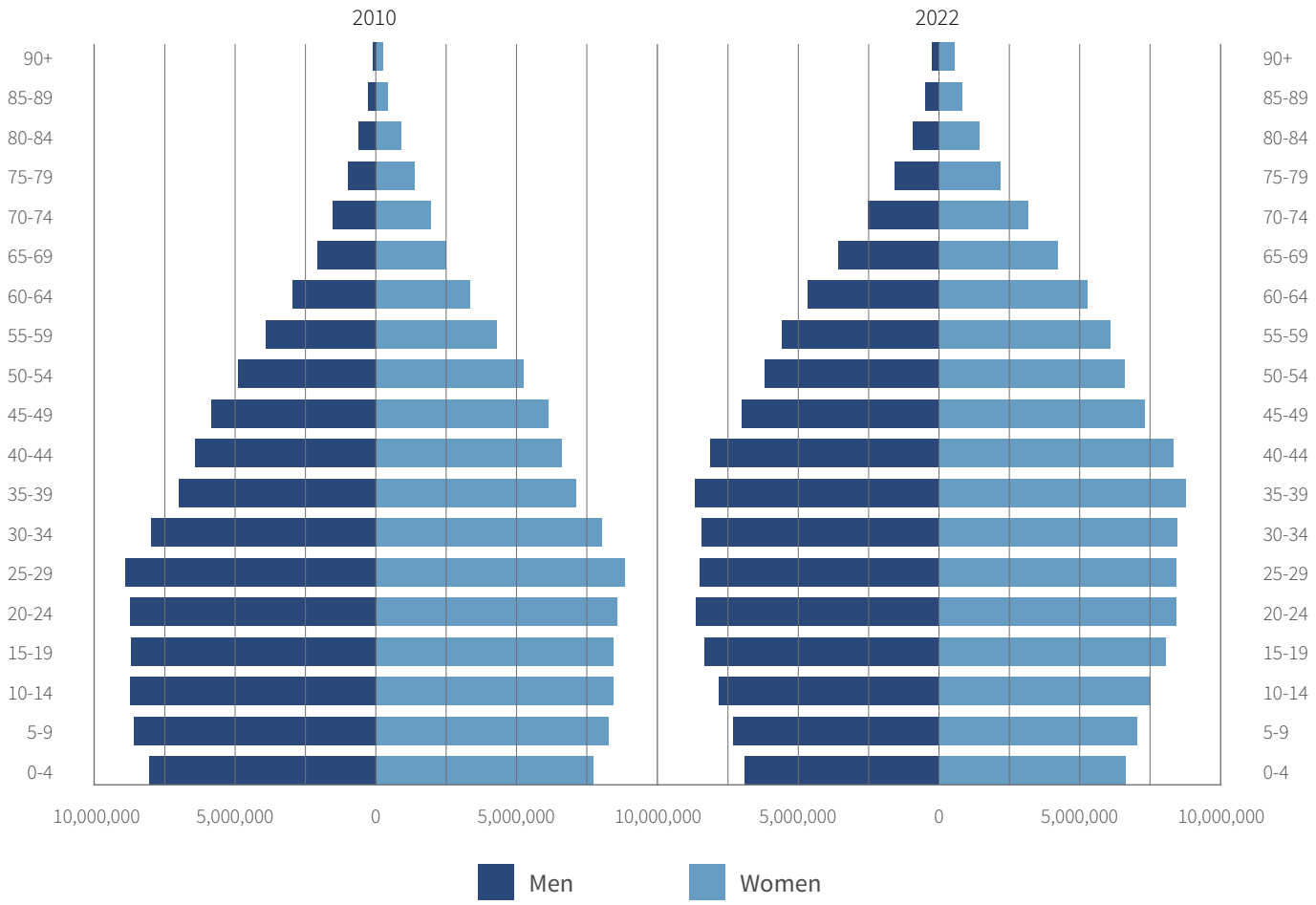
The North Region will have four states with a population growth above 1.5% per year during this period: Acre, Amapá, Roraima and Amazonas. The Distrito Federal, due to intense migratory movements in recent years, will maintain the highest rate of population growth: 2.11% per year between 2010 and 2022. The projection of population growth in the State of São Paulo (0.78% per year) is very close to the national average (0.79% per year). Piauí and Rio Grande do Sul are the states with the smallest projections of demographic expansion: 0.25% per year and 0.33% per year, in that order.

Table 4.1. Estimates of population per unit of Federation, in persons and annual average rate of change .

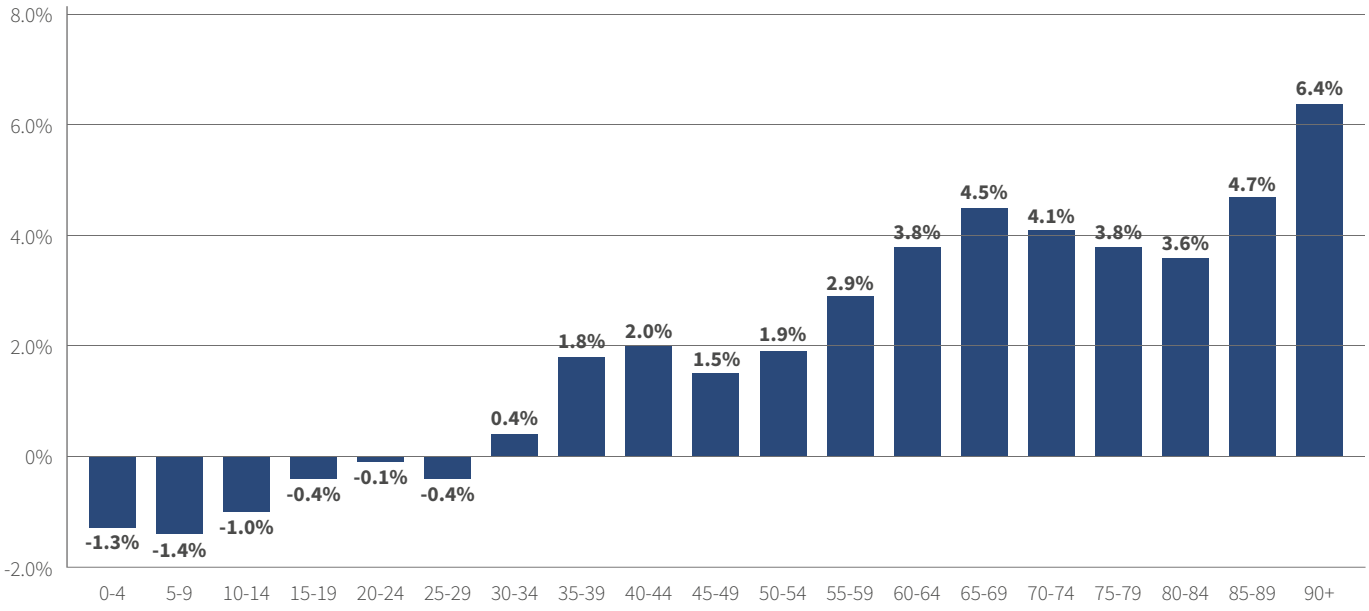
	2010	2016	2022	(%)
North	**16,206,409**	**17,707,783**	**18,983,716**	**1,33%**
Rondônia	1,663,490	1,787,279	1,890,155	1.07%
Acre	734,447	816,687	890,220	1.62%
Amazonas	3,604,165	4,001,667	4,349,811	1.58%
Roraima	460,678	514,229	562,288	1.67%
Pará	7,638,340	8,272,724	8,789,130	1.18%
Amapá	686,189	782,295	872,187	2.02%
Tocantins	1,419,100	1,532,902	1,629,925	1.16%
Northeast	**54,506,351**	**56,915,936**	**58,717,795**	**0.62%**
Maranhão	6,603,880	6,954,036	7,189,442	0.71%
Piauí	3,142,946	3,211,411	3,239,829	0.25%
Ceará	8,569,783	8,964,432	9,272,899	0.66%
Rio Grande do Norte	3,264,647	3,474,998	3,655,233	0.95%
Paraíba	3,819,237	3,999,415	4,141,161	0.68%
Pernambuco	8,985,658	9,410,772	9,759,391	0.69%
Alagoas	3,231,836	3,358,527	3,444,654	0.53%
Sergipe	2,120,052	2,265,779	2,392,601	1.01%
Bahia	14,768,312	15,276,566	15,622,585	0.47%
Southeast	**82,392,683**	**86,356,952**	**89,589,414**	**0.70%**
Minas Gerais	20,134,742	20,997,560	21,646,641	0.61%
Espírito Santo	3,697,243	3,973,697	4,215,796	1.10%
Rio de Janeiro	16,074,006	16,635,996	17,078,778	0.51%
São Paulo	42,486,692	44,749,699	46,648,199	0.78%
South	**28,099,409**	**29,439,773**	**30,567,727**	**0.70%**
Paraná	10,728,961	11,242,720	11,666,293	0.70%
Santa Catarina	6,351,418	6,910,553	7,435,729	1.32%
Rio Grande do Sul	11,019,030	11,286,500	11,465,705	0.33%
Center-West	**14,292,945**	**15,660,988**	**16,888,857**	**1.40%**
Mato Grosso do Sul	2,486,257	2,682,386	2,853,969	1.16%
Mato Grosso	3,049,348	3,305,531	3,523,288	1.21%
Goiás	6,155,266	6,695,855	7,170,021	1.28%
Distrito Federal	2,602,074	2,977,216	3,341,579	2.11%
Brazil	**195,497,797**	**206,081,432**	**214,747,509**	**0.79%**

Source: National System of Sanitation Information (Sistema Nacional de Informações do Saneamento, SNIS). Preparation: Ex Ante Consultoria Econômica.

The Graph 4.1 shows the age pyramid of Brazil in 2010 and in 2022. It shall be noticed that the distribution of Brazilian population per age group will undergo dramatic changes up to 2022. The population in 2010 was more concentrated in the young age groups: 45% of the population had age lower than 25 years old. The population, which is a 26 year-old or above represented 55% of the total. In 2022, the population within this age group will reach 63% of the population and the children and young people will reduce its participation in the total population to 37%. This change in the age distribution will affect the dynamics of family's formation, because there will be more persons at an age of formation. The drop in the number of children in absolute terms over time proves that the families are getting smaller. The number of senior citizens, on the one hand, will be increasing as time goes by, in a process of ageing of the population (Graph 4.2).



Graph 4.1. Age pyramid of the Brazilian population in 2010 and estimate for 2022. Source: Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística, IBGE). Preparation: Ex Ante Consultoria Econômica.



Graph 4.2. Evolution of population per age group, per year, from 2002 to 2022, in percentage. Source: Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística, IBGE) Preparation: Ex Ante Consultoria Econômica.

Formation of families

It is estimated that from 2010 to 2016 more than 6.6 million families were formed in the country. The demographic dynamics and the scenario of moderate economic growth, along with the continuity of the social mobility process, even in a slower pace, will determine the expansion even stronger of the number of families from 2016 to 2011, as shown in the Table 4.2. The growth rate of the number of families, 1.84% per year, will be almost three times the pace of demographic expansion expected for the period. Thus, the number of Brazilian families shall rise from 63.9 million to 70.9 million, with the formation of 6.990 million families in 6 years - or 1.165 million new families per year.

According to the demographic trends, the South and Southeast regions are those which have the lowest perspectives of expansion of the number of families from 2010 to 2022, 1.51% per year and 1.56% per year, respectively. In contrast, the number of families in North and Northeast regions shall grow 2.71% per year and 2.02% per year, respectively. The States of North region will have higher annual growth rates of the number of families, exceeding 3% per year in Amapá. Distrito Federal also has a relatively high rate, leading to the creation of more than 124,000 new families from 2016 to 2011. The projections for growth of the number of families in São Paulo are 1.60% per year from 2010 to 2022. Rio Grande do Sul is the State, which presents the lowest family formation rate, 1.25% per year according to this time comparison.

Table 4.2. New families per Unit of Federation.

	2010-2016	2016-2022	2010-2022
North	**709,058**	**792,844**	**1,501,902**
Rondônia	69,211	72,513	141,723
Acre	36,671	42,271	78,941
Amazonas	154,762	176,494	331,255
Roraima	21,881	24,333	46,214
Pará	332,984	373,737	706,721
Amapá	34,256	39,042	73,297
Tocantins	59,214	64,537	123,750
Northeast	**1,914,281**	**2,144,035**	**4,058,316**
Maranhão	255,192	292,158	547,350
Piauí	104,185	117,981	222,166
Ceará	303,330	344,785	648,115
Rio Grande do Norte	115,382	129,324	244,707
Paraíba	115,143	131,304	246,446
Pernambuco	296,632	325,892	622,524
Alagoas	119,276	134,203	253,478
Sergipe	84,369	93,163	177,532
Bahia	520,669	575,327	1,095,997
Southeast	**2,559,040**	**2,596,281**	**5,155,321**
Minas Gerais	652,361	689,484	1,341,845
Espírito Santo	118,740	121,923	240,663
Rio de Janeiro	436,272	443,494	879,766
São Paulo	1,351,546	1,341,500	2,693,046
South	**874,062**	**875,048**	**1,749,110**
Paraná	354,572	359,365	713,936
Santa Catarina	230,512	227,218	457,731
Rio Grande do Sul	288,895	288,548	577,443
Center-West	**573,986**	**582,975**	**1,156,961**
Mato Grosso do Sul	91,741	95,219	186,959
Mato Grosso	126,962	129,020	255,982
Goiás	232,011	234,653	466,664
Distrito Federal	123,240	124,116	247,356
Brazil	**6,631,853**	**6,989,757**	**13,621,610**

Source: Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística, IBGE). Preparation: Ex Ante Consultoria Econômica.

The relative growth is stronger in North and Northeast regions, but in absolute terms, the major part of the growth comes from Southeast. In the total of 6.990 million new families that will arise from 2016 to 2022, 37.1% will happen in the Southeast region, which is equivalent to 2.596 million new families. São Paulo will account alone for 19.2% of the expansion, which corresponds to 1.342 million new families.

In relative terms, the growth of the number of families in the urban area will be lower than the expected expansion in rural areas: 1.76% per year in comparison to 1.98% from 2010 to 2022. Nevertheless, in percentage terms, the new urban families will represent 84.3% of the total formation of new families in the country in this period. In the North and Northeast regions, the expansion of rural families will exceed the average rate of 2% per year from 2010 to 2022.

Deficit of homes

The other determining factor of the needs of homes is the housing deficit, which corresponds to the liability unredeemed in the past. The decrease of this liability, besides the objective of housing policy, brings significant improvements from the social point of view, since it is concentrated in the population with lower purchasing power.

The Table 4.3 shows the number of families in the housing deficit, according to Fundação João Pinheiro (FJP, 2016) methodology. In 2010, the number of families in the housing deficit was 6.941 million. This volume corresponded to 12.1% of existing homes in the country, indicating that it would be necessary to build or rebuild almost 7 million homes to normalize the housing situation. The urban deficit represented 84.8% of the total deficit of homes in the country.

Table 4.3. Housing deficit per area and Unit of Federation.

	2010		2014		Variação 2010-2014	
	Total	Relative (%)	Total	Relative (%)	Absolute	(%) per year
North	**823,442**	**20.7%**	**632,067**	**11.9%**	**-191,375**	**-6.4%**
Rondônia	58,759	12.8%	45,339	7.7%	-13,420	-6.3%
Acre	34,054	17.9%	30,071	12.8%	-3,983	-3.1%
Amazonas	193,910	24.3%	168,668	14.7%	-25,242	-3.4%
Roraima	25,237	21.8%	22,810	13.9%	-2,427	-2.5%
Pará	410,799	22.1%	286,766	11.7%	-124,033	-8.6%
Amapá	35,419	22.7%	30,201	13.5%	-5,218	-3.9%
Tocantins	65,264	16.4%	48,212	9.5%	-17,052	-7.3%
Northeast	**2,111,517**	**14.1%**	**1,900,646**	**10.2%**	**-210,871**	**-2.6%**
Maranhão	451,715	27.3%	392,517	19.0%	-59,198	-3.5%
Piauí	129,038	15.2%	88,569	8.5%	-40,469	-9.0%
Ceará	276,284	11.7%	283,102	9.8%	6,818	0.6%
Rio Grande do Norte	111,538	12.4%	97,833	8.5%	-13,705	-3.2%
Paraíba	120,741	11.2%	135,153	10.1%	14,412	2.9%
Pernambuco	302,377	11.9%	274,905	8.9%	-27,472	-2.4%
Alagoas	124,063	14.7%	122,063	11.7%	-2,000	-0.4%
Sergipe	74,387	12.6%	69,032	9.3%	-5,355	-1.9%
Bahia	521,374	12.7%	437,472	8.3%	-83,902	-4.3%
Southeast	**2,674,428**	**10.6%**	**2,425,679**	**8.0%**	**-248,749**	**-2.4%**
Minas Gerais	557,371	9.2%	529,270	7.3%	-28,101	-1.3%
Espírito Santo	95,892	9.7%	108,728	7.9%	12,836	3.2%
Rio de Janeiro	525,622	9.8%	460,273	7.5%	-65,349	-3.3%
São Paulo	1,495,542	11.7%	1,327,408	8.6%	-168,134	-2.9%
South	**770,749**	**8.7%**	**645,189**	**6.0%**	**-125,560**	**-4.3%**
Paraná	287,466	8.7%	257,531	6.5%	-29,935	-2.7%
Santa Catarina	179,763	9.0%	155,777	6.3%	-23,986	-3.5%
Rio Grande do Sul	303,521	8.4%	231,881	5.5%	-71,640	-6.5%
Center-West	**560,555**	**12.9%**	**464,480**	**8.7%**	**-96,075**	**-4.6%**
Mato Grosso do Sul	86,009	11.3%	71,651	7.8%	-14,358	-4.5%
Mato Grosso	118,889	13.0%	72,399	6.4%	-46,490	-11.7%
Goiás	229,488	12.2%	202,720	8.8%	-26,768	-3.1%
Distrito Federal	126,169	16.3%	117,710	12.0%	-8,459	-1.7%
Brazil	**6,940,691**	**12.1%**	**6,068,061**	**8.6%**	**-872,630**	**-3.3%**

Source: Fundação João Pinheiro (FJP). Preparation: Ex Ante Consultoria Econômica.

Four years later, in 2014, the housing deficit had reverted to 6.068 million homes, or 8.6% of existing residences in the country. This figure indicates that 873,000 families left the housing deficit in these four years. The drop rate of housing deficit in absolute: terms was a record: 3.3% per year. The drop in the housing deficit exceeded 4% per year, from 2010 to 2014, in North, South and Center-West regions. Such data shows that the housing policy and the macroeconomic conditions of the period were enough to finance housing production, which supplied

the demographic pressure from the growth in the number of families and allowed a decrease in Brazilian housing liability. It is of utmost importance to notice that there was a decrease of the precariousness and the excessive densification of residents in renting houses, two components which are directly associated to poverty.

There was a decrease in the number of families in cohabitation too. The only component of the housing deficit, which grew within the period, was the excessive onus with rent: 802,000 units were added, rising from 2.124 million homes in 2010 to 2.927 million homes in 2014 (Table 4.4).

Table 4.4. Housing deficit per component and Unit of Federation, variation from 2010 to 2014.

	Precarious	Cohabitation	Excessive onus with rent	Excessive densification	Total
North	**-151,105**	**-72,298**	**33,446**	**-1,418**	**-191,375**
Rondônia	-6,457	-14,554	7,781	-190	-13,420
Acre	-6,500	2,547	-88	58	-3,983
Amazonas	-25,059	-14,237	13,730	324	-25,242
Roraima	-8,541	1,478	3,671	964	-2,427
Pará	-93,328	-36,006	7,928	-2,627	-124,033
Amapá	-3,533	-3,099	296	1,119	-5,218
Tocantins	-7,687	-8,426	127	-1,065	-17,052
Northeast	**-101,594**	**-272,378**	**191,890**	**-28,789**	**-210,871**
Maranhão	-28,176	-35,264	4,134	108	-59,198
Piauí	-37,233	-2,264	-2,428	1,455	-40,469
Ceará	26,915	-58,125	47,524	-9,496	6,818
Rio Grande do Norte	-2,804	-15,437	9,177	-4,641	-13,705
Paraíba	-1,838	434	13,082	2,734	14,412
Pernambuco	277	-65,013	45,342	-8,078	-27,472
Alagoas	-298	-18,115	20,804	-4,390	-2,000
Sergipe	-3,882	-6,722	8,637	-3,389	-5,355
Bahia	-54,556	-71,872	45,617	-3,091	-83,902
Southeast	**-70,813**	**-511,210**	**408,759**	**-75,485**	**-248,749**
Minas Gerais	-17,943	-92,396	94,963	-12,725	-28,101
Espírito Santo	-6,954	-5,018	25,871	-1,063	12,836
Rio de Janeiro	1,131	-100,063	52,874	-19,291	-65,349
São Paulo	-47,047	-313,732	235,051	-42,406	-168,134
South	**-100,102**	**-109,343**	**86,897**	**-3,013**	**-125,560**
Paraná	-36,460	-35,121	43,561	-1,915	-29,935
Santa Catarina	-11,366	-41,681	28,330	731	-23,986
Rio Grande do Sul	-52,276	-32,541	15,007	-1,829	-71,640
Center-West	**-56,791**	**-114,485**	**81,147**	**-5,945**	**-96,075**
Mato Grosso do Sul	-15,383	-9,790	11,907	-1,092	-14,358
Mato Grosso	-23,932	-24,469	4,105	-2,194	-46,490
Goiás	-15,088	-51,258	42,297	-2,719	-26,768
Distrito Federal	-2,388	-28,969	22,837	61	-8,459
Brazil	**-480,405**	**-1,079,715**	**802,139**	**-114,649**	**-872,630**

Source: Fundação João Pinheiro (FJP). Preparation: Ex Ante Consultoria Econômica.

It is of the utmost importance to notice that, besides the shortages embodied in the housing deficit, there are serious problems in the liability that involves precarious settlements and irregular properties. These issues require institutional and political actions, which are in line with the needs of housing production.

Deficit of sanitation

The relative delay of sanitation in Brazil is a historical problem. In 1950, only one in three homes was connected to the general sewage system or to the rainwater drainage system. This means that only 1/3 of the population had the sewage away from their place of residence. Less than 5% of the sewage collected received some treatment before dumping in the environment.

The condition improved over the past few decades, but the growth pace was slower and the challenges are still huge. In 2014, the number of houses connected to the general rainwater drainage system reached 31.411 million and the number of homes with treated water reached 53.767 million, according to data from the National System of Sanitation Information (Sistema Nacional de Informações do Saneamento, SNIS) (Brazil, Ministry of Cities (Ministério das Cidades), 2016). In comparison with the statistics of 2010, these numbers show an expressive progress in the sanitation area. The growth rate of the number of homes with sewage collection was 4.6% per year and the families with access to treated water of 3.3% (Table 4.5).

However, the deficit of sanitation in Brazil reached 16.455 million homes without access to treated water and 38.812 million homes without access to sewage collection in the same year. As only 70% of the collected sewage was treated before the disposal in the environment and 55% of homes had access to sewage collection services, it is estimated that only 39% of the water distributed in the residences received treatment before the disposal in the environment. This data shows the shortage of sanitation in the country, which compromises the health, the productivity and the environment, with impacts on the income and the quality of life in the country, as indicated in a recent study by Trata Brazil Institute (Instituto Trata Brazil, 2014) about the benefits of sanitation in the country.

Table 4.5. Sanitation in Brazil, number of homes, 2014.

	Treated water		Sewage collection	
	With access	Without access	With access	Without access
North	**2,032,750**	**3,294,378**	**299,967**	**5,027,161**
Rondônia	204,309	383,849	16,224	571,934
Acre	93,975	141,377	22,116	213,236
Amazonas	547,143	601,228	53,446	1,094,925
Roraima	96,293	68,320	36,254	128,359
Pará	646,899	1,811,778	81,882	2,376,795
Amapá	60,522	163,773	6,918	217,377
Tocantins	383,609	124,053	83,127	424,535
Northeast	**11,854,183**	**6,760,739**	**3,715,650**	**14,899,272**
Maranhão	798,368	1,270,005	149,713	1,918,660
Piauí	656,498	385,595	64,016	978,077
Ceará	1,975,817	907,036	714,247	2,168,606
Rio Grande do Norte	795,431	355,648	200,492	950,587
Paraíba	896,124	437,939	341,783	992,280
Pernambuco	2,048,831	1,050,527	492,188	2,607,170
Alagoas	557,856	489,210	120,320	926,746
Sergipe	582,176	159,501	107,964	633,713
Bahia	3,543,082	1,705,278	1,524,927	3,723,433
Southeast	**26,768,272**	**3,506,920**	**21,519,444**	**8,755,748**
Minas Gerais	6,203,027	1,089,114	4,778,302	2,513,839
Espírito Santo	1,088,851	291,730	575,708	804,873
Rio de Janeiro	4,695,358	1,454,062	3,166,534	2,982,886
São Paulo	14,781,036	672,014	12,998,900	2,454,150
South	**8,835,790**	**1,833,875**	**3,719,638**	**6,950,027**
Paraná	3,457,758	505,545	2,240,236	1,723,067
Santa Catarina	1,940,754	517,088	356,722	2,101,120
Rio Grande do Sul	3,437,278	811,242	1,122,680	3,125,840
Center-West	**4,276,365**	**1,059,137**	**2,156,045**	**3,179,457**
Mato Grosso do Sul	751,951	168,010	285,781	634,180
Mato Grosso	673,814	457,190	166,793	964,211
Goiás	1,933,615	369,589	918,109	1,385,095
Distrito Federal	916,985	64,348	785,362	195,971
Brazil	**53,767,360**	**16,455,049**	**31,410,744**	**38,811,665**

Source: National System of Sanitation Information (Sistema Nacional de Informações do Saneamento, SNIS), Ministry of Cities (Ministério das Cidades) and Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística, IBGE).Preparation: Ex Ante Consultoria Econômica.

The data from SNIS indicates payments made by public and private companies devoted to treatment and distribution of water in the amount of BRL12.582 billion from 2010 to 2014[1]. During this period, the investments in collection and treatment of sewage totaled an average of BRL5.991 billion and the investments in other developments totaled BRL856 million per year. Thus, the average volume of investments was BRL19.429 billion. This data indicated that the capital cost of access to treated water is BRL7,655.00 per home and the access to services of collection and treatment of sewage is BRL4.662.00 per home.

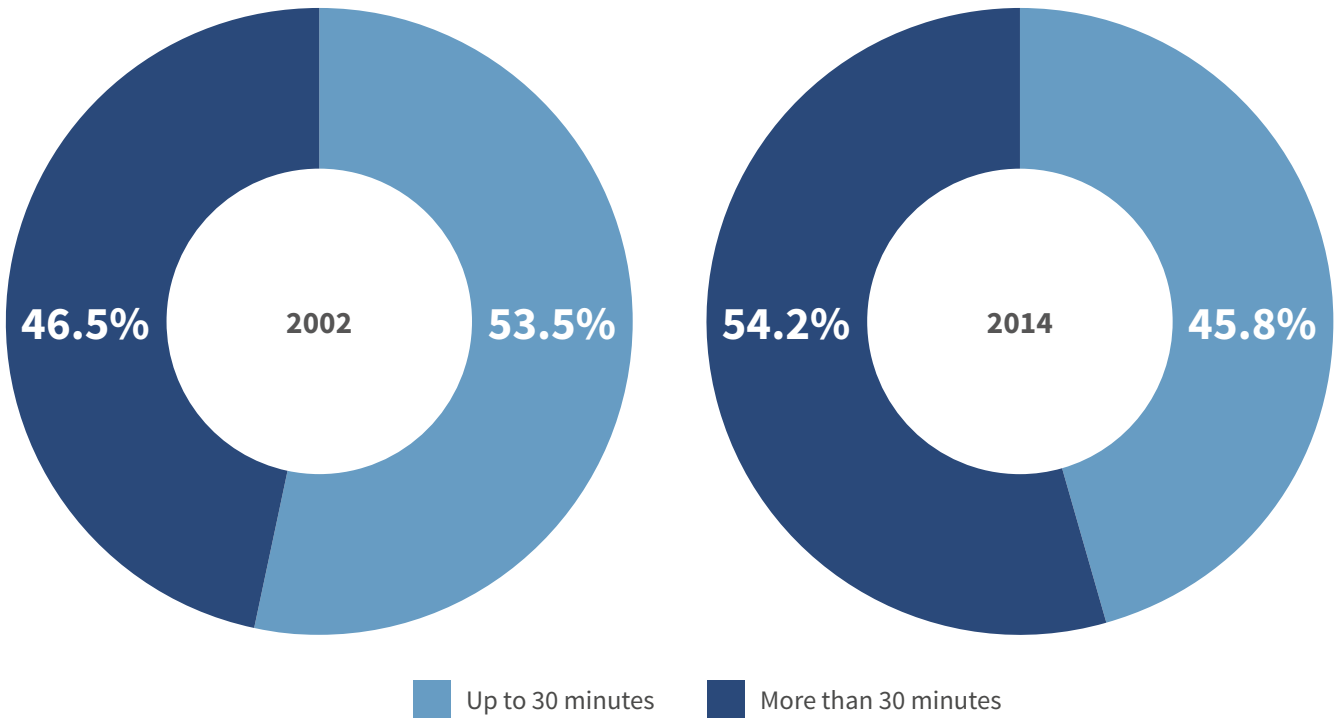
Urban mobility

Considering the nine main metropolitan regions of the country, the statistics from the National Confederation of Transport (Confederação Nacional do Transporte, CNT) show that there was, from October 2004 to October 2014, a growth of 2.8% per year in the number of passengers transported by bus. In terms of kilometers traveled, the growth was 1.9% per year. The difference between both rates involved the increase in the rate of passengers per kilometer (IPK) in the urban bus system, which rose from 1.57 in 2004 to 1.68 in 2014.

The Brazilian fleet of urban buses reached 107 thousand vehicles in 2014, as a result of investments which expanded the stock of vehicles in service and renewed the fleet, whose average age was reduced from 5.3 years in 2004 to 4.7 years per vehicle in 2014. The car and motorcycle fleets, in contrast, increased by 6.8% and 12.2% per year, respectively, within the same period, causing traffic jams in Brazilian cities.

The low historic level of investments in mass public transport systems and in the increase and adequacy of public roads led to loss of operational speed and increase in the cost of public transport, especially the urban bus. From 2002 to 2014, according to data from IBGE, the cost of public transport increased 7.4% per year, in contrast with an inflation of 6.3% per year.

Considering the same time comparison, the travel time from the residence to the workplace increased, according to data from the National Household Sampling Survey (Pesquisa Nacional por Amostra de Domicílios, PNAD). In 2002, 53.5% of workers in metropolitan regions of the country spent less than 30 minutes in the path from its home to the work, while 46.5% of workers spent more than 30 minutes in the transfer (single or return trip). In 2014, such proportion was reversed: 45.8% of workers are still spending less than 30 minutes from its home to the work and 54.2% spent more than 30 minutes (Graph 4.3).



Graph 4.3. Distribution of persons per time of displacement from the home to the workplace. Source: Brazilian Institute of Geography and Statistics (Instituto Brazileiro de Geografia e Estatística, IBGE) Preparation: Ex Ante Consultoria Econômica.

[1] Values to 2016 prices, corrected by deflator from the construction industry (only construction companies).

Investments required

Needs of new homes

The Brazilian housing policy shall have as a goal the production of homes for the families which will be formed in the next six years, and for those who are part of housing deficit. This goal will enable addressing the future housing needs, as well as it will recover the social liability of the deficit, reducing it to an acceptable standard until 2022.

Table 4.6. Needs of new homes, 2017 to 2011.

Year	Motivation			Total
	New families	Decrease of precariousness *	Decrease of cohabitation	
2017	1,115,197	207,823	95,580	1,418,600
2018	1,134,644	207,823	95,580	1,438,047
2019	1,154,430	207,823	95,580	1,457,833
2020	1,174,561	207,823	95,580	1,477,964
2021	1,195,043	207,823	95,580	1,498,446
2022	1,215,882	207,823	95,580	1,519,285
Total	**6,989,757**	**1,246,939**	**573,479**	**8,810,175**

*Number that allows for the elimination of precarious homes, with excessive onus of rental and with excessive densification in 20 years.
Source: Ex Ante Consultoria Econômica.

As seen above, the pace of demographic growth and the economic path of the country will lead to the formation of an average of 1.165 million new families per year from 2017 to 2011. In addition, in order to eliminate the precarious homes, with excessive onus or excessively densified, estimated in 3.949 million in 2014, it would be necessary the building of 208 thousand homes per year over the course of two decades. It shall be added to this amount the building of approximately 96 thousand homes per year, so as to eliminate the undesired cohabitation in 20 years. The Table 4.6 shows this data year on year, from 2017 to 2022.

The sum of these needs - paying attention to the new families and the elimination of the deficit - results in a production of approximately 1.468 million homes per year. This means that in order to meet the goals of housing policy proposed in this document, it will be required the building of 8.810 million homes from 2017 to 2011. This is a great challenge, since this volume of building is equivalent to the total of homes of the States of Minas Gerais and Espírito Santo in 2014.

The Table 4.7 shows the effect of this policy in the housing indicators. The two main consequences are (i) the decrease in the difference between the number of families and the number of homes, and (ii) the gradual elimination of the precariousness - in 2030, all homes would be adequate. Within this scenario, the housing deficit will drop to a satisfactory level, reducing from 12.1% to 4.1% of Brazilian families in 2022.

Table 4.7. Housing and demographic indicators and projections, 2010 to 2022.

Year	2010	2016	2022	(%) per year
Population	195,497,797	206,081,432	214,747,509	0.79%
Homes	57,320,555	63,952,408	70,942,165	1.79%
Housing deficit	6,940,691	5,631,746*	3,811,328	-4.87%
Relative deficit	12.1%	8.8%	5.4%	-6.55%
Inhabitants per home	3.41	3.22	3.03	-0.99%

*The data from 2016 is projected based on evolution of deficit from 2010 to 2014. Source: Ex Ante Consultoria Econômica.

Investments in housing

The consequence of this housing policy in economic terms is the considerable increase of the investment in housing. The building of new homes shall mobilize approximately BRL205.6 billion per year on average, from 2017 to 2020. The value of new properties used to make the projections is BRL130 thousand in 2016. This value takes into account the price of properties of several standards, every one with a reference value. The process involving the increase in value of 3% of the properties is also taken into account, an increase resulting from the own dynamics of investment in the real estate market. The growth of the values over the years causes the increase of the average from BRL130 thousand in 2016 to BRL150.6 thousand in 2022. It is important to notice that this increase in the average values results from two factors: (i) the increase in value of the properties, which is natural with the urbanization process and the raising of plot of land prices; and (ii) the social mobility, which causes the growth of the number of families in the relatively higher income classes. The Table 4.8 shows the values of total and average housing investments required for the period between 2017 and 2022.

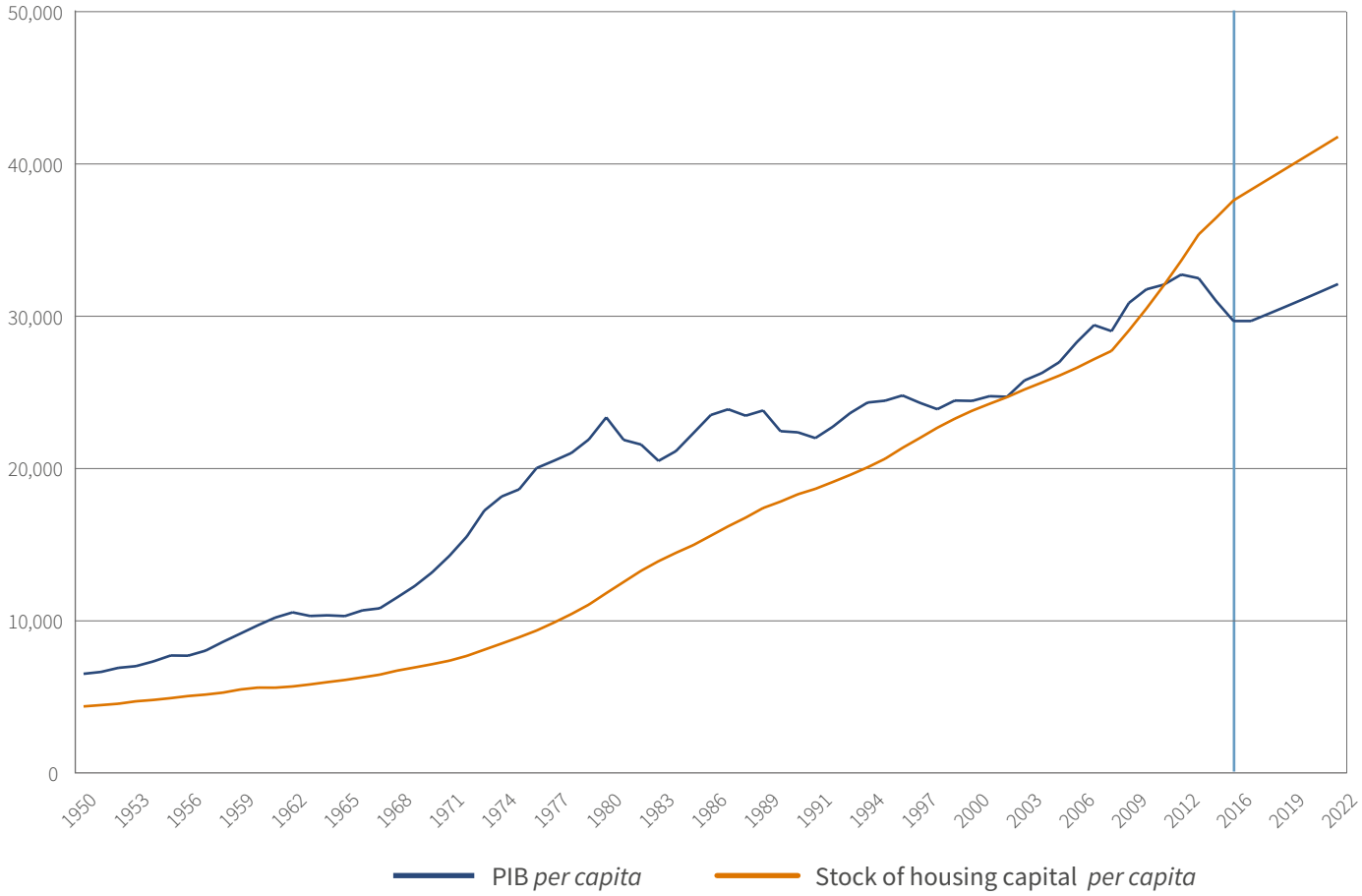
The volume of investments required to restitute the depreciation, that is, the amount of resources to rebuild residential properties shall reach BRL144.4 billion on annual average for the period from 2017 to 2022. This value corresponds to 2.0% of the stock of Brazilian housing capital, estimated in BRL7.772 trillion in 2016. It is of utmost importance to notice that the progress in the investments in new homes, when increasing the stock of real estate assets, raises the needs of investment on maintenance and rebuilding. Thus, in order to meet the housing development goals, investments whose value total BRL361 billion per year on average of the period will be required. This is equivalent to approximately 6% of the Gross Domestic Product (Produto Interno Bruto, PIB), which represents a huge challenge in terms of financing needs.

The consequence of this housing policy will be the constant accumulation of real estate assets, which raise the stock of housing capital per inhabitant from BRL37.7 thousand in 2016, to BRL41.9 thousand in 2022. Which means to say that this process is consistent with the progress of Brazilian PIB per capita projected for the period. Both variables are shown in Graph 4.4, which shows a long-term perspective for the economic growth and accumulation of real estate assets.

Table 4.8. Housing investment, in billions of Brazilian reais*, from 2017 to 2022.

	New homes		Rebuilding		Total		(%)
	per year	2017-2022	per year	2017-2022	per year	2017-2022	
North	**19.598**	**117.585**	**9.757**	**58.540**	**29.354**	**176.125**	**8.1%**
Rondônia	1.697	10.184	1.074	6.444	2.771	16.628	0.8%
Acre	1.179	7.072	0.552	3.312	1.731	10.384	0.5%
Amazonas	5.803	34.819	2.489	14.933	8.292	49.751	2.3%
Roraima	0.633	3.800	0.285	1.711	0.918	5.510	0.3%
Pará	8.015	48.090	4.040	24.237	12.054	72.327	3.3%
Amapá	1.030	6.180	0.426	2.553	1.455	8.733	0.4%
Tocantins	1.556	9.339	0.937	5.623	2.494	14.962	0.7%
Northeast	**44.829**	**268.977**	**28.601**	**171.604**	**73.430**	**440.581**	**20.3%**
Maranhão	5.861	35.166	2.588	15.527	8.449	50.693	2.3%
Piauí	2.482	14.894	1.781	10.688	4.264	25.582	1.2%
Ceará	5.722	34.331	3.587	21.525	9.309	55.856	2.6%
Rio Grande do Norte	2.238	13.429	1.507	9.045	3.746	22.474	1.0%
Paraíba	2.896	17.378	2.090	12.539	4.986	29.917	1.4%
Pernambuco	5.684	34.107	4.079	24.473	9.763	58.579	2.7%
Alagoas	2.905	17.431	1.652	9.912	4.557	27.343	1.3%
Sergipe	1.688	10.128	1.045	6.272	2.733	16.400	0.8%
Bahia	14.996	89.977	10.314	61.885	25.310	151.861	7.0%
Southeast	**92.382**	**554.292**	**79.980**	**479.880**	**172.362**	**1,034.172**	**47.7%**
Minas Gerais	21.750	130.498	17.974	107.842	39.723	238.340	11.0%
Espírito Santo	4.327	25.964	3.204	19.221	7.531	45.185	2.1%
Rio de Janeiro	16.008	96.045	16.601	99.606	32.609	195.651	9.0%
São Paulo	50.202	301.212	42.107	252.642	92.309	553.854	25.6%
South	**25.016**	**150.098**	**24.306**	**145.833**	**49.322**	**295.931**	**13.7%**
Paraná	10.285	61.712	9.089	54.532	19.374	116.244	5.4%
Santa Catarina	6.689	40.133	5.690	34.140	12.379	74.273	3.4%
Rio Grande do Sul	8.098	48.587	9.483	56.898	17.581	105.485	4.9%
Center-West	**18.221**	**109.326**	**12.801**	**76.805**	**31.022**	**186.132**	**8.6%**
Mato Grosso do Sul	2.624	15.745	2.010	12.063	4.635	27.807	1.3%
Mato Grosso	3.504	21.021	2.597	15.583	6.101	36.604	1.7%
Goiás	6.375	38.252	4.695	28.167	11.070	66.420	3.1%
Distrito Federal	6.358	38.146	3.538	21.228	9.896	59.374	2.7%
Brazil	**205.582**	**1,233.492**	**155.444**	**932.662**	**361.026**	**2,166.155**	**100.0%**

*At constant prices of 2016. Source: Ex Ante Consultoria Econômica.



Graph 4.4. Gross Domestic Product (Produto Interno Bruto, PIB) per capita and housing capital per capita, in Brazilian reais, at prices of 2016. Source: Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística, IBGE) and Ex Ante Consultoria Econômica.

Investments on sanitation

The National Plan of Basic Sanitation (Plano Nacional de Saneamento Básico, PLANSAB) sets forth the goals for the comprehensive expansion (universalization) of services comprising treatment and distribution of water, collection and treatment of sewage for 2033, with coverage percentages for the years of 2018 and 2023 too (Brazil, Ministry of Cities (Ministério das Cidades), 2013). Based on these goals, it is possible to make estimations of the number of new residential connections of water distribution and sewage collection required up to 2022, so that the country follows its path of urban development, with decrease in the environmental impacts and improvement of quality of life in the cities. The new connections will provide access to sanitation for those homes built from 2017 to 2022. They will allow for a gradual decrease of the deficit of sanitation heading to the universalization.

From 2016 to 2022, 8.184 million new connections of water and 9.951 million new connections of sewage will be required, which are enough to raise the fraction of homes with access to services of water distribution to 95% and the percentage of homes with access to services of sewage collection to 80%. By these means, the services of water distribution will be very close to the universalization in South, Southeast and Center-West regions of the country. For the other regions, however, there will be still shortages in 2022, with 17% of North homes and 12% of Northeast homes without access to water distribution services. With respect to the sewage collection services, the fractions of homes with coverage will be lower: North (61%), Northeast (66%), Southeast (92%), South (86%) and Center-West (69%), with a national average of 80% of homes.

The data from SNIS on investments made in the sanitation sector in recent years and the increase in the number of accesses to services of water distribution and sewage collection allows for the estimation of the average values of investments per new access (Brazil, Ministry of Cities (Ministério das Cidades), 2016). In case of water distribution services, a new access cost BRL3,378.00 on a national average, from 2010 to 2014[2]. The access to services of sewage collection cost approximately BRL4,662.00 in similar comparison.

Thus, the resources required for the increase of the number of homes with sewage collection and the access to treated water in Brazil will total BRL78.887 billion, which is equivalent to investments of BRL13,148 billion per year. Of that total, 42% refer to investments on system of treatment and distribution of water, and 58% to investments in the sewage collection system. The values concerning the investments in sanitation correspond, as an estimate, to a share of 0.2% of GDP in 2016, implying a relatively small cost for the society.

The Table 4.9 indicates the distribution of these values per Units of Federation for the total period and per year. Considering these values, 33.4% shall be destined to Southeast region, which, despite the better relative situation, still reserves the largest absolute share of the population without access to sanitation. The Northeast region shall receive 24.8% of values, with greater weight for the most populous States (Bahia and Pernambuco), or those which are in a worse relative situation (Piauí and Ceará). The North region of the country shall receive many resources too, accounting for 17.9% of the total. The States of South and Center-West regions of Brazil shall receive 14.2% and 9.8% of investments, respectively.

[2] Values at prices of 2016..

Table 4.9. Investment in treated water and sewage collection and treatment in billions of Brazilian Reais*.

	Water		Sewage		Total		(%)
	per year	2017-2022	per year	2017-2022	per year	2017-2022	
North	**1.405**	**8.433**	**0.945**	**5.669**	**2.350**	**14.102**	**17.9%**
Rondônia	0.053	0.315	0.275	1.649	0.327	1.965	2.5%
Acre	0.081	0.486	0.108	0.647	0.189	1.133	1,4%
Amazonas	0.074	0.446	0.070	0.423	0.145	0.868	1.1%
Roraima	0.029	0.177	0.065	0.391	0.095	0.568	0.7%
Pará	0.886	5.319	0.290	1.740	1.176	7.058	8.9%
Amapá	0.258	1.550	0.036	0.218	0.295	1.769	2.2%
Tocantins	0.023	0.140	0.100	0.601	0.124	0.741	0.9%
Northeast	**1.183**	**7.098**	**2.072**	**12.431**	**3.255**	**19.528**	**24.8%**
Maranhão	0.119	0.715	0.128	0.765	0.247	1.481	1.9%
Piauí	0.036	0.217	0.536	3.217	0.572	3.433	4.4%
Ceará	0.132	0.791	0.380	2.278	0.512	3.069	3.9%
Rio Grande do Norte	0.051	0.309	0.1145	0.867	0.196	1.176	1.5%
Paraíba	0.041	0.248	0.027	0.164	0.069	0.412	0.5%
Pernambuco	0.484	2.905	0.317	1.902	0.801	4.807	6.1%
Alagoas	0.015	0.090	0.017	0.100	0.032	0.190	0.2%
Sergipe	0.057	0.343	0.201	1.204	0.258	1.548	2.0%
Bahia	0.247	1.479	0.322	1.933	0.569	3.412	4.3%
Southeast	**1.862**	**11.175**	**2.523**	**15.137**	**4.385**	**26.312**	**33.4%**
Minas Gerais	0.215	1.290	0.511	3.066	0.726	4.356	5.5%
Espírito Santo	0.151	0.909	0.189	1.131	0.340	2.040	2.6%
Rio de Janeiro	0.410	2.460	0.313	1.878	0.723	4.338	5.5%
São Paulo	1.086	6.515	1.510	9.063	2.596	15.578	19.7%
South	**0.413**	**2.477**	**1.460**	**8.761**	**1.873**	**11.238**	**14.2%**
Paraná	0.190	1.142	0.343	2.059	0.533	.3201	4.1%
Santa Catarina	0.093	0.557	0.549	3.294	0.642	3.850	4.9%
Rio Grande do Sul	0.130	0.779	0.568	3.408	0.698	4.187	5.3%
Midwest	**0.669**	**4.012**	**0.616**	**3.695**	**1.284**	**7.707**	**9.8%**
Mato Grosso do Sul	0.060	0.361	0.071	0.427	0.131	0.788	1.0%
Mato Grosso	0.312	1.870	0.108	0.647	0.420	2.517	3.2%
Goiás	0.141	0.845	0.297	1.783	0.438	2.628	3.3%
Distrito Federal	0.156	0.936	0.140	0.838	0.296	1.774	2.2%
Brazil	**5.532**	**33.194**	**7.616**	**45.693**	**13.148**	**78.887**	**100.0%**

*2016 constant prices. Source: Ex Ante Consultoria Econômica.

In addition to investments in expanding access to treated water, sewage collection and treatment, it is estimated that investments of BRL3.5 billion per year in macrodrainage networks and in the collection and treatment of solid waste are required, which constitutes a total volume of BRL19.2 billion from 2017 to 2022. The sanitation as a whole will receive investments of BRL98.1 billion, or BRL 16.3 billion per year.

Investments in urban mobility

In urban and metropolitan transport, areas there have been advances in recent years. According to a survey by the National Association of Urban Transport Companies (NTU, 2016), from 2010 to 2016, 183 interventions were implemented in urban mobility in 38 large and medium-sized municipalities in the country. The total investment volume of these interventions reached BRL12.045 billion. These interventions include the construction of train lines, subways and airfields, road works, the creation of bus-only lanes and exclusive lanes, and the implementation of bus rapid transit (BRT).

Some of these interventions are part of the Growth Acceleration Program - Urban Mobility (Programa de Aceleração do Crescimento – Mobilidade Urbana - PAC-MU), which had a total of 320 projects, of which 184 were in the preparatory phase, 7 projects were in the bidding process, 110 projects were under construction, and 19 were completed or in operation. Of the total amount of BRL12.443 billion indicated by NTU, BRL3.482 billion came from PAC-MU. In addition to this amount, PAC-MU accounts for BRL12.002 billion of works completed from 2010 to 2016.

These data indicate that the projects monitored by NTU, added to the completed PAC-MU projects, totaled investments of BRL24.047 billion from mid-2010 to mid-2016, corresponding to investments of approximately BRL 4.809 billion per year, of which BRL2.232 billion (or 46.4%) were disbursed with resources from the General Budget of the Federal Government (Orçamento Geral da União - OGU) and from the budget of the State of São Paulo.

The PAC-MU works package under construction in June 2016 and with a construction horizon up to 2022 is budgeted at BRL68.644 billion, of which an estimated 35% has already been disbursed. The residual value of BRL44.619 billion indicates a funds commitment of BRL7.436 billion per year from 2017 to 2022. Although it represents an investment increase of almost 55% in relation to the history of the period from 2010 to 2016, the investments required in mobility, due to the quantitative deficiencies and qualitative improvements required, should involve funds of BRL13.442 billion per year. These funds would allow the development of road works, the construction of BRT systems and light rail vehicles (LRVs) and bus lanes and the execution of works on metropolitan trains, which would lead to the most effective advance in public transport in the country, with environmental and welfare improvements for society. However, this amount is 2.8 times the average annual investment of the last four years. This will require an additional effort to make these ventures feasible in the coming years.

5. Investments in economic infrastructure

The importance of infrastructure for economic growth and development was established a long time ago. Its expansion, maintenance, and diversification bring benefits not only in the short and medium terms, but also mainly in the long term. Thus, poor infrastructure slows down economic progress and undermines the growth potential of a country. In this context, when infrastructure needs are considerable, investments in the area are gaining in importance and the positive effects of the maturation of new projects in infrastructure are enhanced.

This is the current picture of the economic infrastructure in Brazil - the offer of infrastructure in several areas is not enough to adequately meet the existing demand. Therefore, investments in new projects become more urgent, even though the funds need differ for each segment, as well as regulatory and financing obstacles and environmental issues. The role of the public sector in this context - whether as legislator, regulator, partner of the private sector, or even as a direct investor - is crucial for the recovery and expansion of investments in the infrastructure sector.

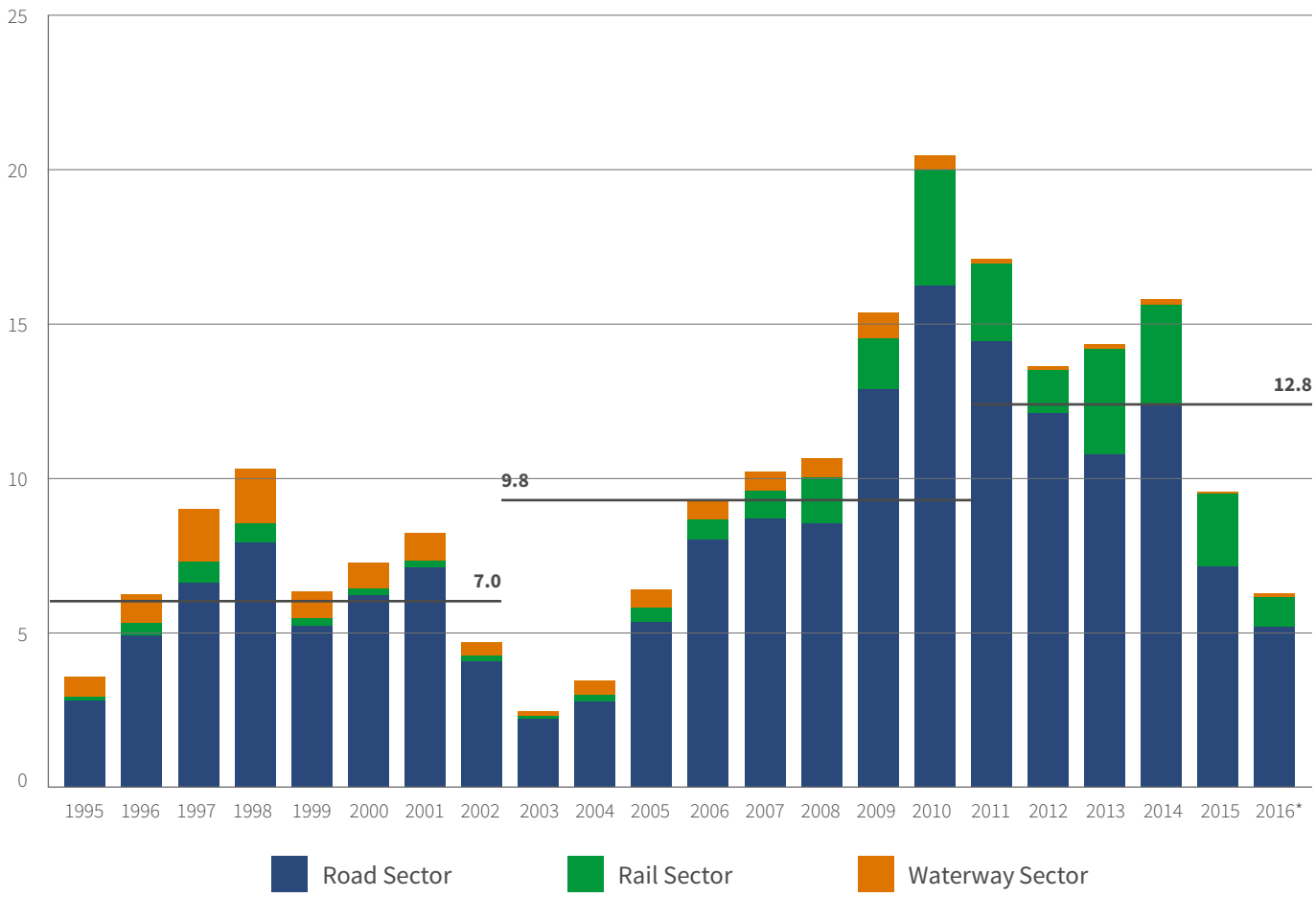
In this sense, the federal government's initiatives on two fronts are particularly important: (i) strategic planning, including the National Logistics and Transport Plan (Plano Nacional de Logística e Transportes - PNLT) and the Strategic Waterway Plan (Plano Hidroviário Estratégico - PHE), both under the responsibility of the Ministry of Transport, Ports and Civil Aviation; and (ii) investment programs, which also involve the private sector. In the last decade, three relevant sets of programs have been launched by the federal government: the Growth Acceleration Program (Programa de Aceleração do Crescimento - PAC), in 2007, of which the second phase was launched in 2011; the Logistics Investment Program (Programa de Investimento em Logística - PIL), launched in August 2012, which had a new stage starting in 2015; and, finally, the Investment Partnerships Program (Programa de Parcerias de Investimentos - PPI), created in May 2016, under which the Grow Project (Projeto Crescer) was launched in September of that same year, aiming to reformulate the country's concessions model, stimulating, thus, the resumption of investments in infrastructure in the midst of the economic crisis that the country is experiencing.

The mapping of infrastructure investments carried out in recent years and those planned for the next ones serves as a starting point for assessing the contribution that the sector can give to Brazilian growth in the coming decades, especially by increasing the economy’s productivity as a whole. Based on the surveys made by various instances of the federal government, under the aforementioned investment plans and programs above mentioned and the 10-year plans, and incorporating to this information the national accounts data and the Annual Survey of the Construction Industry data (Pesquisa Anual da Indústria da Construção - Paic) of the Brazilian Institute of Geography and Statistics (Instituto Brazileiro de Geografia e Estatística - IBGE) from 2007 to 2014, which provide consolidated information on investments in infrastructure works, this chapter seeks to map the necessary investments for the 2017-2022 horizon.

Transport

The public sector is still an important reference when it comes to investments in the transport infrastructure sector as a whole. From 2010 to 2015, the annual average investment of the Ministry of Transport, Ports and Civil Aviation (Budget Reports), taking into account the total spending on road, rail, and waterway modes, was relatively higher level compared to previous years, as shown in Graph 5.1. The ministry's annual average investment in these three segments increased from BRL8.3 billion in the period 2003-2009 to BRL15.2 billion per year from 2010 to 2015, at 2016 constant prices, including investments carried out under the various phases of the federal government's PAC.

This increase was due to the expansion of investments in road transport infrastructure, under the responsibility of the National Department of Transport Infrastructure (Departamento Nacional de Infraestrutura de Transporte - Dnit)[1], whose annual average expenditure between these two periods increased from BRL6.9 billion to BRL12.2 billion (at 2016 prices), and in rail transport, whose average increased from BRL779 million to BRL2.8 billion per year. Investments in waterway transportation infrastructure, on the other hand, decreased if comparing the two periods, from BRL547 million to BRL196 million per year.



Graph 5.1. Federal investments in transports, in billions of Brazilian Reais, at 2016 prices. *Estimate. Source: Ministry of Transport, Ports and Civil Aviation. Drafting: Ex Ante Consultoria Econômica.

[1]Federal government agency linked to the Ministry of Transport, Ports and Civil Aviation, whose objective is to implement the Federal Transit System's (Sistema Federal de Viação) infrastructure policy, comprising its operation, maintenance, restoration or replacement, capacity and expansion adequacy through construction of new ways and terminals and the funds for the implementation of works are from the Federal Government.

It should be noted, however, that these investments reversed in the year of 2015, largely as a result of the fiscal constraints faced by the federal public sector, which led to a substantial reduction of the Union's investments. It is expected, based on data available up to the month of September, that the year 2016 closes with a further reduction of values.

Considering a longer-term horizon, one of the main references of public sector investments is given by PNLT, developed by the Ministry of Transport, Ports and Civil Aviation, in cooperation with the Ministry of Defense. According to the most recent version of the PNLT, from 2011 and published in September 2012, the investments required to meet the needs of the Brazilian transport infrastructure totaled BRL423.8 billion from 2012 to 2031 (Brazil, Ministry of Transport, Ports and Civil Aviation, 2012). Since it is an indicative plan, periodic re-evaluations of the PNLT are planned, in order to allow the development of the transport sector, according to the future demands and the evolution of the national economy.

Regarding the estimated investments in the sector in the coming years, the new reference is the PPI, launched by the federal government[2], with a view to expanding and strengthening the interaction between the State and the private sector, through the conclusion of partnership agreements for the performance of public infrastructure projects and other decentralization measures. In September 2016, PPI's first set of projects was selected and announced under the Federal Government's Grow Project - Projeto Crescer - which included in its portfolio works already planned in the second phase of the 2015 PIL, whose the initial edition was launched in 2012. According to the Ministry of Transport, Ports and Civil Aviation, Projeto Crescer provides for the concession of 34 infrastructure projects, of which 11 are linked to the Ministry: four airports, three railways, two port terminals and two highways, totaling BRL36.6 billion in estimated investments (Brazil, Ministry of Transport, Ports and Civil Aviation, n.d.).

Road

The road transport sector underwent substantial changes from the first concessions made in the 1990s. With respect to federal highways, the first stage had five concessions and was carried out from 1994 to 1997. In 2001, with the creation of the National Land Transport Agency (Agência Nacional de Transportes Terrestres - ANTT), which purpose is regulating and supervising road, rail and pipeline transportation in the country, federal highway concessions are now being carried out and managed by the agency. Thus, under the command of ANTT, the second stage of concessions was carried out, with the conduction of eight auctions in 2008 (Phase I) and 2009 (Phase II). In 2013, the third stage was started, already under the PIL. During this stage, further six federal road sections were granted in 2013 and 2014, in addition to the Rio-Niterói Bridge new concession, which began in 2015.

According to a survey carried out by ANTT, the Federal Highway Concession Program currently covers 11,191 km of highways, divided into concessions promoted by the Ministry of Transport, by the state governments, through delegations based on Law No. 9,277, and by the agency itself. According to the Brazilian Association of Highway Concessionaires (Associação Brazileira de Concessionárias de Rodovias - ABCR), which brings together 59 companies in the highway concession sector in the country, the concessionaires currently operate 19,030 km of federal and state highways in 12 Brazilian states, which corresponds approximately 9% of the national paved road net.

[2] Created under the Presidency of the Republic, the PPI was launched through Provisional Decree No. 727, dated May 12, 2016, which was later converted into Law No.13,334, dated September 13, 2016.

Regarding the national road net, from 2001 to 2015, according to Dnit data, there was no progress in terms of extension, with a decrease of 1.6% comparing the two years. In 2001, the country had 1,748,228 km of highways and, in 2015, 1,720,643 km, as shown in Table 5.1, which, in addition to showing the evolution of the extent of the net, divides it according to its physical situation. Despite the overall negative result, there was 23.2% accumulated growth in the period of the extension of the paved portion and 89% in the accumulated in the period of the double lane extension, indicating the recovery process of the net promoted by successive concessions rounds.

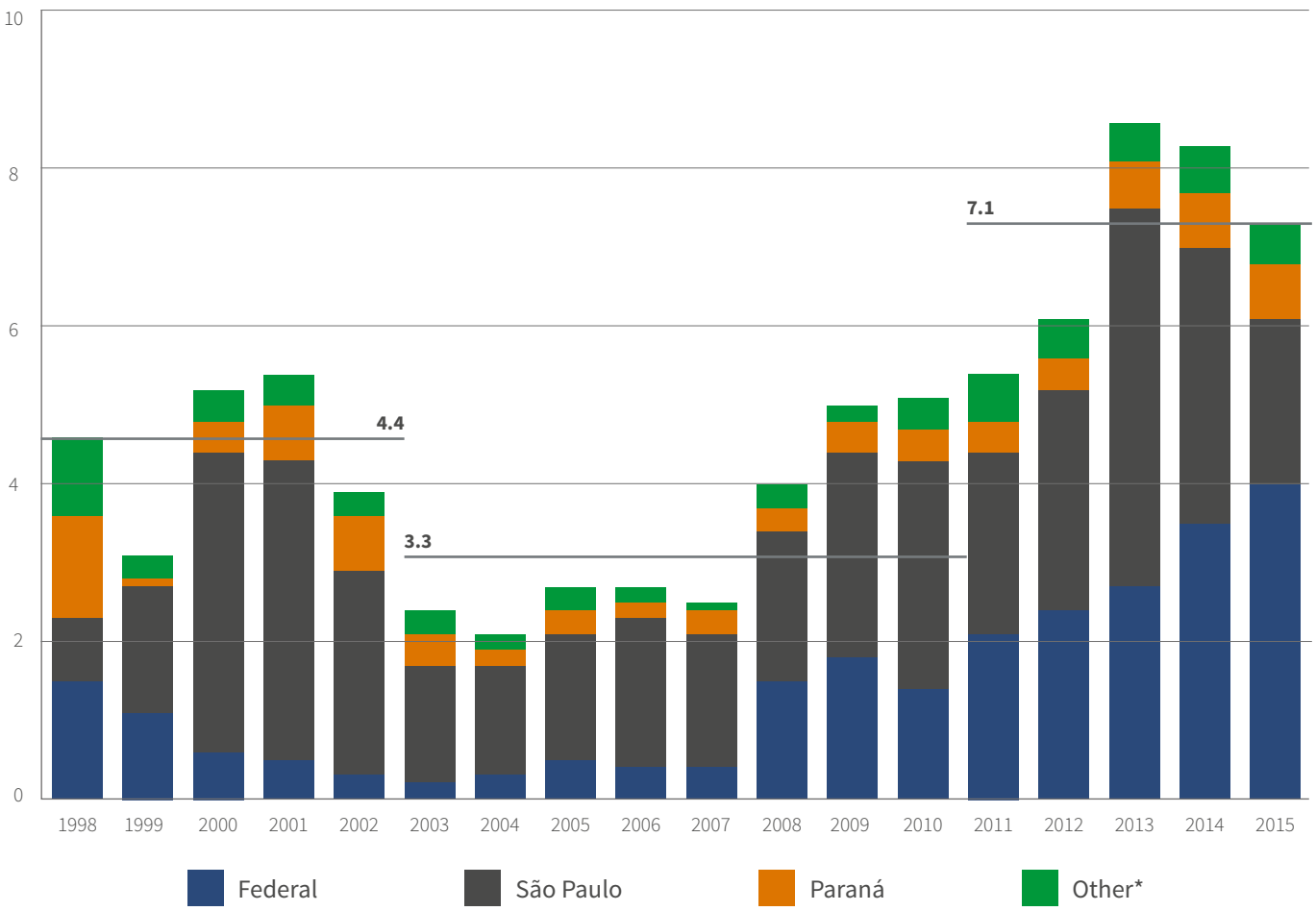
Table 5.1. Road net, according to physical situation (km).

Year	Planned	Unpaved	Paved	Total
2001	149,930	1,427,394	170,903	1,748,228
2005	143,925	1,391,868	205,706	1,741,500
2010	131,331	1,368,227	212,738	1,712,296
2015	157,561	1,352,464	210,619	1,720,643
2015-2001	**7,631**	**-74,931**	**39,716**	**-27,584**

Source: National Department for Transport Infrastructure (Departamento Nacional de Infraestrutura de Transporte – Dnit) and Ministry of Transport, Ports and Civil Aviation. Drafting: Ex Ante Consultoria Econômica.

In addition to the public investments in road transport conducted by DNIT, as discussed in the previous section, it is important to highlight the investments made by highway concessionaires. According to ABCR, the concessionaires invested BRL40.7 billion from 2010 to 2015 (at 2016 prices), which corresponds to an annual average of BRL6.8 billion. Most of them were carried out by concessionaires in the state of São Paulo (approximately BRL18.3 billion), followed by federal concessionaires, with BRL16.2 billion (ABCR, 2015), as shown in Figure 5.2. As of 2013, however, the year-on-year increase in investments reversed a direct result of the reduction in the amounts invested in São Paulo, even though there has been a continuous increase in federal concessionaire investments since 2010.

Regarding to the investments planned, the Projeto Crescer covers the concession of two highways, whose auctions are expected to take place in the second half of 2017. According to the information disclosed by the federal government, it is estimated that BRL14.8 billion will be invested over 30 years of concession of the two projects, with concentrate amount (BRL12.0 billion) in the sections of BR-101/116/290/386 highways, in the state of Rio Grande do Sul. In a complementary manner, Brazilian Association of Highway Concessionaires (ABCR, 2015) plans investments of BRL49 billion up to 2021, taking all its associates together.



Graph 5.2. Investments made by highway concessionaires, in billions of Brazilian Reais, at 2016 prices. * States of Pernambuco, Bahia, Espírito Santo, Minas Gerais, Rio de Janeiro, and Rio Grande do Sul. Source: Brazilian Association of Highway Concessionaires (ABCR). Drafting: Ex Ante Consultoria Econômica.

Railway

In 1992, the Rede Ferroviária Federal S.A. (RFFSA) (Federal Railway Company) was included in the National Privatization Program (Programa Nacional de Desestatização - PND), which started the privatization process of the railway sector in the country. In the 1990s, with the concession to the private initiative for 30 years, which could be extended for a further 30 years, of the operation and maintenance of seven regional railways, as well as traffic control and transportation service, RFFSA was liquidated and their assets transferred to the concessionaires.

In 1997, the federal government granted the so-called Companhia Vale do Rio Doce the right to operate for 30 years the Vitoria-Minas Railway (Estrada de Ferro Vitória a Minas - EFVM) and the Carajás Railroad (EFC), used by the company in the transport of mineral goods. With the implementation of ANTT, in 2002, federal railroad concession contracts began to be managed by the agency.

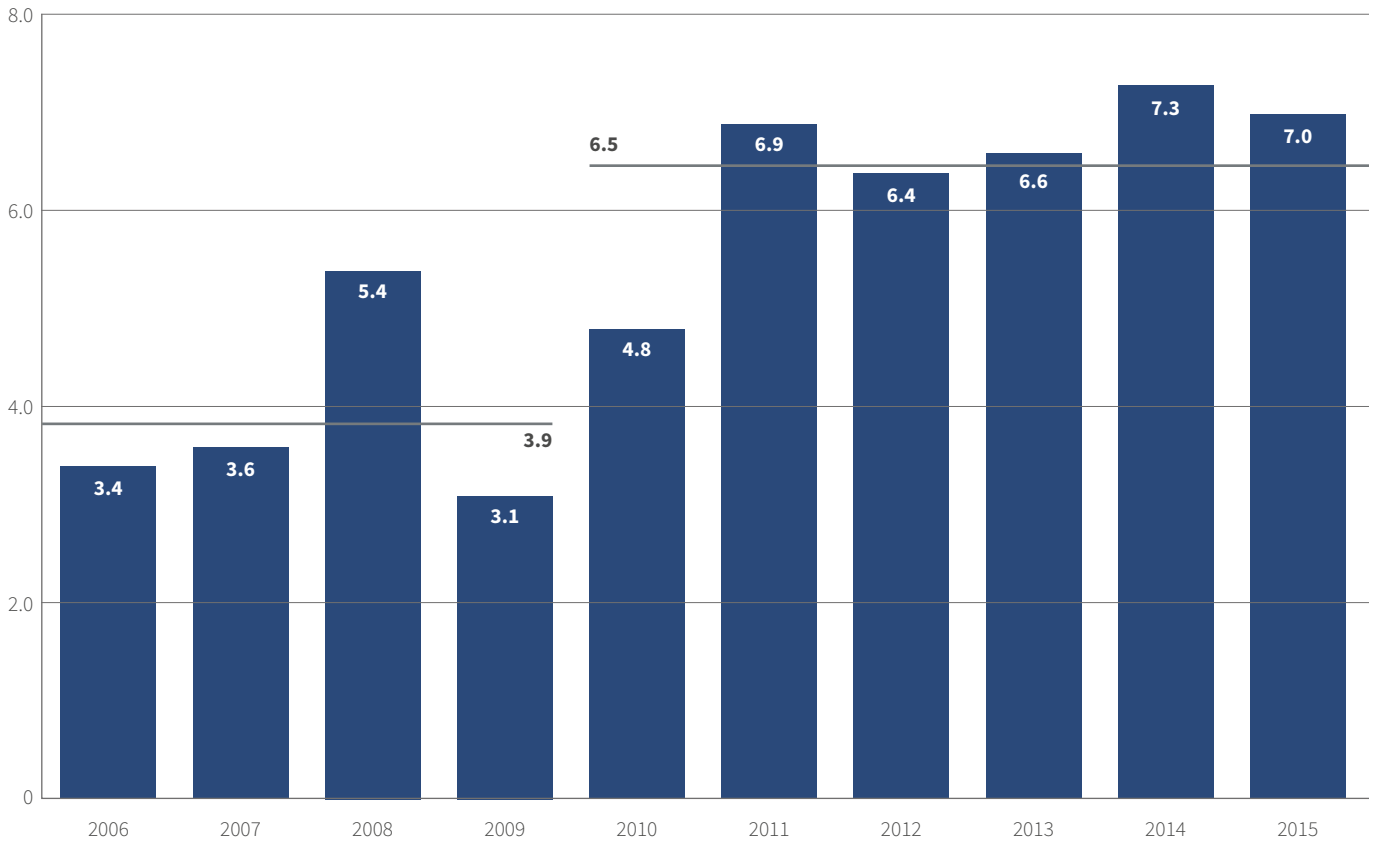
Finally, it should be noted that, before the sector privatization process, the federal government also made other concessions for the construction and maintenance of railways. These concessions comprised; the Ferrovia Norte- Sul (North-South Railway), Ferroeste – Estrada de Ferro Paraná Oeste S.A. (Paraná West Railroad Company), and Ferronorte – Ferrovias Norte Brazil S.A (Brazil North Railway Company)[3]. In 2008, ANTT granted Valec Engenharia, Construções e Ferrovias S.A. - a public company controlled by the Federal Government and linked to the Ministry of Transport, Ports and Civil Aviation - the construction, operation and development of the service of the Ferrovia de Integração Oeste- Leste de Ilhéus (BA) a Alvorada (TO) (West- East Integration Railway from Ilhéus to Alvorada).

[3] In 2008, the amendment to the Articles of Incorporation of Ferronorte S.A. for America Latina Logística Malha Norte S.A was approved, according to a survey prepared by the National Land Transport Agency (ANTT).

With regard to development and investments, Villar and Marchetti (2007) identify three phases in the first decade after the privatization of the sector. From 1996 to 1999, the group of concessionaires resumed investments in the sector, which had been reduced substantially since 1993, year that marked the effective start of the concession process in the sector, promoting the recovery of the permanent road and rolling stock, greatly degraded by the lack of maintenance of installed capacity from 1993 to 1996. However, such investments were sufficient only to recover the performance of the RFFSA System observed in previous years.

Since 2000, there has been an increase in the capacity and the assumption of logistics services, with the expansion of manholes, the capacity to support the permanent route and the construction of road and rail integration terminals and the acquisition of new rolling stock. During this period, investment in the sector increased and, since 2003, the investments were also directed to the acquisition of railcars and locomotives. In the second half of the 2000's, the expectation was that a third phase of investment would begin, which would be characterized by the expansion of the net and the overcoming of logistical bottlenecks[4] untreated, due to a lack of equation between the interests of the granting power, states, municipalities, and concessionaires, in addition to the expansion of the net in large projects, such as Ferrovia Norte-Sul and Nova Transnordestina.

Many bottleneck issues were not adequately addressed, especially those related to physical obstacles and substantial net expansion, despite the significant increase in investments made by the concessionaires from 2006 to 2015, as shown in Graph 5.3. Total investments jumped from a level of BRL3.5 billion per year, in 2006-2007, to an annual average of BRL6.5 billion from 2010 to 2015, at 2016 prices.



Graph 5.3. Investments of railway concessionaires, in billions of Brazilian Reais, at 2016 prices. Source: Evolução do Transporte Ferroviário de Cargas (Evolution of Rail Freight Transport), August 2016, National Agency of Land Transport (ANTT). Drafting: Ex Ante Consultoria Econômica.

[4] As Villar and Marchetti (2007) emphasize regarding the equation of logistic bottlenecks, investments should be applied in the solution of physical obstacles, especially in urban environments, mainly to increase the average speed of the compositions, with consequent increase of the productivity of the system.

Of the total investments made by the concessionaires since 2006, it is possible to note, among the main types, the high participation of rolling stock investments up to 2008, as presented in Table 5.2. As of 2010, there is a growing increase in infrastructure investments, followed by the group that ANTT calls other investments, such as the environment, buildings and computerization. However, the investment in rolling stock had continued to have a significant weight until 2014.

Table 5.2. Investments of railway concessionaires, by type, in billions of Brazilian Reais*.

Discrimination	2006	2010	2015	Annual Average Variation (%)
Rolling stock	1.990	1.132	0.600	-12.5%
Infrastructure	0.694	1.514	3.361	19.2%
Superstructure	0.004	1.080	1.286	87.9%
Telecommunication	0.032	0.016	0.032	0.1%
Signaling	0.110	0.111	0.293	11.5%
Workshops	0.116	0.110	0.088	-3.0%
Staff training	0.029	0.039	0.013	-8.6%
Road vehicles	0.005%	0.007%	0.000	-34.9%
Other investments***	0.441	0.774	1.345	13,2%
Total	**3.420**	**4.783**	**7.017**	**8.3%**

*At 2016 prices. **Railcar, locomotive, other vehicles and equipment and passenger cars. ***Environment, buildings, informatics and others.
Source: Evolução do Transporte Ferroviário de Cargas (Evolution of Rail Freight Transport, August 2016, National Agency for Land Transport (ANTT). Drafting: Ex Ante Consultoria Econômica.

Within the scope of the Projeto Crescer, as mentioned previously, 3 railways are contemplated, with auction expected to take place in the second half of 2017 and planned investments totaling BRL14.3 billion, to be used over the period granting. The highlight is the EF-170, the Ferrogrão, a greenfield project, which will consist of a new rail corridor for export by Arco Norte, aiming to improve the flow of agricultural production in the Midwest, connecting the region to the Port of Miritituba, in the state of Pará. The investment planned in this project amounts to BRL12.6 billion, with a concession term of 65 years.

Air transportation

The concessions of the domestic airports were started in 2011, with the Airport of São Gonçalo do Amarantes, in Natal. In February of the following year, the first batch of larger airports was auctioned, including Brasília International Airport, São Paulo International Airport in Guarulhos, and Viracopos International Airport in Campinas. According to the National Civil Aviation Agency (ANAC) [5], these concessions aimed at improving the quality of services at these airports and speeding up the execution of the works needed to meet the demand for air transport, the growth of the sector in the country and, particularly, the occurrence of major sporting events planned for the following years – the 2014 FIFA World Cup and the 2016 Olympic Games, in the city of Rio de Janeiro. The total investment to be made during the concession period of each one of them was BRL16.2 billion. Part of this amount had already been invested in the first two years of concession.

In December 2012, PIL's scope was expanded, which included specific actions for the airport and port sectors. According to the airport program lines (PIL-Airports), the objectives would be three: to improve the quality of services and the airport infrastructure for the users; to expand the supply of air transportation to the population; and rebuild the regional aviation network. From the point of view of new investments, the highlights of the program were: (i) second lot of concessions, with the concession of two major international airports - Galeão (RJ) and Confins (MG) - and estimated investments of BRL9.2 billion; (ii) investments greater than BRL7.3 billion in 270 regional airports, aiming to strengthen and restructure the Brazilian regional aviation network (Siqueira, 2014).

Considering these two fronts of investment, only the concession of the international airports was, in fact, carried out. In November 2013, concession auctions for Galeão (RJ) and Confins (MG) were carried out and the winning groups took over the management of the airports in August 2014[6]. The works at the two airports that were already in the bid, contracted and in progress when the auctions occurred, continued to be carried out by the Brazilian Airport Infrastructure Company (Empresa Brazileira de Infraestrutura Aeroportuária -Infraero). For Confins airport, the total estimated value of the investments to be made over the concession period (30 years, renewable once for up to 5 years) is BRL3.5 billion. As for Galeão, the expectation is for investments of BRL5.65 billion over the concession period (25 years, extendable once for up to 5 years).

With respect to investments made by the public sector in recent years, in the form of Infraero's capital expenditures, the state company invested approximately BRL12.2 billion from 2010 to 2015, at 2016 prices. BNDES also disbursed a substantial sum for the airport expansion and modernization projects, which are part of the disbursements to the sector of auxiliary transport services (National Classification of Economic Activities - Classificação Nacional de Atividades Econômicas – CNAE - 52), which totaled BRL36.5 billion from 2010 to 2015[7].

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[5] Created in 2005, the National Civil Aviation Agency (ANAC) began operating in 2006, replacing the Civil Aviation Department (DAC). Federal special regime agency - linked to the Ministry of Transport, Ports and Civil Aviation - was created to regulate and supervise the activities of civil aviation and the aeronautical and airport infrastructure in the country. It is also within its competence to grant, permit or authorize the operation of air services and airport infrastructure.

[6] It should be noted that, in the case of the concession of Brasília, Guarulhos, Campinas airports, the first batch of airports granted to the private sector and Confins and Galeão, the Brazilian Airport Infrastructure Company (Infraero) remained with 49% of the capital stock of each concession.

[7] In this sector is also included financing for concessionary companies of road and rail transport and port operators.

With respect to regional airports, in August 2016, the federal government announced investments in 176 airports, other than the 270 originally considered by PIL. Of this set of 176, 53 were considered priority and should receive investments of BRL300 million from 2017 to be operating by 2020. Also as announced by the Ministry of Transport, Ports and Civil Aviation, the Regional Aviation Program, responsible for the portfolio of the selected airports, should receive BRL1.2 billion in investments up to 2020, of which BRL300 million per year as of 2017. The funds would come from the National Civil Aviation Fund (Fundo Nacional de Aviação Civil - FNAC), consisting of fees and aviation grants, which can only be invested in the sector itself.

The Projeto Crescer contemplates a new round of airport concessions, to be held in the first quarter of 2017, according to the latest forecast (published in September 2016). According to the announcement, the winner of the concession must pay in one lump sum 25% of the value of the grant (including goodwill), with a grace period of 5 years, repaying the grant annually as of the sixth year of concession. Table 5.3 lists the four airports included in the Projeto Crescer, which were already included in the portfolio of projects for the second stage of PIL-Airports, of 2015, as well as the estimated amount of investment to be made during the concession period of each Airport, which is expected to be approximately BRL6.5 billion. Unlike the previous rounds of concession, the expectation is that Infraero will not participate as a shareholder.

Table 5.3. Projeto Crescer – Airports: planned concession and investments.

Airport	Planned Investments (in BRL billion)	Estimate Capacity (millions of passengers/year)	Concession Term (years)
Aeroporto Internacional Pinto Martins, Fortaleza	1.370	5.9	30
Aeroporto Internacional Luís Eduardo Magalhães, Salvador	2.312	11.5	30
Aeroporto Internacional Hercílio Luiz, Florianópolis	0.961	2.1	30
Aeroporto Internacional Salgado Filho, Porto Alegre	1.900	8	25
Total	**6.543**	**27.9**	

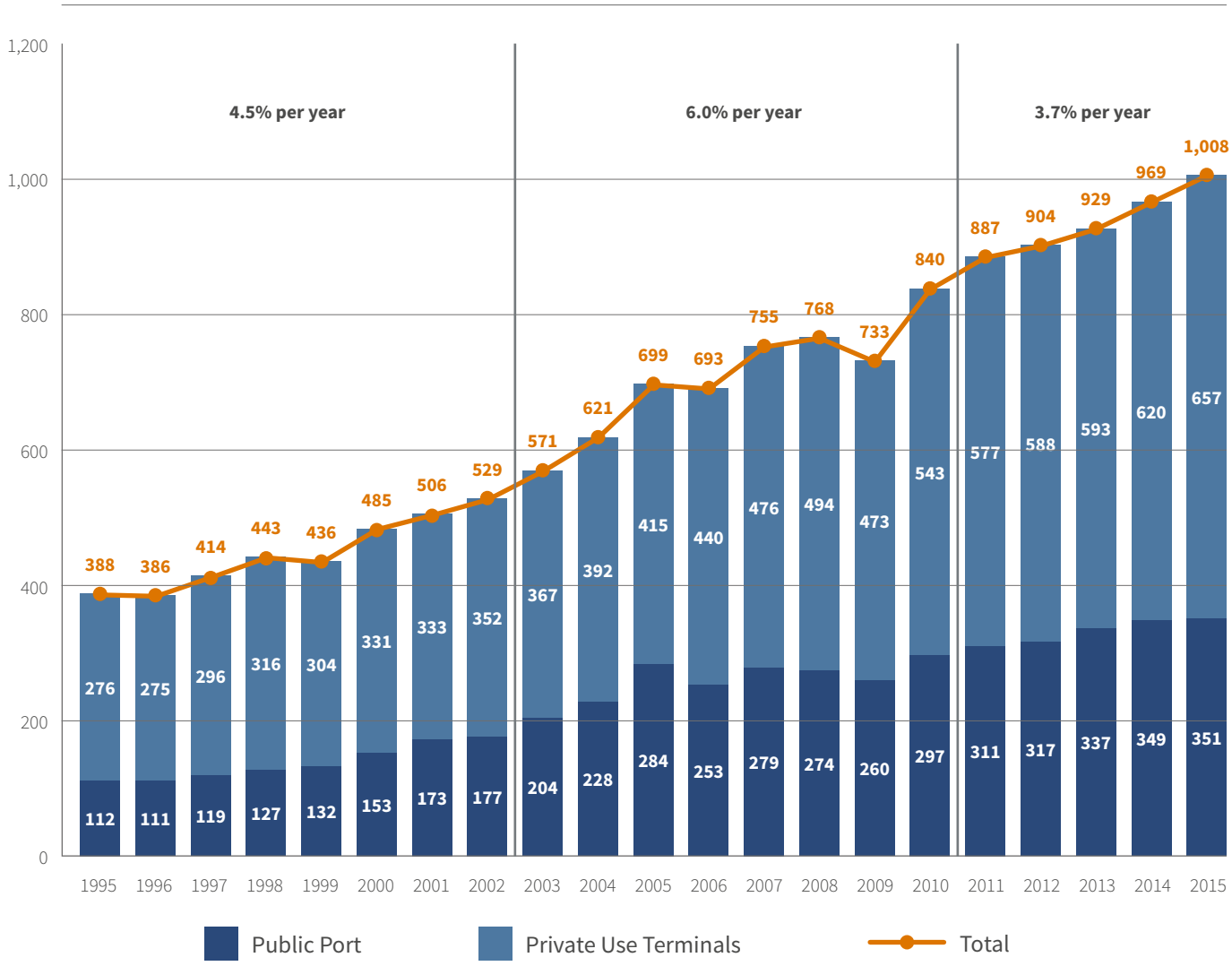
Source: Projeto Crescer, Federal Government. Drafting: Ex Ante Consultoria Econômica.

Waterway

In 2013, the new regulatory framework for the port sector was updated through Law No. 12,815 of June 5, 2013, also known as the New Ports Act. The new law provided for the direct and indirect exploitation by the Federal Government of ports and port facilities and the activities performed by port operators. According to the mentioned law, Article 1, it is worth noting that: (i) the indirect exploitation of the organized port and the port facilities located therein will occur through concession and lease of public good; and (ii) the indirect exploitation of port facilities located outside the organized port area will occur upon authorization. In addition to these points, the New Ports Law, together with Decree No. 8,033, of June 27, 2013, which regulates it, has finally established new terms for the operation of Private Use Terminals (Terminais de Uso Privado - TUP), Cargo Transhipment Stations (Estações de Transbordo de Cargas - ETC), Tourism Port Facilities (Instalações Portuária de Turismo - IPT)

and Small Size Public Port Facilities (Instalações Portuárias de Pequeno Porte - IP4). Finally, such law also established the National Port and Waterway Dredging Program – Progama Nacional de Dragagem Portuária e Hidroviária - II[8]

The main reference of the federal government for defining the sector's directions is the National Port Logistics Plan (Plano Nacional de Logística Portuária - PNLP) of the Secretary of Ports (SEP) of the Presidency of the Republic (Brazil, Secretary of Ports, 2016). Originally launched in 2012, the Plan was updated in 2015 and can be seen as the State's instrument of strategic planning for the national port sector, which proposes to design short, medium and long-term scenarios, both for the growth of port services demand and guidelines for intervention in the infrastructure and management systems of Brazilian public ports[9]. One of the strategic pillars of the first version was the expansion of the capacity of the country's port system.



Graph 5.4. Port movement by type of installation, in millions of tons. Source: National Agency for Waterway Transportation (Antaq). Drafting: Ex Ante Consultoria Econômica.

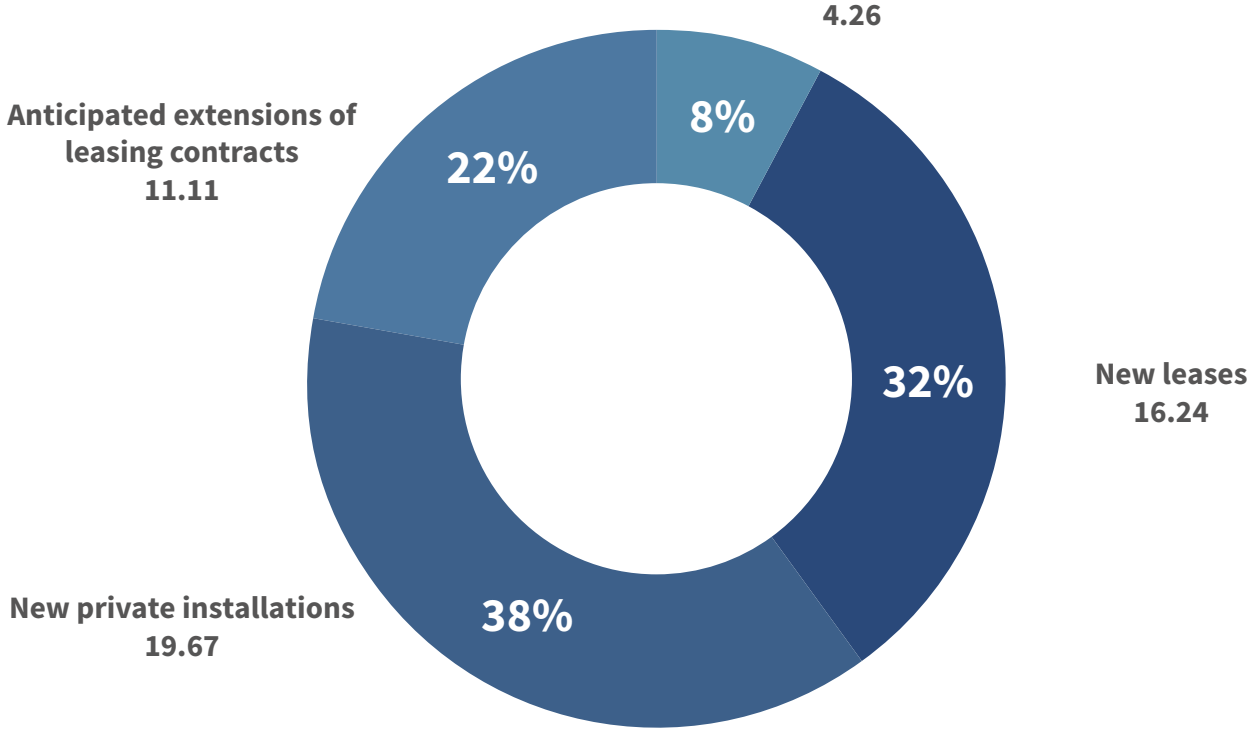
[8] The program covers (i) dredging engineering works for maintenance or expansion of port areas and waterways, (ii) signaling and marking service, (iii) environmental monitoring, and (iv) services and works execution management.

[9] According to the Secretary of Ports (SEP), in a federal government effort to improve the management of ports, on January 8, 2014, the Official Gazette of the Federative Republic of Brazil published the Ordinance SEP/PR No. 03, which institutionalized, in addition to the National Plan of Port Logistics (PNLP), the other instruments that form the set of the national port sector planning: the Master Plan (Plano Mestre), the Zoning and Development Plan (Plano de Desenvolvimento e Zoneamento - PDZ) and the General Concession Plan (Plano Geral de Outorgas - PGO).

The Graph 5.4 shows the evolution in the past two decades of gross cargo handling (solid bulk, liquid bulk, general cargo and containers) of the National Port System, which includes both the organized ports and private port installations. The continuous growth of cargo handling can be noted, in millions of tons, from 2010, and the respective participation per type of installation. In 2015, the private installations represented 65.1% of the all handling.

With the purpose of ensuring the growth of this capacity, so as to properly meet the expected demand expansion for the following years, the SEP, aligned with the strategic planning of the sector and started at the first version of PNLP, has structured a port capacity expansion plan, organized around five guidelines: (i) Port Leasing Program, (ii) Contract Rebalancing and Extensions; (iii) Authorizations of Private Port Installations and expansions of existing installations, (iv) National Dredging Plans (PND); and (v) port infrastructure works.

Such guidelines or programs are particularly relevant, as the investments in the port sector made by the country are organized around these lines. In this sense, the relevant period for the PNLP is from 2015 to 2042, to which the program forecasts a 92% demand growth for Brazilian ports, reaching, at the end of the period, the level of 1.800 billion cargo tons[10]. Therefore, the expansion would be made on the level, as observed in 2015, of 1.800 billion tons of gross cargo, illustrated by Graph 5.4. Given the current installed port capacity and demand projection, it is necessary to invest BRL51.28 billion until 2042, with BRL47.0 billion from the private sector, which would correspond to an annual average close to BRL2 billion. These investments, at the launch of PNLP 2015, already contemplated those investments foreseen for the second stage of PIL – at its "Ports" version – and by the PAC, and would be divided according with the lines mentioned in the Graph 5.5



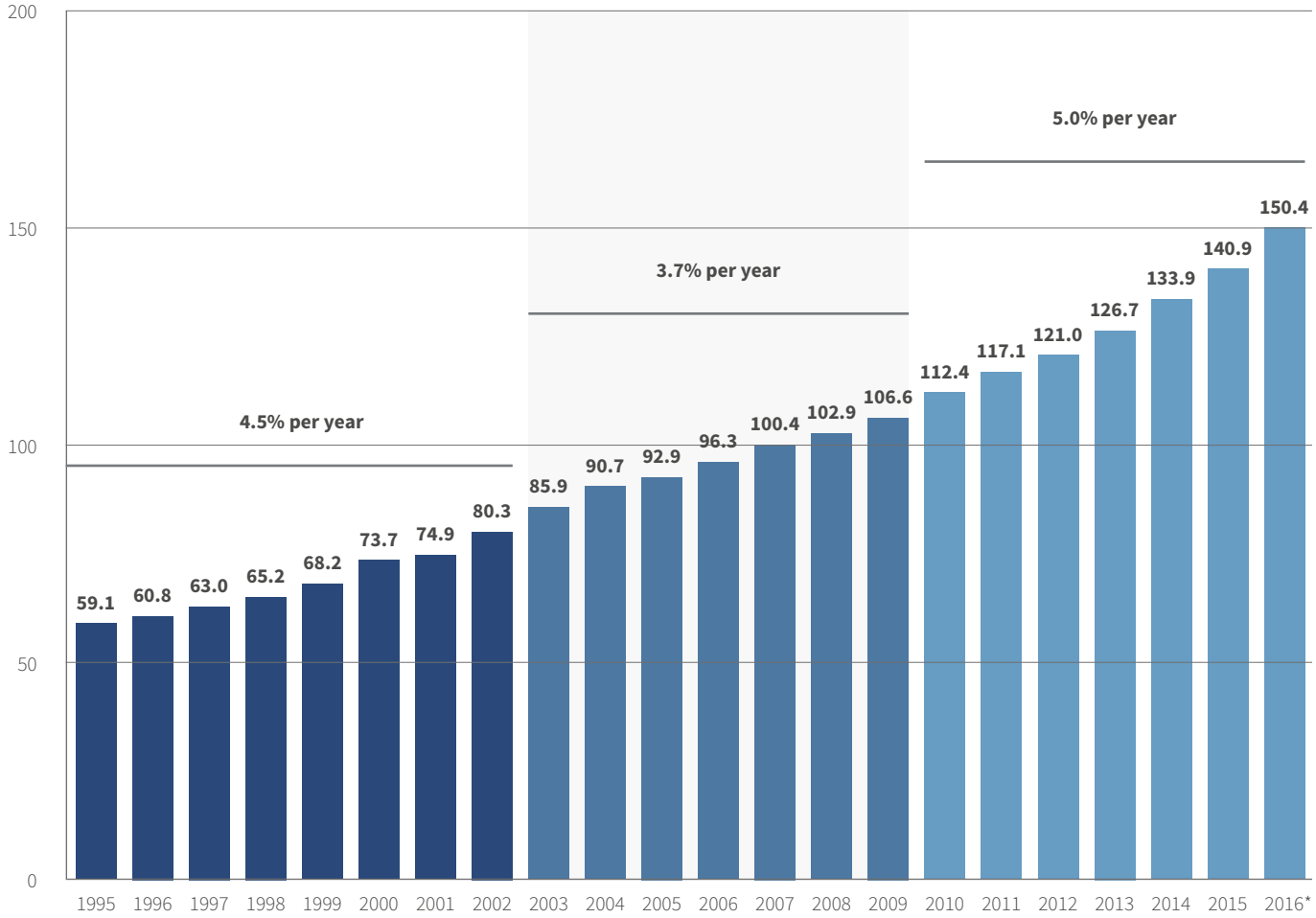
Graph 5.5. Distribution of necessary port investments, 2015-2042, in billion reais (R$). Source: Secretariat of Ports, National Plan of Port Logistics, 2015. Prepared by: Ex Ante Consultoria Econômica.

[10] This growth rate can be reviewed, since the amount observed for 2015 has exceeded the amount expected by PLNP for the year in question, which marks the beginning of the projection period.

In regards to the private sector performance, according to a recent balance by SEP, made in June 2016, there were 180 port installations authorized by the federal government. Since the promulgation of the New Ports Law, the SEP has authorized 67 installations, among new authorizations and expansion of existing terminals, with planned investments reaching BRL16.2 billion. Beyond this set, 67 other processes are being analyzed in the SEP-Antaq system, with planned investments of BRL6.25 billion. The Crescer Project listed two enterprises in its first round: (i) terminal lease at Rio de Janeiro Port (RJ), for handling vegetal bulk cargo; and (ii) concession of two fuel terminals of the Santarém Port (PA), both with bidding stages expected to the second quarter of 2017, and total investments of BRL92.6 million within the concession period.

Energy, Oil and Gas

At the end of 2015, the electric power generation capacity reached 140.858 GW of installed power in Brazil, according to the data of the Brazilian Electricity Regulatory Agency (Aneel). This implied in an average growth of 4.6% per year between 2010 and 2015, a rate above the rate observed between 2003 and 2009, which was 3.7%. The Graph 5.6 presents the evolution of the installed capacity since 1995 and the average annual growth per subperiod. The Aneel's expectation is that, by the end of 2016, the installed capacity reaches 150.436 GW, which would correspond to an average annual growth of 5.0% for the 2010-2016 period.

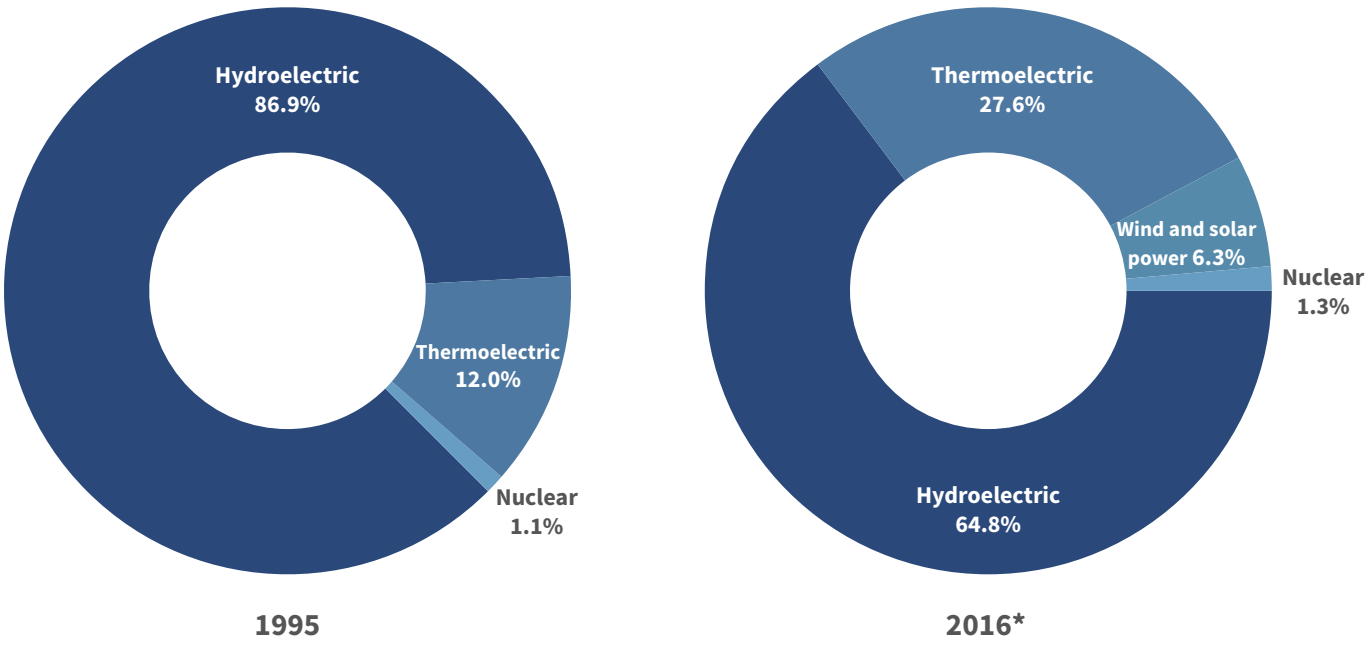


Graph 5.6. Installed capacity of electric power generation, GW. *Estimate: the Brazilian Electricity Regulatory Agency (Aneel). Source: National Energy Balance (MME/EPE, 2015a); for the year of 2015, Aneel. Prepared by: Ex Ante Consultoria Econômica.

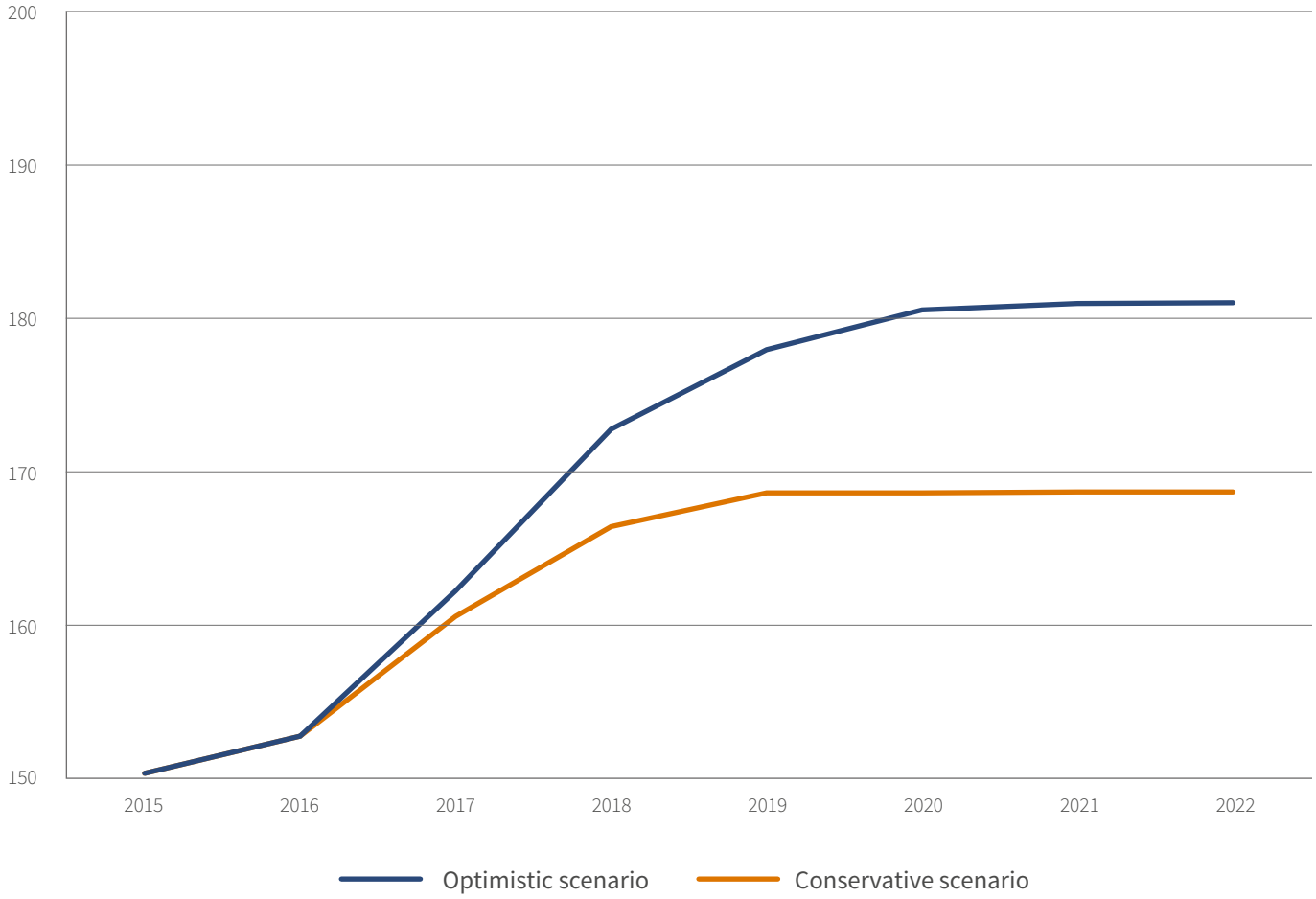
It is worth mentioning that the evolution of the installed capacity of electric power generation in the country in the past years was very distinct in terms of source. As Graph 5.7 illustrates, the hydroelectric source has lost participation, while thermal – which includes biomass, gas, oil and mineral coal – and wind power have all gained space. Between 1995 and 2005, the thermal and wind power sources reached the respective annual growths of 10.8% and 39%, faced with an annual average expansion of the hydroelectric source of 3.3%. Within the period from 2005 to 2016, while the capacity of thermoelectric generation was increased at the rate of 6.8% per year and wind power at 69% per year, the hydroelectric generation reached an annual average expansion of 2.7% per year.

Aneel performs a monthly monitoring of the expansion of electric energy generation offering, encompassing all enterprises being deployed in the national territory, considering all energy sources. Based on the monitoring made in September 2016, the forecast is of an increase of 38.038 GW of new installed capacity between the monitoring reference date until the end of August 2022. For 48.3% of the incremental capacity, which corresponds to 18.370 GW within this period, there are no restrictions for the entry into operation; for 32.4% of the total, there are some restrictions identified; and there are other major restrictions for the entry into operation of enterprises representing 19.3% of the installed capacity of incremental electric energy.

Therefore, conservatively speaking, by gathering all enterprises without restrictions for the entry into operation, it is possible to count on the increase of 15.921 GW of capacity within the period from 2017 and 2022, considering all electric energy sources, which would correspond to an annual average growth of the capacity of 1.7% in this period, considering as reference the expected capacity for the closing of 2016 (150.436 GW). From a more optimistic perspective, which also considers the enterprises with some restriction, the expectation is that 28.242 GW will be added, corresponding to an annual average growth of 2.9% towards the estimates for the closing of 2016 (Graph 5.8).



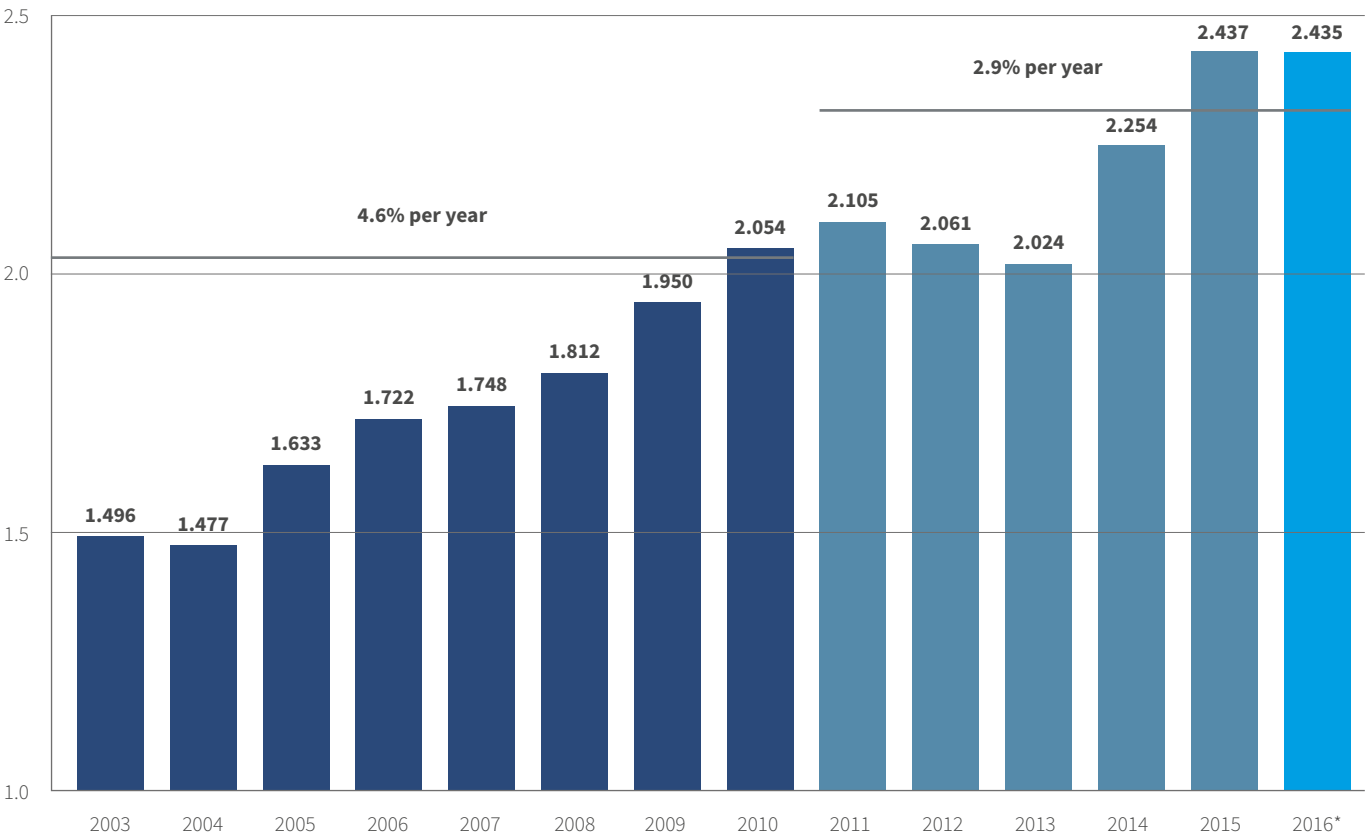
Graph 5.7. Installed capacity of electric power generation per source. *Based on data collected until September. Source: National Energy Balance (MME/EPE, 2015a); for the year of 2016. Brazilian Electricity Regulatory Agency (Aneel). Prepared by: Ex Ante Consultoria Econômica.



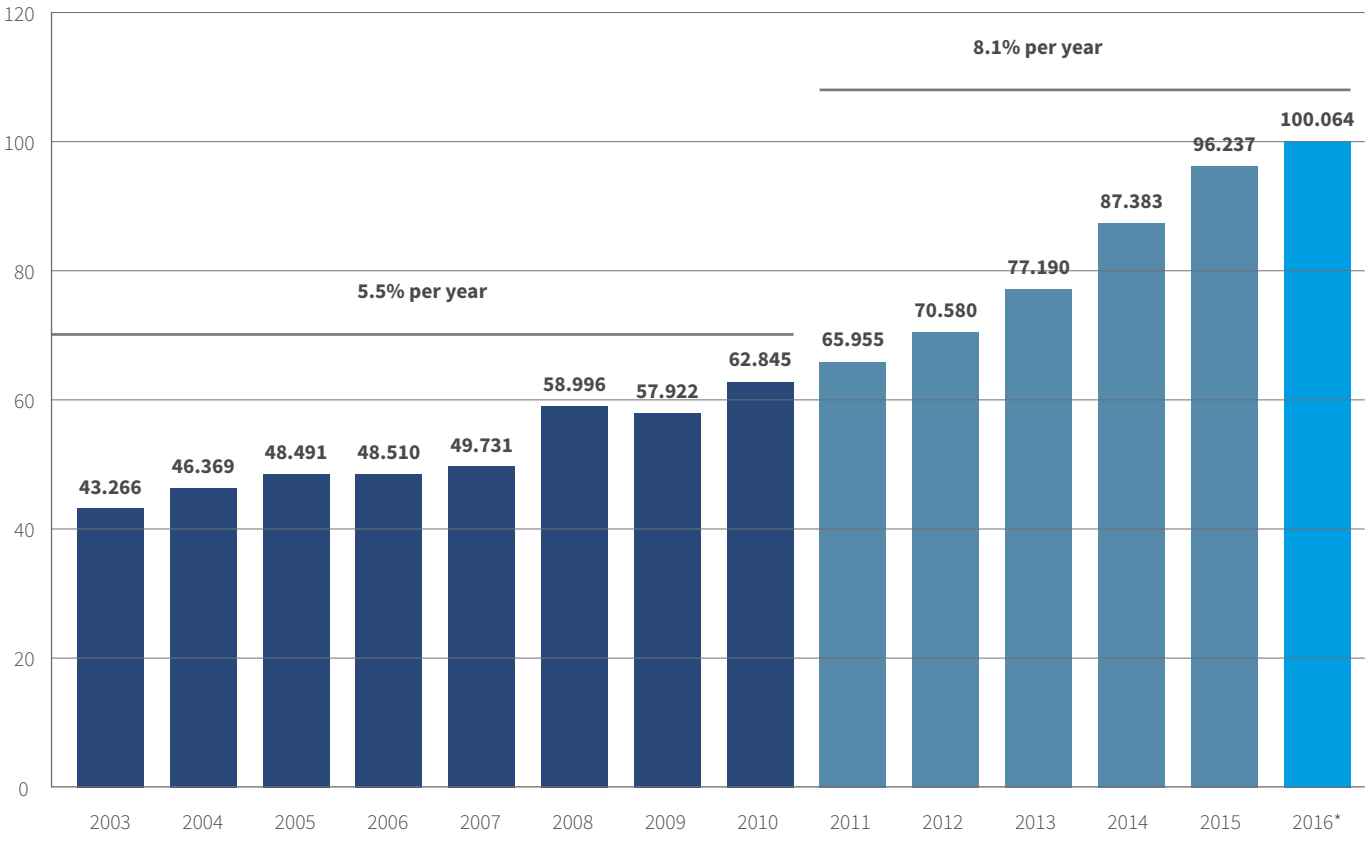
Graph 5.8. Installed capacity of electric power generation per source: forecast for entry into operation, all sources, 2016-2022, GW, based on data collected until September 2016. Source: Brazilian Electricity Regulatory Agency (Aneel). Prepared by: Ex Ante Consultoria Econômica.

According to data compiled by the National Agency of Petroleum, Natural Gas and Biofuels (ANP), the national production of petroleum had a growth of 4.6% per year, between 2003 and 2010, reaching an annual average of 2.054 million barrels/day in 2010. This growth was reduced between 2010 and 2015, when the recorded annual average growth rate was 3.5%, a result of the decreased observed in 2012 and 2013, as Graph 5.9 illustrates. In the years of 2014 and 2015, the expansion was considerable, with annual peaks of 11.3% and 8.1%, respectively. However, in 2016, considering the average until August, the indication is of a certain stability in the production, in comparison to the average observed in 2015. With such result, the average expansion of the petroleum production in the recent period would fall back to 2.9% per year, between 2010 and 2016.

The national gas production, on the other hand, recorded an average growth between 2003 and 2010 of 5.5% per year. Between 2010 and 2015, the growth reached 8.9% per year, reaching 96.2 million m^3/day. With data provided by ANP until August of the current year, the production in 2016 now exceeds 100 million m^3/day, as Graph 5.10 points out. In case this level is maintained until the year's closing, the average expansion of natural gas production in the country would be slightly reduced, reaching 8.1% per year between 2010 and 2016.

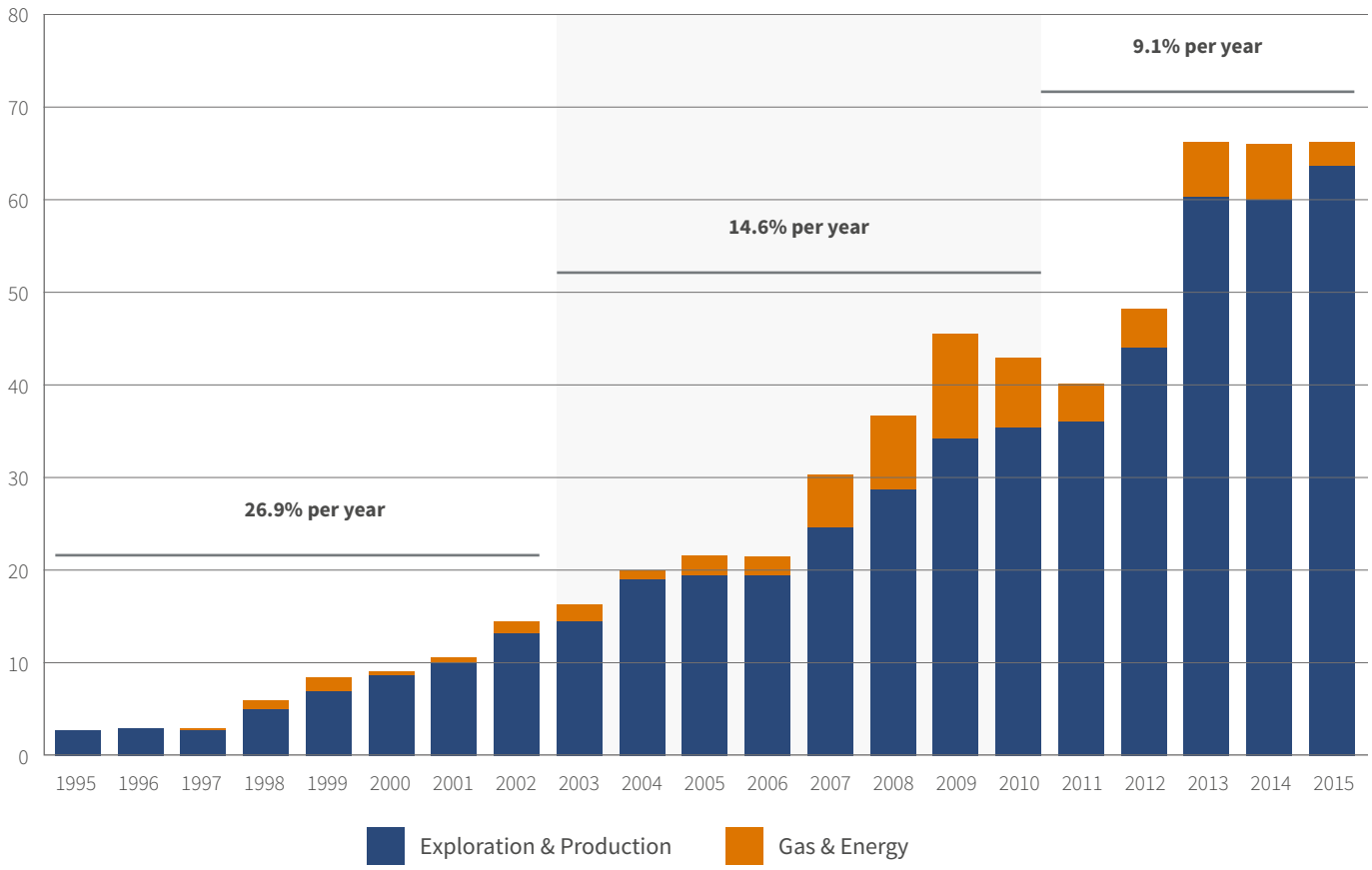


Graph 5.9. National production of petroleum, in million barrels/day, annual data and average growth per period. *Average until August 2016.
Source: National Agency of Petroleum, Natural Gas and Biofuels (ANP). Prepared by: Ex Ante Consultoria Econômica.



Graph 5.10. National production of natural gas, in million m³/day, annual data and average growth per period. *Average until August 2016.
Source: National Agency of Petroleum, Natural Gas and Biofuels (ANP). Prepared by: Ex Ante Consultoria Econômica.

It is worth mentioning that the petroleum production growth, in the country in the two-year period of 2014-2015, is consistent with the Petrobras investment expansion towards exploration and production (E&P) in the immediately previous years, as shown in Graph 5.11, which presents the recent history of investments in reais made by the two most important actuation areas of the company – E&P and Gas & Energy. As illustrated by the graph, the investments for the set of areas reached a high level between 2013 and 2015, in reais, at constant prices of the year 2015. However, when these investments are expressed in USD, company reference for its Business and Management Plans, a reduction can be observed since 2013 (a cumulative decline of 35.2% until 2015), largely the result of the depreciation of the real against the US dollar in the period.



Graph 5.11. Petrobras investments, in billion reais (R$), at 2015 prices. Source: Petrobras. Prepared by: Ex Ante Consultoria Econômica.

According to the Decennial Energy Expansion Plan (PDE) 2024 (Brazil, Ministry of Mines and Energy, 2015b), the amount of investments that is necessary to supply the economy with energy volumes that are consistent with the PDE macroeconomic assumptions reaches BRL1.4 trillion, between 2015 and 2024, which corresponds to an annual average investment of BRL140.7 billion. The Chart 5.4 offers the detailing per sector presented by PDE 2024: 26.7% correspond to the electric energy sector; 70.6% to the petroleum and natural gas; and 2.6% are related to the liquid biofuels segment. Such investments represent an expansion, between 2014 and 2024, of the following magnitudes: (i) from 132.9 GW to 206.4 GW in the installed capacity of electric energy generation, without including self-production; (ii) from 2.3 million barrels/day to 5.1 million barrels/day in petroleum production; and (iii) from 87.4 million m^3/day to 171.7 million m^3/day in the production of natural gas.

Among the total investments in electric energy, BRL268 billion between 2015 and 2024, approximately BRL103.6 billion (or 38.6% of the total) would be destined to power plants

that are already authorized and hired, while the remainder, BRL164.9 billion (61.4% of the total), is related to planned power plants. In regards to investments in transmission lines and substations, the investment estimates reach BRL107.8 billion, from which BRL78.3 billion would be destined to transmission lines and BRL29.5 billion to substations. Still, according to the balance presented by PDE 2024, from the total amount, BRL69.4 billion will be directed to non-tendered installations, with investments in transmission lines reaching BRL49.7 billion and substation investments at BRL19.7 billion.

Table 5.4. Energy investments, from 2015 to 2024, in billion reais (R$)*.

Sector	Amount	Annual average	Participation (%)
Electric energy offering	**376**	**37.6**	**26.7%**
Generation**	268	26.8	19.0%
Transmission***	108	10.8	7.7%
Petroleum and natural gas	**993**	**99.3**	**70.6%**
Exploration and production of petroleum and natural gas	961	96.1	68.3%
Petroleum by-products offering	25	2.5	1.8%
Refining	17	1.7	1.2%
Transportation infrastructure	8	0.8	0.6%
Natural gas offering	7	0.7	0.5%
Liquid biofuels offering	**39**	**3.9**	
Ethanol – Production plants	31	3.1	2.2%
Ethanol – Pipeline and port infrastructure	7	0.7	0.5%
TOTAL	**1,407**	**140.7**	**100%**

*Reference currency exchange rate: BRL2.65/USD (commercial – end of period, purchase and sales average, December/2014). **Including plants that have already been granted and authorized, among them are plants with contracts signed in new energy auctions. ***Including installations that have already been tendered, which will enter into operation within the 10-year period. Source: Ministry of Mines and Energy (MME)/Energy Research Company (EPE), Decennial Energy Expansion Plan (2015b). Prepared by: Ex Ante Consultoria Econômica.

According to the PDE 2024, investments in petroleum exploration and production between 2015 and 2024 must be around USD 350 billion and USD 375 billion, an interval that takes into consideration aggregate investments in the entire E&P sector in the country, including Petrobras' share and investments associated with the PAC project portfolio of the federal government – mainly those projects associated to the exploration and production of Campos and Santos basins, including pre-salt discoveries.

Another important point to be noted, since the preparation of PDE 2024, is the economic crisis, by which the country is going through, that has been aggravated since, as well as the crisis in the petroleum and gas sector, a direct result of the difficulties faced by Petrobras in the past two years. As a result, the company has been making substantial revisions of investments forecast for the following years, with the last revision presented in its Business and Management Plan 2017-2021, released in September 2016. According to this plan, in the total investment comparison, expressed in US dollars, the company is projecting a 25% reduction in the nominal amount of investments, which would go from USD 98.4 billion in the previous cycle (2015-2019) to USD 74.1 billion for the new cycle (2017-2021). From this total, USD 60.6 billion will be directed to E&P (81.8% of total investments) and USD 12.4 billion will be directed to refining and natural gas areas (16.7% of the total). This indicates that, in order to meet the demands presented by the PDE, it will be necessary to expand private investments from other sources in the Brazilian petroleum and gas sector.

The expected investment flow in the energy sector as a whole until 2024 will cause some changes in the composition of the national energy matrix, with the most important being the project participation loss of the set of non-renewable sources in comparison to the set of renewable sources. The PDE 2024 forecasts a participation decline of 2.7% of the first set, consequence of the projected reduction of 3.3% of the petroleum and its by-products, which has a participation in the matrix that will be decreased from 38.2% in 2015 to 34.9% in 2024. The general scenario is illustrated by table 5.5, which presents the evolution of the internal energy offering per 5-year period, reflecting both the amount as the expected investment schedule for each subperiod.

The expectation is that the non-renewable sources will present an average growth of 1.7% per year until 2024, an increase rate inferior to the expected for renewable sources (4.1%). Furthermore, the PDE projects the stability of the hydraulic and electric energy participation, and growth of other renewable sources, which include wind power, vegetal oils and black liquor, which will likely present a rate of 9.9% per year, in average, resulting in an increase of 3.3% in its participation in the energy matrix, the highest expansion among the listed sources (from 4.8% in 2015 to 8.1% in 2024).

Table 5.5. Decennial Energy Expansion Plan 2024: evolution of the internal energy offering 2015-2024.

	2015		2019		2024		2014-2024 variation (% a.a.)
	k toe	%	k toe	%	k toe	%	
Non-renewable energy	**172,074**	**57.5**	**183.717**	**55.0**	**218,793**	**54.8**	**1.7**
Petroleum and petroleum by-products	114,319	38.2	122,109	36.6	139,250	34.9	1.5
Natural gas	33,949	11.3	33,305	10.0	46,956	11.8	1.3
Mineral coal and by-products	17,941	6.0	19,320	5.8	22,991	5.8	2.7
Uranium (U3O8) and by-products	4,038	1.3	6,858	2.1	6,986	1.7	5.6
Other non-renewable sources	1,827	0.6	2,125	0.6	2,609	0.7	3.7
Renewable energy	**127,289**	**42.5**	**150,246**	**45.0**	**180,659**	**45.2**	**4.1**
Hydraulic and electricity	40,417	13.5	45,073	13.5	53,270	13.3	4.3
Firewood and charcoal	22,403	7.5	22,993	6.9	27,444	6.9	1.0
Sugarcane by-products	50,212	16.8	60,171	18.0	67,586	16.9	3.5
Other renewable sources	14,256	4.8	22,009	6.6	32,358	8.1	9.9
TOTAL	**299,362**	**100.0**	**333,964**	**100.0**	**399,542**	**100.0**	**2.7**

Toe = ton of oil equivalent. Source: Energy Research Company (EPE), Prepared by: Ex Ante Consultoria Econômica.

In regards to the amounts invested in the sector in recent times, it is possible to have a quite reasonable estimate from inversions performed under the PAC, considering that the program portfolio contemplates the most diverse enterprises, including, for example, Petrobras' enterprises, the main company in the petroleum and natural gas sector, as well as the works of large hydroelectric power plants in the past years, such as Belo Monte Hydroelectric Power Plant, Santo Antônio Hydroelectric Power Plant and Jirau Hydroelectric Power Plant. Therefore, based on the complete balance of the previous cycle of PAC works (2011-2014) and the third balance available of the current cycle (2015-2018, released on August 2016), the program's energy infrastructure axis – which gathers energy sector projects (generation and transmission), exploration and transportation of petroleum, natural gas, petroleum refining, petrochemical activities and renewable fuels – it accumulates investments reaching BRL370

billion between 2011 and June 2016. This corresponds toan annual average investment of BRL61.6 billion. It is worth mentioning that this amount encompasses both state investments and private investments, within the program's scope, and it also includes both works expenses and acquisition of machinery and equipment.

Another relevant information source regarding investments made in the energy sector in the past years is related to the disbursements made by BNDES. Specifically, the amount that was effectively disbursed by the bank between 2010 and 2015 for the electricity and gas sectors was approximately BRL141.3 billion, at constant prices of 2016, which corresponds to an annual average of BRL23.6 billion, an amount 62.8% above the average recorded between the years of 2006 and 2009, of BRL14.5 billion.

Table 5.6. "Crescer" Project: energy infrastructure, main projects.

Petroleum and natural gas		
Project	**Public notice release expected for**	**Auction expected for**
Fourth round of biddings of petroleum and natural gas marginal fields	2nd half of 2016	1st half of 2017
Fourteenth round of biddings of exploration blocks of petroleum and natural gas, under concession regime	1st half of 2017	2nd half of 2017
Second round of biddings under the production agreement regime (unitizable areas)	1st half of 2017	2nd half of 2017

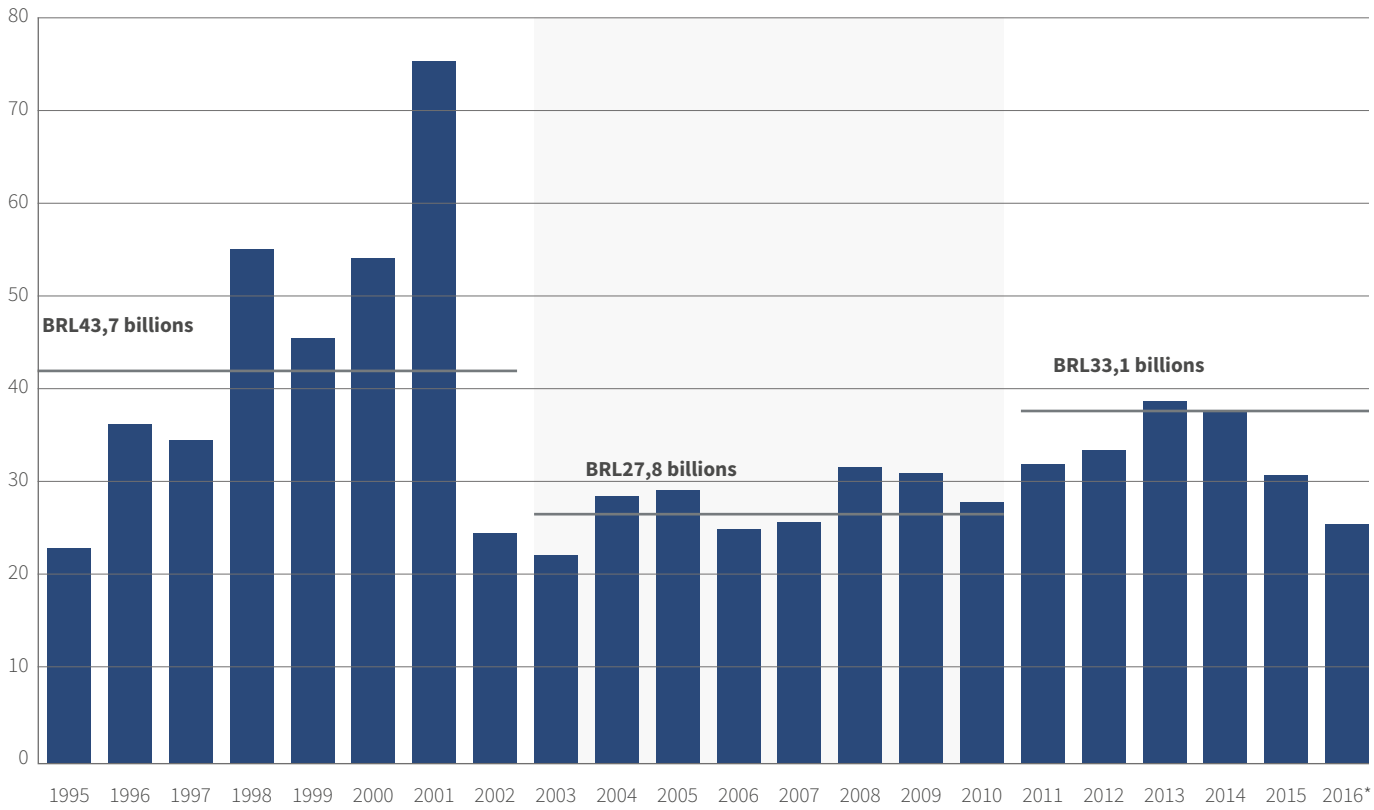
Electric energy					
Project	**State**	**Capacity (MW)**	**Concession period (years)**	**Public notice release expected for**	**Auction expected for**
Hydroelectric power plants					
São Simão Hydroelectric Power Plant	MG/GO	1,710	30	2nd half of 2017	2nd half of 2017
Miranda Hydroelectric Power Plant	MG	408			
Volta Grande Hydroelectric Power Plant	MG	380			
Small Hydroelectric Stations					
Pery Hydroelectric Power Plant	SC	30	30	2nd half of 2017	2nd half of 2017
Agro Trafo Hydroelectric Power Plant	TO	14			
Total		**2,542**			

Fonte: Projeto Crescer, Governo Federal. Elaboração: Ex Ante Consultoria Econômica.

Finally, it is worth listing the main actions contemplated by Projeto Crescer, such as it was announced in the first round, in September of 2016, in the areas of electric energy, petroleum and natural gas. Table 5.6 brings the most important projects, per area, as well as the schedule associated to each one of them, standing out the retaking of biddings under the system of production sharing (unitizable areas) and the concessions of assets already existing in the sector of electric power generation.

Telecommunications

At the onset of years 2000, telecommunications investments were directly associated with the process of privatization which began in 1995, with the approval by the National Congress of Amendment No. 8 to the Federal Constitution, which enabled the federal government to grant concessions for exploitation of telecommunications services to the private sector. As a result, the telephone service providers, fixed and mobile, and TV service providers by signature invested, between 1995 and 2002, an annual average of BRL43.7 billion, at 2016 prices, to face the urgent need of expanding the installed capacity of the sector. Between 2003 and 2010, this average decreased to BRL27.8 billion per year, and raising again between 2011 and 2016, whose annual average of investments was of BRL33.2 billion, being such values also at 2016 prices. It is worth pointing out, however, that despite the annual average being higher in recent years, the investments realized by the various companies that comprise the sector have been reduced since 2013, as seen in Graph 5.12[11].



Graph 5.12. Investments from telecommunication service providers, in billions of reais (R$), at 2016 prices. *Own estimate. Source: Brazilian Association of Telecommunications (TeleBrazil). Preparation: Ex Ante Consultoria Econômica.

The privatization process and the following investments in the expansion, modernization and improvement of quality of telecommunication services rendered had a considerable impact on the sector, in the country. Based on Table 5.7, which brings the main sectorial indicators, it is possible to have an idea of this impact: the telephonic density of mobile telephony service, expressed by the number of accesses per 100 inhabitants, for example, raised from 0.9 to 125.7 between 1995 and 2015. The counterpart of this track record was the continuous reduction of the number of public telephones, which has been declined since 2002.

[11] The trajectory of sectorial investments is also reflected in the data of disbursements of National Bank of Economic and Social Development (BNDES) to the telecommunications sector, which also displays a higher level at the inception of years 2000, with a subsequent reduction, followed by a recovery from 2010 and drop from 2014.

Table 5.7. Telecommunications: main indicators.

Indicators	1995	2015	Annual Average Variation (%)
Telephone Service (individual and public)			
Telephone sets (in millions)	14.7	301.5	16.3%
Density (telephone set per 100 inhabitants)	9.4	147.0	14.7%
Mobile Service			
Personal mobile access*	1.4	257.8	29.7%
Density (accesses per 100 inhabitants)	0.9	125.7	28.0%
Television by signature			
Signatures (in millions)	1.0	19.1	15.9%
Density (signature per 100 households)	2.6	28.9	12.8%

*In 1995, reference is made to the number of cellular phones. In 2015, the reference is made to the mobile telephone lines. Source: National Telecommunications Agency (Anatel). Preparation: Ex Ante Consultoria Econômica.

From the part of the federal government, it was created in May of 2010, the National Program of Broad Band (PNBL), with the main purpose of providing massive access to broad band Internet in the country, mainly in the regions with less technology, according to the Ministry of communications. The target was to reach 40 million households connected to the world network of computers still in 2014. For that purpose, the program managed by the Secretary of Telecommunications of the Ministry, sought to implement activities in various fronts, such as the exoneration of networks and access terminals, the expansion of public optical fiber network (managed by Telebras) and the program of exoneration of smart phones.

From the point of view of investments, it is worth mentioning that one of the main PNBLs was to boost the private sector, so that it invested in the broad band infrastructure, on a competition system, where the State would act in a complementary form, applying its direct investments into collective accesses, aiming mainly at reducing the regional and social inequalities. Under this scope, it was created in 2012 a differentiated special taxation system for the Broadband National Program to implement the Telecommunication Networks (REPNBL-Networks) which established the exoneration of taxes and federal contributions[12] on the construction of broadband telecommunication networks, Including therein machines, instruments, new equipment and construction materials and services used in implementing the infrastructure of these networks. The objective, therefore, was to anticipate and expand the investments in this segment and, at the same time, to encourage the national industry of equipment. Having started effectively in 2013, the REPNBL shall be effective until the end of 2-16, and, according to a balance carried out by the Ministry of Communications, until the end of October of 2015 they had approved 1,167 projects, totaling BRL15.1 billion in investments forecasted on broadband networks in the country. (Ministry of Communications, 2015).

[12] These are: the contributions for the Social Integration Program/Program of Public Employee Savings Contributions (PIS/Pasep) and Contribution for Social Security Financing (Cofins), as well as the Tax on Industrialized Products (IPI)

Necessary Investments

In the cycle of investments from 2007 to 2014, the strategic sectors of economic infrastructure were prioritized with the expansion of resources to the areas of transports, energy, oil and gas and telecommunications. The expansion and the improvement of economic infrastructure, besides generating employment and income by means of hiring jobs and the activation of the building productive chain, promoted the reduction of costs in all economic activities that demanded this infrastructure. There was, in this sense, a balanced gain in installed capacities, which accommodated the economic expansion observed in these years.

Table 5.8 brings information on the investments in jobs realized between 2007 and 2014, in each segment of economic infrastructure and indicators of the expansion in the capacity or in the activities of these areas.The investment data are part of the Annual Survey of the Building Industry (Paic), from IBGE. Therefore, the investments in works and construction services discussed in Chapter 2 are considered in the total volume, where the activities of the activities of construction productive chain were analyzed.

This methodology differs from the one adopted in the 11th ConstruBusiness, which included the global values of investments realized in the segments of transportation, telecommunications and energy. In these values, not only were included the capital expenses with construction works and services, but also the expenses with the acquisition of machinery and equipment, products that do not belong to the construction productive chain. In the case of investments in the oil sector and natural gas, for example, the expenses with the acquisition of oil drilling vessels were included.

With the review in methodology of national accounts, concluded at the end of 2015, and with the continuous improvement of annual surveys of the economic activity by IBGE, it became possible to stand out the expenses with the construction of global values invested by these sectors. Therefore, it was possible to construct a new and more solid base of information on the investments in construction works in these areas. Furthermore, with the change in methodology, it was possible to follow up the amounts expended in the upkeep of the capital stock previous installed, which in the public sector areas was considered expense cost expense and not capital expense. This is most important for the segments of transport, energy and telecommunications, which hold a structure whose maintenance absorbs huge resources.

In the eight years of cycle of 2007 to 2014, Brazil invested BRL912 billion reais on infrastructure works in transport, electric energy, minerals assets – with prominence for the production of petroleum and natural gas – and on telecommunications. This is equivalent to an average annual expense of BRL114 billion, which corresponded to 1.9% of the Brazilian PIB in that period. In terms of per capita the country expended BRL581 per Brazilian individual, per year, in the maintenance and expansion of the economic infrastructure, in average, in the period.

Table 5.8. Investments in construction work in the segments of infrastructure, in billions of reais*, from 2007 to 2014.

Segments	Total	Per Year	(%) of PIB (GDP)
Transport	533.0	66.6	1.1%
Highways	349.7	43.7	0.7%
Railways	49.3	6.2	0.1%
Waterways (ports and waterways)	48.1	6.0	0.1%
Airways	3.4	0.4	0.0%
Stations**	23.1	2.9	0.0%
Road construction (bridges, tunnels)	59.4	7.4	0.1%
Electric Power	160.4	20.0	0.3%
Mineral Resources (oil and gas)	161.5	20.2	0.3%
Telecommunications	57.1	7.1	0.1%
Grand Total	**912.0**	**114.0**	**1,9%**

*At 2016 prices. ** Airports, marine terminals, train and bus stations, etc. ***Bridges, tunnels, pedestrian overpasses, etc. in highways and railroads. Source: Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística, IBGE, 2007-2014a). Preparation: Ex Ante Consultoria Econômica.

Of the total invested, 48% were intended to the transportation sector; 22% to the electric power, 22.2% to the production of mineral goods (including oil and gas), and 7.8% to the segment of telecommunications. The fact that most part was destined to the transportation sector, reflects an aspect of this segment that distinguishes it from all other segments: almost the total investment in this segment relates to civil construction works, whereas, in the case of oil and gas segments or that of telecommunications, the expenses are high in machinery and equipment pertaining to the expenses with construction jobs. In the case of electric power, the share depends on the area (generation, transmission or distribution) and on the source of energy (hydraulic, thermal, aeolic or solar photovoltaic).

The expansion in infrastructure and in services of these sectors is presented in Table 5.9. In the sector of transports, the progress was clear. The GDP of the highway transportation sector grew 61.6% in actual terms between 2007 and 2014, as a result of the increase in activities of cargo and passenger transportation via highway. The Brazilian highway mesh grew, from 218.1 thousand kilometers to 224.2 thousand kilometers of paved roads[13] between 2007 and 2014, indicating the increase of over 6 thousand kilometers to the initial stock. In this period there was an intense maintenance of the preexisting network, with improvement and maintenance of conditions and conservation in general.

Table 5.9. Indicators of expansion of capital and of activities in economical infrastructure, from 2007 to 2014.

Infrastructure Segments	2007	2014	Variação
Transport			
GDP of highway transportation sector, in BRLBillions*	79.219	127.990	48.771
Paved Highway Network, in thousand kilometers	218.133	224.240	6.108
Volume of railroad cargo, in million tons	414.953	471.569	56.616
Volume waterways cargo, in million tons	823.037	1,069.744	246.707
Million passengers transported in airplanes	61.576	124.486	62.911
Electric Power, generation capacity in GW	100.352	133.913	33.561
Mineral assets, including oil and gas, production, in TOE	767.464	1,048.695	281.232
Telecommunications, in millions of cellular accesses	122.122	281.601	159.479

*At 2016 prices. TOE = ton of oil equivalent. Preparation: Ex Ante Consultoria Econômica.

[13] As for methodological construction, the kilometers on highways with two lanes or more are equivalent to 2.2 times the number of kilometers in a highway of a single lane.

The movement of cargo in Brazilian railways went from 415.0 million tons, in 2007, to 471.6 million tons, in 2014, indicating a growth of 13.6% in the period. The movement of bulk cargo and in containers in the Brazilian ports, in turn, grew 30%, going from 823 million tons per year, in 2007, to 1.070 million tons per year, in 2015. The movement of passengers in airports more than doubled in the period: 61.6 million passengers transported in 2007 against 124.5 million passengers transported in 2014. All this expansion was possible due to the maintenance and expansion of the installed capacities in the infrastructure of transports.

The installed power of generation of electric energy increased 33.4% between 2007 and 2014, going from 100.4 GW to 133.9 GW. This represented a huge effort, since the installation of additional 33.5 GW to the electric generation in the country, observed in the period of eight years, was equivalent to almost one third of all investment made in the country until the beginning of last decade.

In the area of production and transportation of mineral assets, in which stand out the segments of oil and gas, the investments also resulted in a strong expansion of the activities. As previously seen, the production of petroleum raised 28.9% between 2007 and 2014, and that of natural gas, 75.7%. Considering the average production of both segments, in ton of oil equivalent, the expansion was 36.6%.

Taking as a baseline the investments in progress and those forecasted in expansion plans and in tendencies of growth in demands, it is possible to estimate the value of investments necessary between 2017 and 2022, period of perspective analysis of the 12th ConstruBusiness. For that matter, we take the historic prices, monetarily updated of the investments in each one of these infrastructure segments.

The basic premises for the projections are as follows:

- Increase of 4.886 thousand kilometers of paved roads in the next 6 years and the proper maintenance of the highway mesh of 228.4 thousand paved kilometers.
- Growth of 1.5% per year in the volume of conveyed cargo through railways.
- Increase of 2% per year in the volume of sea and river cargo
- 5% growth per year in the flow of passengers in the airports.
- Installation of 22.1 GW of power in the electric sector.
- Increase of 3% in the production of oil and natural gas.
- Increase of 6% in telecommunication services.

The implications in terms of necessary investments are displayed in Table 5.10. In total, are necessary BRL684.5 billion in investments on economic infrastructure, of which about 60% must be dedicated to the transportation sector, 15% to the segment of electric energy, 18% for the production of mineral goods (with emphasis to the segment of oil and gas), and 7% in telecommunications. In terms of annual averages, the values are relatively close to those used in the cycle of 2007 to 2014. The lower value of investments is due to the conclusion that large undertakings started in the previous period, like the hydroelectric power plant of Belo Monte, Jirau and Santo Antonio.

Table 5.10. Investments in infrastructure segment works, in billions of reais*, cycles of 2007-2014 and 2017-2022.

Infrastructure Segments	2007-2014		2017-2022	
	Yearly Average	Total of period	Annual Average	Total of Period
Transport**	66.621	532.967	68.072	408.433
Electric Energy	20.047	160.372	17.586	105.519
Mineral Goods (oil and gas)	20.188	161.504	20.664	123.983
Telecommunications	7.143	57.141	7.759	46.555
TOTAL	**113.998**	**911.984**	**114.082**	**684.490**

*At 2016 prices. **Includes all transportation modals and investments in airports, maritime terminals, train and bus stations, bridges, overpasses and accesses, tunnels and pedestrian overpasses, etc. in highways and railroads. Preparation: Ex Ante Consultoria Econômica.

6. Responsibility with the investment

Proposals to provide velocity to hired construction jobs

The economic and fiscal crisis through which the country is undergoing increased the time of executing the works in Brazil, expanding a cycle already very lengthy. Construction jobs have been interrupted and cancelled, reducing the pace of progress in the works and, consequently, increasing the delays in completing the jobs. There have been payment delays, with consequences for the companies in the building productive chain and their collaborators. Hence, the society and the Brazilian economy lost. They should expect more for urban development and for the economic infrastructure, with impact on the competitiveness of the enterprises and the well-being of the population.

There were advances from the companies in terms of project and planning improvements, but the delays and the interruption of jobs are still very common. The delays lead to the undesired demobilization of labor in sites and the unexpected breaking of contracts, creating liabilities among companies and the public sector, which result in unrecoverable losses in the economy and, above all, postpone the delivery of undertakings, which many times, are projects crucial to the economic and social development of the country.

As pointed out in the 11th ConstruBusiness, the good performance of undertakings does not depend solely on a good project or a good plan. The physical and financial executions of projects involve necessarily the participation of the public sector and of the society. When the actions are mismanaged, they may compromise the established plan, creating unpredictability which lead to delays and problems of financial management. The problems may occur in all phases following the hiring: in the preparatory activities for the job, during construction of even post completion. This is due to the fact of not having a commitment for the effective joint action from all actors involved. For this, the actions in the public sector and in the society in relation to the execution of projects are, many times, unarticulated and untimely.

The hindrances to the good progress and the unnecessary delays come from unexpected interferences, from difficulties with land expropriation, from lack of coordination toward public service concessionaires, from hiring engineering studies and projects through lower price and poor quality, from delay in obtaining environmental licenses, from the action often dissociated and untimely from controlling agents, from excess red tape and procrastination in releasing resources. Adding, as an additional problem, the lack of planning in relation to public income and expenses, that creates circumstances of contingency of resources. These are interferences that originate unpredictability in project work, dismantling the planning work and increasing the inefficiencies in the Brazilian economy.

This chapter displays the hindrances that steal the celerity in building projects, explains why they exist and illustrates its consequences for the society, besides pointing out what is necessary to make in order to overcome these obstacles. First of all, the process of hiring the jobs should be analyzed. In sequence, cases are presented of delays in projects, which have been studied by the Construction Observatory from the Department of the Construction Industry of the Federation of Industries of the State of São Paulo (Deconcic-Fiesp) in the project that created the System of Follow Up and Analysis of Projects of Urban Infrastructure and Economy, a tool with indicators of progress in infrastructure work in Brazil and an analytical material on the causes of delays.

Besides exposing briefly the diagnosis of problems, this publication brings the proposals of what to do to improve this situation, providing predictability to the jobs and reducing the cycle of construction projects. The proposals are part of the labor agenda of Deconcic-Fiesp for the next years.

Process of hiring the jobs

Prior to forming a job site and starting the construction of a building or of a highway, for example, there is the procurement process. The works are started with a basic or executive project which defines what is going to be built, its object and how much it will cost. Later, there is the acquisition and sale of the work, the licensing and the hiring. These phases hold specific characteristics that depend on the type of work (building or infrastructure), and on the type of client (public or private).

Project

Whether in a building job or in infrastructure, the initial phase involves the development of engineering projects. In case of infrastructure jobs, where the demand from the public sector is of great concern, in general two types of project are developed, basic and executive, which contain budgets. Furthermore, it is necessary to detail through a study, the potential socioeconomic and environmental impacts of the project (Picture 6.1)

Picture 6.1. Definitions.

Basic Project	Defines the elements that characterize the job or service with a minimum level of precision
Executive Project	Details all elements involved in the construction, considering the geotechnical and calculation aspects, and the subsequent maintenance of the job
EIA-Rima	Studies the socioeconomic and environmental potential impacts of the job and deals with eventual compensations and mitigations of such impacts
Building Budget	Defines in detail the expenses with acquisition of materials, labor and services for the preparation of job. Either the basic as well as the executive projects hold a budget

EIA-Rima = Study of Environmental Impact – Report of Environmental Impact. Source: Deconcic-Fiesp (2014).

In the case of buildings, particularly of residential and commercial buildings, the project is different. Prior to launching an undertaking, the companies develop preliminary constructive, financial and sales projects to assess the feasibility of market and later, detail such projects to plan the job. In such cases, detailed budgets are developed and, depending on the size of the project, environmental and transit impact studies are necessary.

Tender of Open Market Sale

In case of public jobs, whether buildings or infrastructure, the purchase occurs through the process of bidding, regulated by Federal Law No. 8,666/1993, which has been constantly updated and modernized by the National Congress. In this process, the bidding offer is made among constructing companies to define which company offers the lower hiring value, given the conditions and technical requirements defined in the project.

In case of building jobs demanded by the private sector, which are hired by companies and families, it is also common the bidding and the price quotation to define which construction company shall perform the job. There is no specific selection process to be followed in these cases, but the price criterion prevails most of the time.

Hiring

The hiring phase involves the definition and signature of a construction contract that defines the agreed terms between the parties in what it pertains terms, prices, quality items, guarantees and all other conditions the parties deem necessary. The hiring aims at the legal safety of the parties and the reduction of risks for the contracting and contracted parties. In this aspect there is great difference between the contracts between private persons and between the public entity and the private. In this later case, the so called administrative contract is subordinated to the federal legislation, which establishes the supremacy of public interest over the private (Figure 6.1).

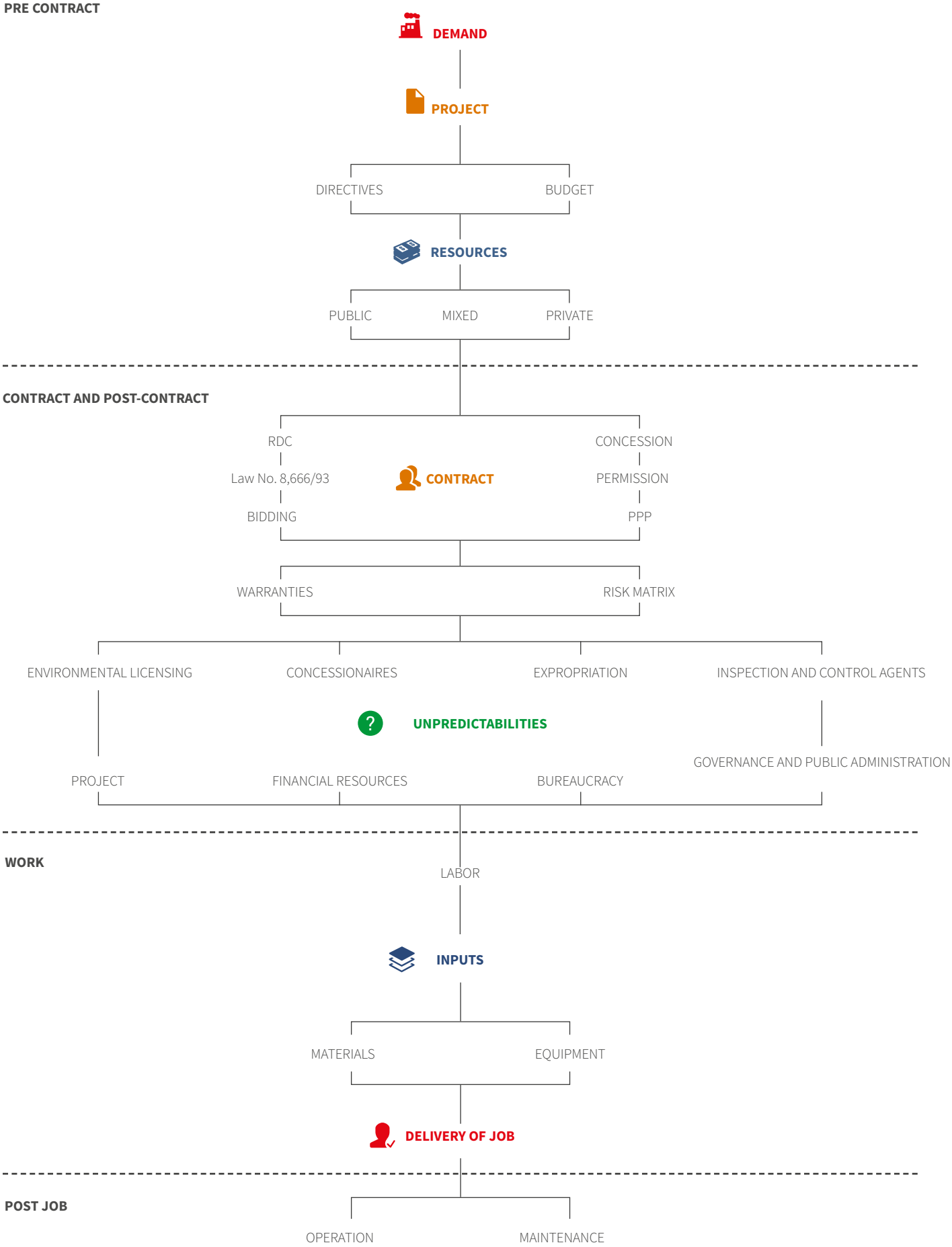


Figure 6.1. Phases of the undertaking. Source: Deconcic-Fiesp (2014).

Delayed Construction Jobs: Selected examples

North Segment of Mário Covas Ring Road (Beltline)

The North segment of Mário Covas Rodoanel (Beltline) (SP-21) is an emblematic case of a delayed project that comprises an ample set of ongoing problems in the undertaking. This segment is the final part of the beltline of 180 km long in the metropolitan region of São Paulo [RMSP], which interconnects the main roads that cross the State of São Paulo: Anchieta (SP-150), Imigrantes (SP-160), Ayrton Senna (SP-70), Dutra (BR-116/SP-60), Fernão Dias (BR-381), Bandeirantes (SP-348). Anhanguera (SP-330), Castello Branco (SP-280). Raposo Tavares (SP-270), and Régis Bittencourt (BR-116). The main objective of the undertaking is to allow the flow of vehicles on these roads to avoid passing within the regional counties, thus eliminating the passing transit, which is the cause of traffic jam, and to reduce the travelling time of passengers and cargo.

The projected job was divided into four segments (West, South, East and North) executed in consecutive stages. The first stage of the road (West segment) with 32 kilometers long, was started in 1998, and inaugurated in October of 2002. The works in the South segment began in May of 2007, and the 57 kilometers of road[1] were ready for operation in September of 2010. The works of the East segment started in August of 2011, and the total length of its 43.5 kilometers was inaugurated until June of 2015.

The North segment, with 44 kilometers, shall interconnect the West segment to the East segment, uniting the road systems Ayrton Senna-Dutra and Anhanguera-Bandeirantes, with interconnection of 3.6 kilometers to the International Airport of São Paulo, in Guarulhos-SP. The North Beltline is financed by the governments of the State of São Paulo and the Federal government, and counts also on the financing from the Bank of Inter-American Development (BID).

This road segment received budget allocations to prepare engineering surveys and projects, and for the report of socioeconomic and environmental impacts since 2010, year in which the bidding process should have started. However the bidding process was accomplished only in December of 2012, in view of successive changes in the bidding publication and questioning from competitors and inspection and control agents. The works were bid into six lots[1] and had a global amount of BRL3.9 billion.

The works began in March of 2013, with forecast to deliver within 36 months, that is, in March of 2016. Since its inception, however, several and successive factors provoked great delays. In mid 2016, less than 50% of the project had been finished and the delivery date was reprogrammed for March 2018.

Lots 4 and 6 of the North Beltline had their inception retarded in view of delays in the processes of expropriation in Court of Justice. The case of lot 6 is the most serious, since in mid 2016 only 27% of work had been accomplished. Lots 3 and 5 underwent delays because the excavation of tunnels resulted more difficult than anticipated in the initial engineering projects. Until June of 2016, only 35% and 44% of works in these lots had been finished, respectively. In the case of lot 1 the bid winning companies faced adverse financial situations in 2015, and until mid 2016 only 38% of works had been finished. Even in the case of lot 2, which did not directly face legal or engineering problems, the works were delayed, since three months after the start-off term a little over two thirds of the job had been concluded, according to information from the company Desenvolvimento Rodoviário S.A (Dersa) published in the newspaper O Estado de S.Paulo, edition of June 3 2016.

It is possible to visualize the progress of projects and the emergence of delays through the evolution of physical goals stated in the Law of Budgetary Directives (LDO) of the State of São Paulo, from 2010 to 2017. Table 6.1 brings the physical goals of completion of Program 1611 of LDO (Highway-Railway Transposition in the metropolitan region of São Paulo, whose objective is to build the Mário Covas Beltline and the Railway ring surrounding the RMSP.

[1] There is also an interconnection of 4.4 kilometeres of this segment of Beltline with the county of Mauá, which was built as an environmental offset of the job.

[2] Lot 1: Mendes Junior/Isolux; lots 2 and 3: OAS; lots 4 and 6: Acciona; and lot 5: Construcap/Copasa.

Table 6.1. Physical goal of the Law of Budgetary Directives, Highway-Railway Transposition of the metropolitan region of São Paulo (RMSP), 2010 to 2017, in percentages

Year	Annual Goal	Accumulated Goal	Indicator of delay in projects*
2010	2.7	2.7	-97.3
2011	15.0	17.7	-82.3
2012	12.0	29.7	-70.3
2013	42.0	71.7	-28.3
2014	26.4	98.1	-1.9
2015	30.9	129.0	29.0
2016	14.9	143.8	43.8
2017	27.1	171.0	71.0

Source: Law of Budgetary Directives (LDO) of the State of São Paulo. *The indicator of work delay (IAO) is defined as the accumulated goal in the LDO up to the period, in percentage, discounted 100%. Should the accumulated goal exceeds 100%, we know that the project has already surpassed the delivery time forecasted in previous LDO. Preparation: Ex Ante Consultoria Econômica.

The second column on the table displays the annual goal of LDO, which is the expected percentage of physical execution of jobs. This goal is a base to define the amounts budgeted for the works in each year, and it is reviewed every LDO. The third column is based to define the budgeted amounts of the works for each year, and it is reviewed every LDO. The third column shows the physical goal accumulated in the successive LDOs, from 2010 to 2017, which have to be approved by the Legislative Assembly until the end of the year prior to that of reference. The amount of 2011, for example, is equivalent to the sum of 2010 goal with that of 2011, and the amount of 2012, to the sum of accumulated goals until 2011 with the 2012 goal.

This item of data indicates that, from the point of view of public planning, when the job was effectively bid in December of 2012, approximately 30% of it should have been ready. In other words, the project in fact, started with a delay of almost three years. After the bidding, the contract estimated the completion in March of 2016. However, the 2016 LDO, approved at the end of 2015, already accumulated goals of 143.8% from jobs carried out until 2016, indicating a delay of minimum 43.8%. The LDO for 2017, which has to be approved and the end of this year, already includes a goal that implies a delay of 71%. That is, instead of 36 months, it is already admitted that at least the job shall last 62 months. This points out to its completion in May of 2018. Considering the delay in the bidding process, which was of almost three years, we could say that it requires about eight years to execute the 44 kilometers of highway - a progress of approximately 5.400 meters per year. A project whose cycle could be of less than 48 months, including the bidding process, is going to last almost the double – without counting on new delays.

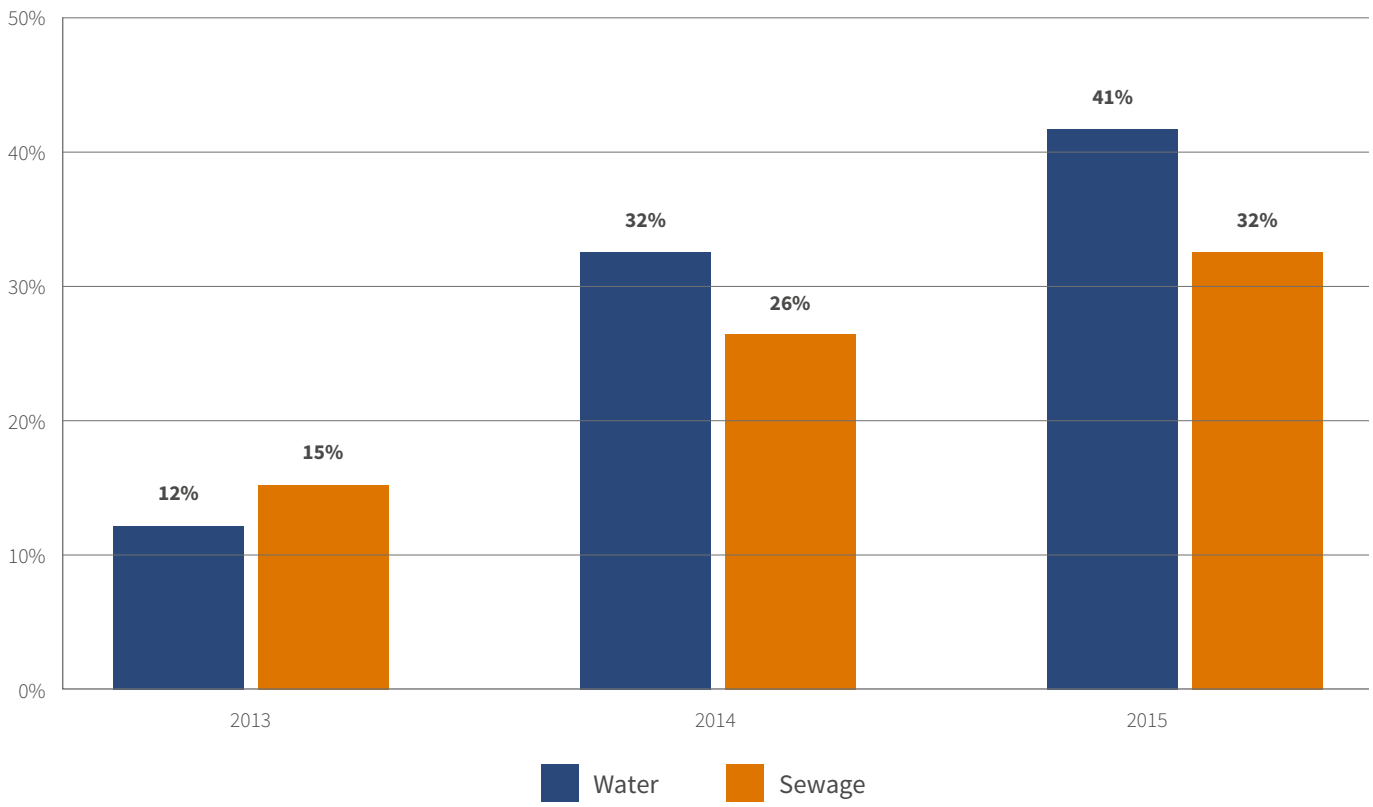
A study performed in 2016 by the Construction Observatory, from Deconcic-Fiesp, in the scope of project that created the System of Follow-up and Analysis of Urban and Economic Infrastructure Projects, identified that, besides the unpredictability of cycle term, there are also uncertain in relation to project amounts. Until mid 2016, we had already spent BRL4.646 billion in works of the North segment of Highway Beltline, an amount that corresponds to only 52.3% of the amounts anticipated in the Annual Budget Laws of 2010 up to the current year. Nonetheless, what was carried out and paid already exceeds in more than BRL700 million the bidding amount and the hiring. This makes the cycle of undertakings something difficult to plan in Brazil, with uncertainties that increase several times the systemic risk of businesses in the construction sector.

Growth Acceleration Program (PAC) - Sanitation

Recent study of the Trata Brasil Institute (Instituto Trata Brasil, 2016) submitted the balance of 340 building jobs in the Growth Acceleration Program (PAC) in the sanitation area, being 157 jobs in treatment and distribution of water and 183 in projects of sewage collection and treatment. The study – based on data of the Ministry of Cities, of Caixa Econömica Federal and of National Bank of Economic and Social Development (BNDES) – releases information on the progress of all construction projects in cities with more than 500 thousand inhabitants, since 2009, and a detailed follow-up of the physical progress of jobs in the group of undertakings hired between 2007 and 2010.

The data illustrate clearly the problem of delays and interruptions in jobs. In the case of sewage collection and treatment jobs, only 32% of 183 hired had been fully completed up to 2015. All other projects were still in progress or at a standstill, or even had their jobs not even initiated. On average, the rhythm of physical progress of jobs indicated an advance of only 43% of total contracted. In the case of projects of water treatment and distribution, the survey indicated that only 41% of hired jobs had been fully completed until 2015. The fraction of executed jobs was of 45% of total hired (Graph 6.1).

Graph 6.1. Portion completed of jobs in the Growth Acceleration Program (PAC) in percentage of total jobs in each sanitation segment

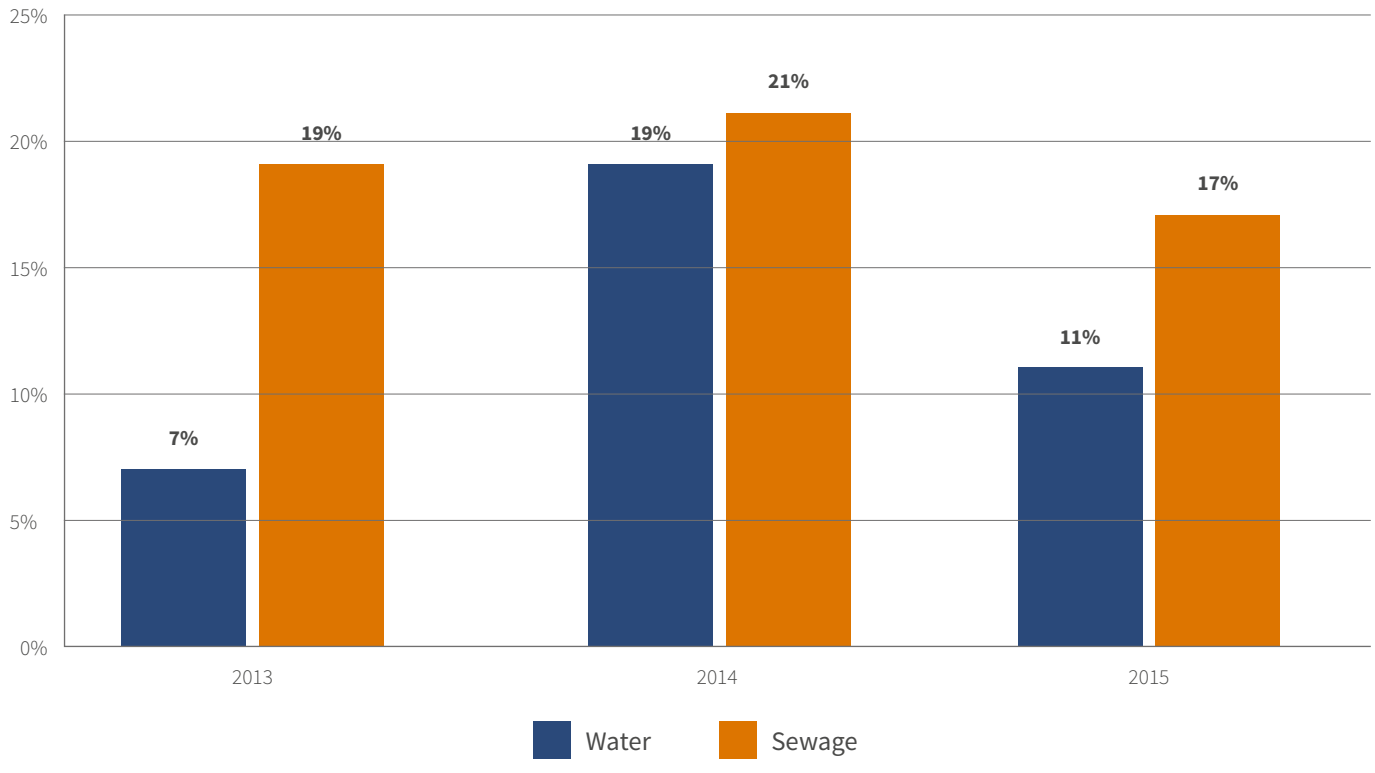


Source: Trata Brazil Institute (2016). Preparation: Ex Ante Consultoria Econômica

Another item of data that calls to attention is the high percentage of jobs at a standstill, that is, of jobs that had been hired and started, which consumed resources and which were paralyzed in 2015 (Graph 6.2). In case of collecting works and sewage treatment, 17% of the 183 projects were paralyzed in 2015. In the case of jobs for water treatment and distribution, the percentage was lower (11%), but still high.

Varied are the reasons of stops and delays in jobs, according to the survey, among which stand out: the slowness in releasing resources for the inception of jobs, the hiring based on improper basic projects, delays in concession of environmental licenses, difficulties with bidding processes and out of date budgets, among others. It does not seem to be lack or resources for the investment, but operating difficulties and red tape for the good progress of jobs. These are questions that retard the gains in well-being stemming from sanitation investments and that could be worked out in an independent way from problems associated with the availability of funds and of credit conditions for the investment.

Graph 6.2. Portion of undertakings of the Growth Acceleration Program (PAC) at standstill, as a percentage of total jobs in each sanitation segment.



Source: Trata Brazil Institute (2016). Preparation: Ex Ante Consultoria Econômica

The slowness in completing the jobs and the interruption of jobs, regardless of responsibilities, retard the rhythm of urban development in the country. As seen in Chapter 4, the shortages in sanitation are still very high, with considerable environmental impacts, and the challenges for 2022 are huge, because the pace of forming families and the growth of cities shall still be high in this future horizon.

Obstacles: which are they and what to do to overcome them?

The cases previously presented strengthen the general view that the good performance of jobs not only depends on the project and planning of the companies. The physical and financial execution of jobs involves necessarily the participation of the public sector and of society. These shares, if misdirected, may compromise the established plan, creating unpredictability that lead to delays in jobs and problems in financial management. These losses end up being paid by the companies and by society.

The problems may occur after hiring the job, prior to its inception, during construction and even post-job. This is because when there is a defined schedule for the interventions, in general, it is not followed and there is no commitment from all actors involved, in a way that the actions of the public sector and that of civil society (organizations, associations, individuals and corporations) in relation to carrying out the jobs, are most of the times, disjointed and untimely, thus generating obstacles to the good progress of jobs and unnecessary delays. The obstacles arise from unexpected interferences, from difficulties with expropriation of real estate properties and resettlement of populations, from defective hiring of jobs, from the lack or coordination at a public service concessionaire, from the delay in obtaining environmental licenses, from the action frequently dissociated from inspection and control agents, from the

excess red tape and from the delay in releasing resources.

These obstacles are described in more detail below. The problems and implications associated to each theme are related and, at the end, Picture 6.2 brings the proposals of what to do to reduce these hindrances.

Environmental Licensing

The obtainment of environmental licenses is today a great obstacle to the progress of infrastructure jobs. Created to protect the collective right to an ecologically balance environment, the environmental licensing stipulates an extensive and cumbersome sequence of procedures to obtain authorization for the construction and operation of highways, hydroelectric plants, ports, airports and other installations that impact the environment.

The environmental licensing comprises three consecutive stages: (i) the Previous Licensing, which approves the location and conception of the undertaking and certifies its environmental feasibility, operating as a legal authorization from the environment control agency for the beginning of planning; (ii) the Installation License, which authorizes the beginning of execution of the job to install the undertaking, with the approval of schedules of implementation and the plans and programs of environmental control; (iii) The License to Operate, which authorizes the company to start operating the undertaking, agreeing with its form of interaction with the environment during the first years of operation.

Although with a clear definition in law and being formed by a known set of administrative procedures, the environmental licensing is provided in an extremely slow, costly and under red tape process. This because there are no previously defined environmental procedures and programs, as well as there are not terms established for the public agents' decisions. There is a frankly fearful position from the public agents, which is nourished by the fear of questioning their official decisions. The lack of communication between the agencies during the licensing is another source of slowness.

Defects in Contracting

One of the most serious problems that occur in public works, directly responsible for stoppages and delays, is related to the defects in contracting. The defects are faults originated in studies and basic projects of engineering ill prepared, and in terms of reference of hiring that may lead to overpricing, overworked prices or even unfeasibility in managing the jobs.

There are also problems that emerge in pre-qualifying the bidders, at times incapable of performing the bid jobs. In these cases, the simple judgment by the criterion of lowest price leads to a situation in which the technical solutions are not considered, which may select companies with higher change of having the job interrupted due to technical conditions.

Regardless of this, many contracts to prepare engineering projects are currently made with low technical requirements, incompatible prices with the hired scope and improper terms. The ill prepared projects have better chance of leading to deadlocks and interruptions, besides the implications in all other areas (environmental, security, financial, etc.).

With the purpose of updating the Bidding Law, it is going through the National Congress

now the draft bill by the Senate (PLS) No. 559/2013, which may contribute that the various obstacles mentioned in this chapter are finally removed.

Among the legal provisions being discussed at the National Congress to update Law No. 8,666/1993, it is suggested the inclusion of expressed contractual clauses in order to fix the inobservance of the rule in the following items:

- Requirement of a complete/basic project, prepared by the contracting party, as a requisite for bidding public works and for pre-qualification, under the responsibility of the designer. (article. 7th, §2, I).
- Maintain the qualification phase prior to the phase of opening the proposals (art. 43).
- Keep ample and unrestricted publicity of the work budget, in consonance with the constitutional principal of publicity of public acts.
- Keep the forms of anticipated bidding submission of prices, invitation and competition for engineering works and services, exclusively, not admitting in these cases the use of bidding or any form that permits offer of bid.(art. 22).
- Formulas and criteria of assessment of unenforceability of price holding absolute presumption (art. 48, §1).
- Criterion of readjustment, which shall reflect the effective variation In production cost, admitted the adoption of specific or sectorial indices, since the date scheduled for the presentation of proposal, or of the budget to which the proposal refers to, up to the date of complying each installment, prevailing the periodicity of verification of such compliance to the annual periodicity referred to in article 3, § 1, of Law No. 10,192/2001, (art. 40, XI).
- Requirement, as a mandatory clause of the administrative contract, of an index of readjustment regardless of the term of contract, admitting its automatic incidence from the contractual periodicity.
- Requirement, as a mandatory clause of the administrative contract, of application of interests and monetary adjustment for the period of default from the Administration (art. 40, XIV, c).

As contributions to be inserted in the new reading of Bidding Law, it is hereby suggested:

- Simplifying the documentation of fiscal good standing, using the online consulting tool whenever possible.
- Adoption, preferably of a system of registration and pre-qualification as a phase preceding the receiving of proposals for engineering works and services.
- Make it mandatory, the warranty of a proposal limited to 1% of the estimated value of the contract.
- Insurance with guarantee of up to 30% of the contract value for jobs of large amounts and complexity (value higher than BRL500,000,000.00), and a percentage between 5% and 10% for all other works.
- Schedule a period for the response to requests to recompose the economic-financial balance, with assessment of a sanction in case of noncompliance.
- Express provision that it is possible to rebalance only one item of the price composition (realignment) in view of the extraordinary risk.
- To define as the date of expense assumed, the signature of contract or the issuing or a service order, to guarantee the previous engagement.
- The environmental licenses and legal requirements have to be obtained with anticipation, previously performing the environment, social and geophysical studies, under full responsibility of the contracting party.
- All areas reached by the project works have to be previously expropriated.
- Creation of an instrument that penalizes the public manager for the noncompliance of contractual clauses, as well as it happens with the contracted party, in order to guarantee the bilateralism of the constitutional principle of legal security.

- The modality called Integrated Contracting shall be used only for jobs of large amounts and complexity, with amount higher than BRL500,000,000.00

Expropriation and resettlement

Many infrastructure and building works require land that is occupied. This is the case, for example, of road construction, which ends up cutting farms, or streets in urban centers, whose expansion requires land that is already built and occupied.

As these works have public utility or social interest, the State can take the necessary properties to itself through fair compensation. The expropriation is done through two public acts: (i) the declaration of public utility or social interest; and (ii) the declaration of concrete measures (indemnity values, time limits on vacating premises, etc.). The execution of expropriation can be administrative, which occurs when the public power and the expropriated agree on the indemnification and other conditions of the expropriation act, or can be judicial, when the State files an expropriatory action before the Judiciary - this is generally the case when no agreement is entered into by and between the parties.

In the case of individual properties, expropriation is made with financial reimbursement. In situations where large communities are expropriated, as in the case of hydroelectric plants, for example, it is usual to resettle populations, which involves the construction of new housing for families and new properties for commercial establishments and services as expropriated.

Although there is a consolidated legislation, in practice, these acts are time consuming and generate many judicial inquiries regarding the public utility of the property, the indemnity amounts and other rights of such affected population, which leads to the paralysis of the processes and the delay in the works. Supposed illegality in the act of expropriation may lead to judicial challenge, including a writ of mandamus and injunction suspending the settlement until the final decision.

Taking into consideration the excess of cases before the Brazilian Judiciary Power, the motion for clarification can last for years, with delays of unpredictable dimensions in the execution of the works. The companies contracted have financial losses and the delay of the works puts in the background the very social interest or public utility that motivated the project, without there being any way to compensate the population for possible damages.

Inspection and control agents

By involving public utility projects, infrastructure and urban development works are subject to a large number of control agents and to various supervisory bodies. The energy, transportation and sanitation works are contracted directly by the State or carried out by concessionaires of public services, which are subject to strict control procedures.

As an example, we can mention the case of sanitation works, which are supervised and controlled by numerous controlling bodies with powers to impose rules or paralyze works, such as ministries, state and municipal secretariats, financial institutions, attorneys, regulatory and supervisory bodies. These agents control and oversee qualitative and quantitative aspects of the administrative, accounting, technical, operational, financial and labor dimensions.

Necessary to obtain transparency and probity in public management, the control and inspection carried out by so many agents, with such wide and diverse powers, are severe difficulties, by the fact that, on the one hand, on the disarticulation of action between those actors and, on the other hand, the possibility of halting work at any time, often without proper evaluation of the negative effects of such a drastic measure, often imposing unnecessary and unpredictability delays in the execution of works. The improper or anticipated suspension ends by imposing unexpected costs to the construction company, with cessation of financial flows, discontinuance of contracts and irrecoverable losses, which will then be judicially challenged.

Public administration

Two factors associated with public management can cause slowness and unpredictability in the cycle of works. The first is associated with the legal insecurity of those responsible for contracts and other public acts involving the works.

The public agent may approve a work, an authorization, a license or a payment, and then, another public control agent, whose power overlaps with that of the manager, may question his decision. At the limit, a public official may have to respond with his or her personal assets for any damages claimed by another decision or control area. The pressure on his action is clear, often leading to stalemate and indecision. This imposes unrecoverable losses on companies, and puts again the social interest or public utility of undertakings, which are the subject of decisions.

Technical decisions are also compromised by the misallocation of talents in the public sector. The structures of positions and salaries in the executive branches privilege, in terms of remuneration, the activities of supervision to the detriment of the planning and management positions. This induces a more qualified labor to public recruitment examinations for inspection positions and feeds the shortage of skilled labor in the planning and management areas.

Financial resources

In addition to the factors that generate an unpredictability in contracts and that are directly related to the relationship with public agents and the society, there are economic and administrative factors that affect the good performance of the works and lead to cost increases, with a commitment to Companies planning and financial feedback. The lack of guarantees for constructing companies and the poor financial management of contractors can significantly interfere with financial flows, by jeopardizing the ability to pay contracts in progress.

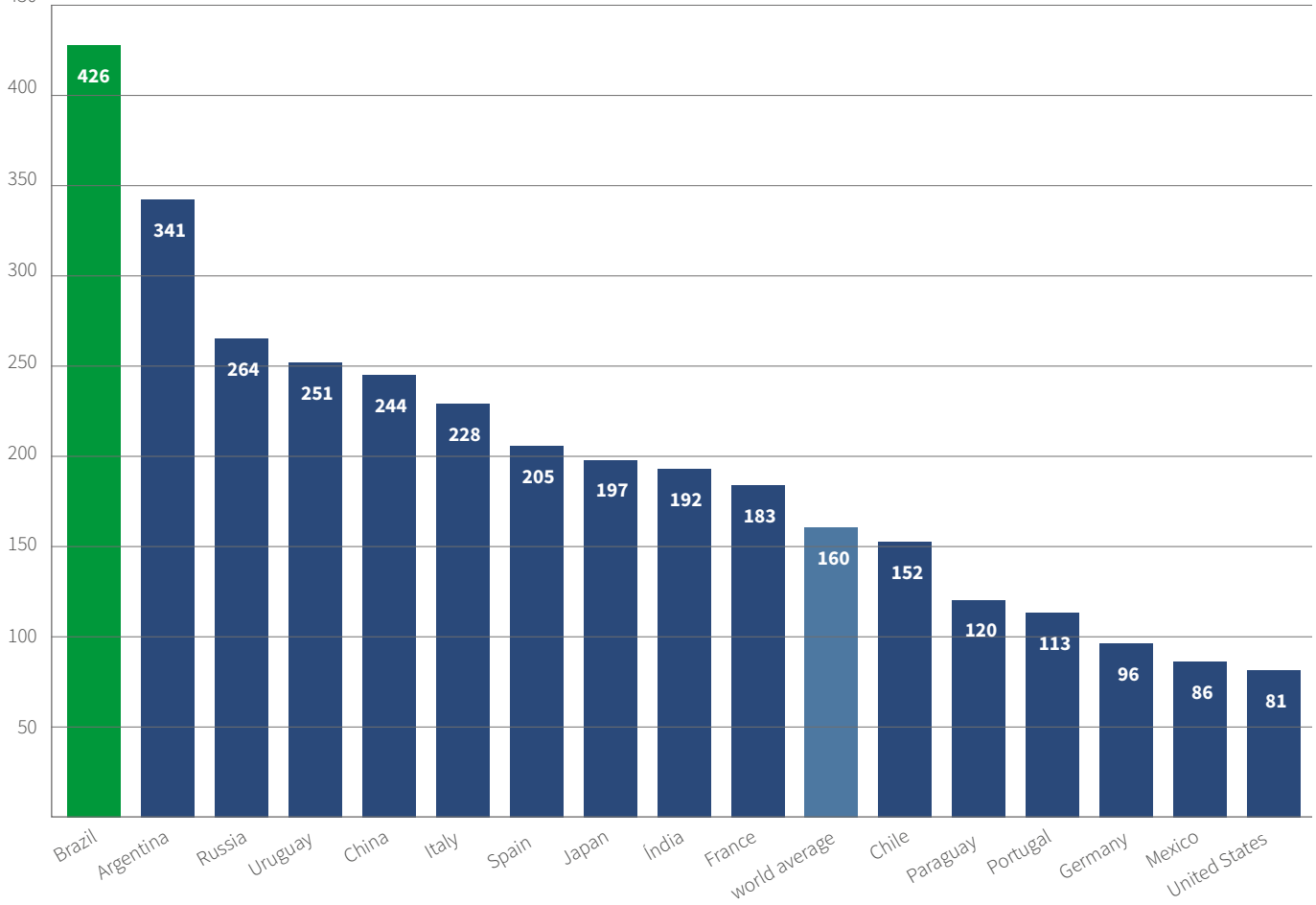
The lack of budgetary and financial resources leads to the interruption of works due to the lack of payment. In addition to imposing losses on the companies, with loss of revenues and costs due to shutdown, the interruption of works leads to administrative and judicial inquiries about economic-financial losses. These questions can be extended for years, generating uncertainties for both companies and public authorities and for the society as well.

Bureaucracy and legal certainty

Excessive bureaucracy is another aspect affecting the construction activities in Brazil and increases the average time of the construction cycle. After contracting a work, excessive bureaucracy can impose delays and unrecoverable costs on companies. This bureaucracy concerns compliance with all rules and procedures established by law, regulations and ordinances. The demands vary according to the city, due to the diversity of the codes of works, the administrative standards and the security requirements of each city hall.

It is important to mention that, in this case, the government powers of different spheres and of supervisory bodies overlap, by creating sluggish and multifaceted processes that occupy the time and talent of managers. World Bank indicators (World Bank, 2016) place Brazil among the five slowest bureaucratic countries in the world, along with Cyprus, Zimbabwe, Barbados and Venezuela. In 2015, the average time to build a warehouse was estimated in 426 days in Brazil, while in the world average 160 days was spent to carry out the same activity. The other MERCOSUR countries or the BRICS group (Brazil, Russia, India, China and South Africa) performed the same type of work in a much shorter time (Graph 6.3).

Graph 6.3. Average time to build a warehouse in days, 2015.



Source: World Bank (2016). Prepared by: Ex Ante Consultoria Econômica.

Excessive bureaucracy has negative impacts on the companies' productivity within the construction chain, while at the same time making work and services more expensive. If the bureaucracy stalls and increases the delay of the works, it ends up increasing the direct and financial costs, which are increasing as a result of the time.

In addition, there is legal uncertainty in contracts and very large complexity in the legal structure. Laws dealing with various aspects of economic activity cause great confusion and difficulties in dealing with specific issues, whose legal framework is fragmented in many instruments.

As previously mentioned, it is expected that the revision of the Brazilian Procurement Law will contribute to the removal of confusing points of the current legislation.

Public service concessionaires

The execution of works of buildings and infrastructure requires the cooperation of public service concessionaires. For example, the construction of a bridge in a consolidated urban area, in general, requires electric utilities and telecommunications services to move the cabling and that the water and sewage concessionaire move its networks. As this represents an activity outside the daily life of these companies, and it is not in their direct interest, there is slowness and disarticulation in the actions necessary to prepare the ground for the work.

Another problem occurs when the works are ready, but they cannot be delivered because utilities have not yet been installed. This is often the case in the residential building segments: the builder finishes the construction, but does not receive the permission for the families to move, as there is still no energy, gas or treated water. It is important to note that this occurs even in works of social interest contracted by the government, whose delivery and occupation occur four to six months after completion of the works, due to delays in the installation of these services.

In addition to such delays, another aspect of this problem is the decentralization of the actions necessary for readjustment of public utility services. Each issue should be dealt separately in each of the utilities (electricity, water, sewage, gas and telecommunications), which in large cities can easily involve separate dialogues with more than seven different agents. Each agent has its own negotiation deadlines and processes to reschedule the network, causing a serious coordination problem and a high cost of articulating these actions.

Chart 6.2. Proposals to reduce the business cycle.

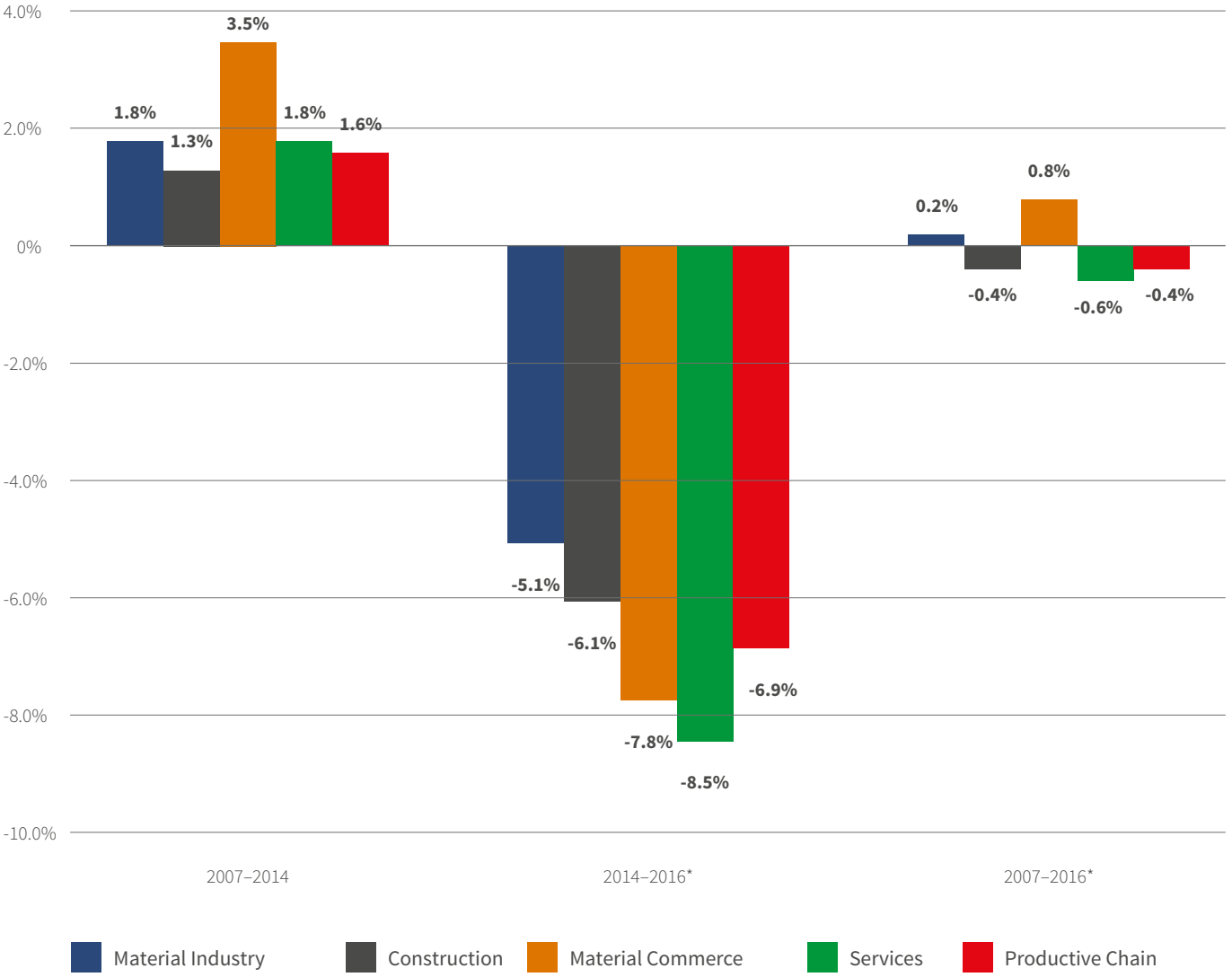
Environmental license	Defects in contracting	Expropriation and resettlement	Inspection and control agents
To clearly define the competence aimed at licensing the undertakings	To more broadly adopt prequalification procedures for effectively qualified bidders	To establish the deadline for all stakeholders involved	To establish deadlines for resources and define the area of action of each agent, avoiding overlapping of functions
To clearly define the concept of “relevant public interest project", from higher decision-making bodies, on which the environmental license to mitigate environmental risks should be issued.	To judge the bids by technique-price model, recognizing the technical solutions	To create special courts and boards of judges in the matter before the Court of Justice, as well as to properly qualify them to give speed to the proceedings	To give personal responsibility to public officials in criminal, civil and administrative matters for non-compliance with any provision of the legal system
To unify legislation at different levels of government and qualify the public employees	To adopt more robust works insurance, with the possibility of replacing the contractor with the insurer	To require a reduction in the time for processing legal proceedings	To delimit the function of the Federal Audit Court for approval of annual accounts and denunciations and representations, repealing its role in previous approvals of infrastructure projects
To create preclusive deadlines for the issuance of environmental licenses in the form of regulatory licenses and approval of operations by Cade	Effective adoption of defaulting individuals and delinquent companies’ registers	To adopt clearer discipline on the criteria for provisional remedies in possession of real estate, necessary for infrastructure projects	To reduce interference by enforcement agents at each stage of the project
To draw a linearity in the environmental licensing procedure, so that no setbacks occur	The contractor is responsible for the good contracting. Without planning, there is no coordination of activities, which will result in delays and unscheduled costs	To create legal discipline aiming at making available to assign the payment of indemnification in court to properties whose property register is doubtful	To establish guarantees to the contract manager for decision-making for the quick and efficient project execution, except in cases where it faces jurisprudence or there is evidence of bad faith
To hold the public agent responsible for granting undue or delayed license	To improve project quality	To adequate risk sharing on expropriation under contract, assigning the risks and uncertainties not manageable by the contractor to the public authority	To require articulation of the performance of inspection agents within a pre-established schedule in relation to strategic works
To promote the culture of integrated evaluation, that is, always observing the economic, social and environmental impacts of the work	To require the submission of projects with the respective Technical Responsibility Note of the professionals who execute and carry out the budget review, comparing project information, memorandums, financial and physical statement and financial schedules	To set up integrated planning	To hold agents responsible for objection / interruption of work or denial of licenses improperly
To set up integrated planning			To promote the culture of integrated evaluation, that is, always observing the economic, social and environmental impacts of the work

Public administration	Financial resources	Bureaucracy and legal certainty	Public service concessionaires
To qualify public employees and allocate them according to their qualifications, prioritizing the positions of planning and management	To guarantee payments and financing within the established deadlines	To computerize processes and eliminate unnecessary steps	To establish deadlines for the necessary activities by public service concessionaires
To prioritize the Federal Audit Court actions in order to oversee governance and public management	To reduce the number of steps and agents	To standardize and simplify the procedures of each agency intervening in the project, within a pre-established schedule, in relation to strategic projects	To establish joint and several contractor's liability or of the granting power with the necessary measures for the adequacy of the concessionary networks
To require goals and institute meritocracy policy, with increased remuneration through performance	Creation of priority projects, which are not subject to the contingency of public resources	To veto the so-called "***leis-ônibus***" (laws with a variety of changes in a choice of sectors), with a range of subjects in a single document	To hold public service concessionaires accountable for inadequate service to public works of strategic nature or of public interests
To hold the agents responsible for actions that may jeopardize the good progress of the works and the public interest	Advances in relation to the tax budget in investments in urban development and economic infrastructure	To comply with what is established in the contracts	To improve the regulatory agency structure, allowing the effective monitoring and inspection of the activities of such concessionaires
To adopt, when possible, insurance for public agents, preventing the insured from being held liable to proceedings with his personal assets in cases of proven good faith	To define clear and linear procedure for requests on economic and financial rebalancing		To introduce integrated planning
To regulate the Fiscal Management Council, provided in the Fiscal Responsibility Law (Complementary Law No. 101/2000)	Improvement of alternative procedures for conflict resolution and adoption of dispute boards in public procurement		

Cade = Administrative Council for Economic Defense. Source: Fiesp (2014); Toledo Junior (2001, p.279). Prepared by: Ex Ante Consultoria Econômica.

7. Fiesp's Compete Brazil Program - Competitiveness Agenda on Construction Supply Chain

During the economic cycle, between 2007 and 2014, where the volume of financial resources increased, the demand for housing and infrastructure works allowed the expansion of all links in the construction chain. The increase in activities brought gains in scale, made possible the increase in the use of capital and encouraged technological innovation, processes that had positive effects in the sectors' productivity. However, from 2014 onwards, the economic and fiscal crises led to strong contractions in both credit and activities, with effects not only on revenues from the segments that make up the construction supply chain. There was a sharp decline in productivity in virtually all sectors, with rising costs and a loss of competitiveness (Graph 7.1).



Graph 7.1. Evolution of labor productivity * in the productive construction chain, by segments and sub periods, as a percentage of the year. * Value added per employee at constant prices. Source: Brazilian Institute of Geography and Statistics (IBGE). Prepared by: Ex Ante Consultoria Econômica.

In the civil construction, productivity growth (1.3% a year from 2007-2014) was strategic to meet rising labor costs (1.6% a year from 2007-2014, as seen in Chapter 2). This was possible because the builders increased the use of machines and equipment, adopted more efficient constructive methods and increased the scales of operation. From 2014 to 2016, on the other hand, there were intense losses of efficiency: in two years, labor productivity in the construction sector fell by 6.1%, leading to a reduction in the company's return.

The labor productivity evolution was also quite unfavorable in the materials, machinery and construction industry in those two years. The value added per worker fell by 5.1% per year between 2014 and 2016, which virtually nullified the productivity gains accumulated in the cycle from 2007 to 2014, which were 1.8% per year. Trade in materials and services for construction have lost even more in the last two years: 7.8% and 8.5% a year, respectively. Thus, real levels of added value per worker in the construction chain in 2016 should be below the standard of 2007, which indicates a mean annual loss of 0.4% in nine years.

The sustained growth and competitiveness basis is the continuous increase in productivity, which is achieved through technological innovation, the qualification of labor, the reduction of inefficiencies in the production process and the increase in production scales. Without this, the increase in demand has a negative impact, since it increases production costs, contracting margins and discouraging corporate investment. On the other hand, in a recessive environment with a loss of productivity, we have the combination of three very unfavorable conditions: unemployment, with an increased idleness of installed capital, inflation of costs and loss of return on capital.

This chapter of the 12th ConstruBusiness presents the lines of work and proposals of the Federation of Industries of the State of São Paulo (Fiesp) Compete Brazil Program, focused on construction, addressing themes and ways to increase competitiveness in the sector, today much more than the times when the construction chain experienced high expansion rates. The issues have been discussed in the working groups organized by the Department of the Construction Industry (Deconcic-Fiesp): Responsibility with the investment; Industrialized Construction; Materials and Construction Components (which is part of the Brazilian Life Cycle Assessment Program); Building Information Modeling (BIM); Building Safety; and Business Environment in the Real Estate Sector. Each group listed the main challenges related to the themes, prioritizing them and indicating the ways to solve them. In addition, the groups discussed successful experiences in some areas.

More important than briefly exposing the diagnosis of the problems affecting the competitiveness of the construction chain, the 12th ConstruBusiness brings proposals to increase productivity and the successful initiatives which are underway and which have the support of Fiesp. The topics are organized into three sections addressing to the following issues: (i) management, planning and process in construction, (ii) investment financing; and (iii) technology, capital and labor (including taxation) in the production chain.

Management, planning and process in construction

Building Information Modeling (BIM)

The project development methodology called BIM – (Building Information Modeling) is a concept that digitally represents the physical and functional characteristics of a building, sharing and integrating knowledge in order to build a real base for decision-making during the life cycle of the undertakings. Traditionally, projects are designed in two dimensions. The BIM methodology extends this to the three primary spatial dimensions, incorporating information on the dimensions of time, costs and life cycle. The information arranged in the primary spatial dimensions goes beyond geometry. The methodology covers spatial relations, geographic information and quantities and properties of building components, which are defined in data libraries provided by manufacturers

The system integrates the information of the architectural and landscape projects with those of structural engineering and the hydraulics and electric plans, guaranteeing the consistency of the plans of integral form. The administrative counterpart of financial flows, production schedules, human resources and purchases of materials and services is also integrated into the system, so that, for example, the impacts on the costs of a change in the hydraulic plan or in a window can be evaluated quickly. Throughout the process, the BIM methodology incorporates the necessary changes and re-updates the entire information system and, at the end of construction, all information is archived, giving a complete historical record of the work, which can be used in the future in a variety of ways - information support for renovations and adaptations of buildings, insurance contracts, legal issues, etc.

In Brazil, its use is still little disseminated due to the relatively high investments that are necessary for its adoption and the very culture of Brazilian companies and also of their final customers. The use of BIM implies a company productive structure reorganization, breaking with the traditional production processes, allowing the interface of information between the various disciplines in the process of elaborating projects. The software is imported and has a high tax burden (import tax, income tax, Social Contribution on Net Income tax [CSLL], Social Integration Program [PIS] and Contribution for Social Security Financing) [Cofins]). The hardware required to operate the tool is also sophisticated and expensive. In addition to representing a high capital expenditure for engineering and architecture medium and small size companies, which do not have financing lines for their acquisition, there is the question of the need for greater qualification of the workforce. There are still few professionals able to fully utilize the tool. The construction materials produced in Brazil do not yet have libraries that adequately specify their technical and environmental properties, limiting the use of the methodology for adequate sustainability assessments

Over the past three years, the BIM working group has developed important strategic actions. In 2014, a mission was carried out to France to learn about the strategies and mechanisms adopted in the country. A study by the French Federation of Construction (Fédération Française du Bâtiment [FFB]) identified productivity gains of 35 euros per square meter in new construction due to the adoption of the methodology. In that same year, the BIM Methodology course of the National Industrial Learning Service (SENAI-SP) was started, which its first group formed in 2015. In March 2016, the International Seminar on BIM was held at Fiesp with the presence of Brazilian and French specialists. Also in this year, the proposal of the Brazilian Agency for Industrial Development (ABDI) was discussed at Fiesp for integrating Brazil into the buildingSMART International (bSI).

In April 2016, Deconcic-Fiesp published a report presenting the actions of the working group since its foundation in 2014, expanding and deepening the proposals regarding BIM. The advancement of the use of this methodology in Brazil involves policies to encourage the acquisition of tools and the quality of the workforce. There is also a great task to be accomplished by the industry, which is the generation and cataloging of information on materials, machinery and equipment.

Actions:

- To improve and deepen Brazil's technical relations with France through a technical cooperation agreement between the two governments.
- To encourage the development of libraries associated with construction materials and machinery and equipment used in construction.
- To encourage the structuring of public bodies for contracting projects in BIM, through training of professionals, exchange of international experiences and adequate hiring processes.
- To encourage the use of BIM concept by reducing the tax burden on the software and creating financing lines.
- To expand support for professional qualification actions for development of projects in the BIM environment.
- To support the development of reference guides and manuals about BIM in Brazil.

Integrated Licensing Work System (Silo)

In general, the licensing of works is a slow process and must be done together with municipalities, with their own specificities and rituals. In some cities, the slowness of the process, the way it is done, and the sequence of bureaucratic steps to approve the project, the construction, and the habitation certificate take up a great deal of time. In addition, in most municipalities, the process is manual, which undoubtedly slows down the pace of approval.

The municipality of Atibaia represents a positive experience. On October 28, 2015, its city council instituted the Integrated Licensing Work System (Silo), a computerized process for approval of plants, and to issue authorizations and documentation necessary for demolition, construction, renovation and housing. Silo consists of a platform that operates in a web environment and that receives registration records of companies and technical managers, projects, license applications and all the files and documents necessary for approval of the works. The platform is flexible, which allows the creation of customized interfaces.

The system operates in an integrated and very simple way: the contractor opens a registry of the company and the technical managers and, with each project, opens a process in the system. Afterwards, the forms related to the project are filled out and all documents are deposited electronically - the plants are transferred in PDF format. The project evaluation and approval are done by the technical staff of the city hall in the system itself, which dispatches notices and allows on-line processes monitoring. Once the project, the demolition, the construction or the dwell approved, the system issues the license. Upon completion, the process follows for electronic filing.

In addition to being secure, the automation of licensing processes saves a great deal of time for professionals and reduces business costs, without prejudice to the regulations made by city governments. After its implementation in an experimental phase, in which tests were carried out in 10 licensing processes, the average time of issuance for license fell from 60 to 10 days. It is also a tool that gives transparency to the approval processes of the works.

Actions:

- To support the dissemination of the results of the Silo implementation in the municipality of Atibaia, highlighting the gains for society and municipalities.
- To disseminate the use of Silo to other municipalities, promoting the acquisition of necessary equipment and software and training of the workforce.

Property Registry

One demand of the Fiesp's Compete Brazil Program related to institutional and management aspects is the debureaucratization of the property registry. The 10th ConstruBusiness, published in 2012, brought proposals that have made good progress in recent years, leading to a major institutional reform. In October 2014, the federal government published the Provisional Measure no. 656/2014, which became Law 13,097 / 2015, which instituted the concentration of acts in the property registry, with the purpose of giving greater security to real estate business.

The law established in its article 54 that the constitution, transfer or modification of rights over real estate will have its effectiveness guaranteed. This is because the previous legal acts which were not registered before the Property Registry will have no legal value in questioning. Thus, those who acquire or receive real estate as collateral rights will no longer run the risk of a third party claims rights over that property.

Pursuant to article 55, the alienation or encumbrance of autonomous units which are part of a real estate development, parceling of land or condominium of lots of urban land, duly registered, cannot be subject to loss of rights due to a preexisting cause (eviction). The article 59 exempted the clerk from transcribing the document evidencing the payment of the Tax on Transmission of Real Estate (ITBI), tax certificates and certificates of property and real encumbrances, simply by recording in the deed that the documents were presented.

The article 61 granted a period of two years, which expires in January 2017, so that the past acts that are not included in the property registry are duly registered, otherwise these acts lose their validity. The law was a major breakthrough, which will have a reducing effect on legal uncertainty, but it must be applied in full without any changes in deadlines.

Another priority proposal, which was already included in the tenth and the eleventh ConstruBusiness, is to encourage the efficiency of notaries through greater control of public power over their performance. The idea is to create a productivity measurement system and establish minimum levels of performance. The notary who fails to comply with these requirements will be subject to a fine and, in the limit, to the loss of ownership of that registry. In addition, it is necessary to set deadlines for computerization of all registries in the country.

Actions:

- Mobilizing the public power to create a system for evaluating the performance of real estate registries.
- Mobilize the public power to promote the computerization of registries in the country.

Security in buildings

The Deconcic-Fiesp Construction Safety Working Group was created at the end of 2013, aiming to bring together entities from the sector directly involved with the issue to develop related actions, seeking legal protection that encourages periodic maintenance in buildings, aiming to increase security for users. In its first meeting, the creation of three specific subgroups was formalized: (i) Legislation, Standardization and Strategies; (ii) Financing and Insurance; and (iii) Qualified Labor and Certification.

Throughout 2014, the group met to draw up diagnoses of the insecurity points in the buildings, according to the existing subsystems. In addition, it acted in the identification of the bills that were in progress before the Legislative Power, with the intention of proposing amendments. Articulations were made with parliamentarians, presenting amendments to approve the Bill (PL) Nº 6,014 / 2013, which determines the periodic inspection of buildings and creates the Technical Building Inspection Report.

Also amendments were proposed in PL Nº 3,370 / 2012, which deals with the obligation of expert surveys and periodic maintenance in buildings, and in PL Nº 2,020 / 2007, which deals with general safety standards in concert halls and the like.

In 2015, the working group presented the proposal to make a mandatory periodic technical inspection in buildings with more than 15 years in the Urban Development Committee of the House of Representatives. The inspection would seek to ascertain the minimum safety conditions, indicating possible interventions aimed at regularizing the conservation status.

Actions:

- To support the creation of mandatory periodic technical inspection in existing buildings for more than 15 years.
- To develop the Safe Building Guide, a publication to raise awareness of society and public authorities about the importance of periodic inspection in buildings.
- To develop actions to qualify professionals in the area.

Financing

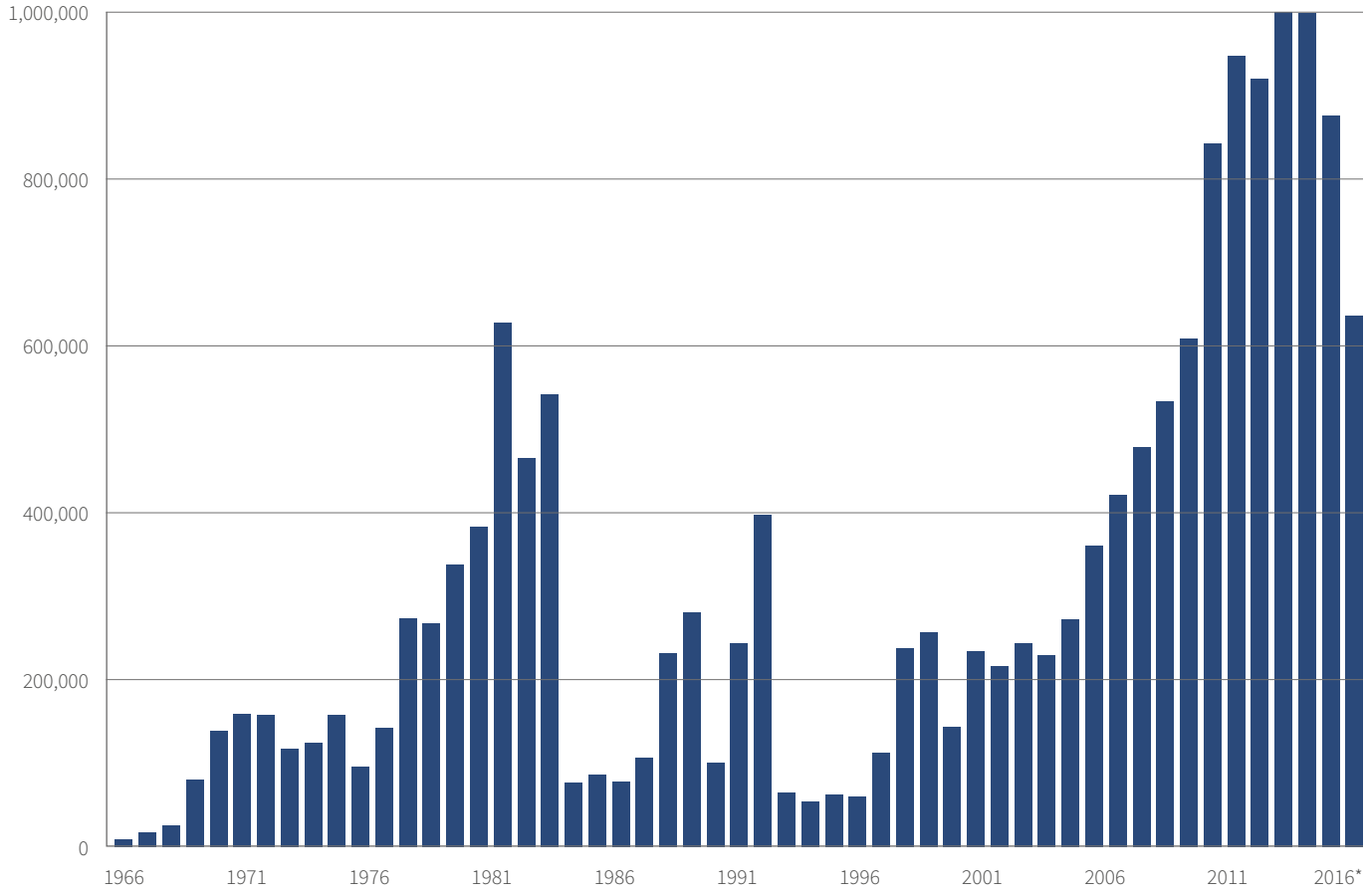
Mortgage loan

The housing financing had a sharp expansion between 2007 and 2014, which contributed to the expansion of the activities of the construction production chain in the country. The value of the stock of housing real estate credits reached approximately BRL497.8 billion in December 2014, which is equivalent to approximately 8.8% of Brazil's gross domestic product (GDP). In December 2007, the balance of housing credit was only 1.8% of the country's GDP.

The increase of 7 percentage points of GDP in the real estate loan balance was due to the expansion of savings accounts and the FGTS. In the scope of Housing Finance System financing, which includes funds from the Brazilian Savings and Loan System (SBPE) and the FGTS, the number of units financed by the savings accounts was above the 500 thousand mark in the years 2013 and 2014. The number of properties financed by FGTS was around 460 thousand units in that period. In addition, the number of credits granted, excluding financing of construction materials, was about one million units in those years (Graph 7.2).

The main securities that raise funds for credit in the financial market are the Real Estate Receivables Certificate (CRI), created in 1997, the Real Estate Credit Certificate (CCI) and the Real Estate Credit Letter (LCI), both created in 2004. These securities also showed significant growth in this investment cycle. According to the Custody and Financial Settlement Center for Securities (Cetip), CRI's outstanding stock reached BRL62.347 billion in October 2014, with an annual average growth of 44.4% in real terms since October 2007. The balance of CCI in circulation, in turn, totaled BRL98.686 billion, with a real average expansion of 55.4% a year since October 2007. The LCI stock reached BRL165.310 billion in October 2014, a value of 41% higher than that of October 2007.

The main responsibility for this credit expansion was the Minha Casa Minha Vida (PMCMV) Program. Between 2009 and 2014, the number of units financed in the country totaled 5.655 million, and the housing units contracted by the PMCMV totaled over 3.755 million in the period (2/3 of the total).



Graph7.2. Number of housing units financed by the FGTS and the Brazilian Savings and Loan System (SBPE). * Values projected from the results observed until September 2016. Source: Caixa Econômica Federal and Brazilian Association of Real Estate Credit and Savings Entities (Abecip). Prepared by: Ex Ante Consultoria Econômica.

From 2014 onwards, however, there was a sharp contraction in the credit supply. In the period from 2016 to August, 457.2 thousand housing units were financed by the FGTS and savings accounts, 31.4% less than in the same period of 2014. In the case of financing under the SBPE, the decrease was 61.4%. In terms of values, there was a nominal reduction of 39.1% between 2014 and 2016 (cumulative for the year up to August), and in SBPE there was a nominal reduction of 58.2% of the amounts financed. The main reason for this retraction was the increase in the federal public debt, fueled by the fall in revenues and the increase in interest rates, as discussed in Chapter 3. This movement drained resources from the savings accounts, which had negative net funding of BRL91.2 billion between December 2014 and September 2016.

The capitalization titles on the market also show a loss of dynamism. According to data from Cetip, the outstanding CRI stock reached BRL65.720 billion on October 21, 2016, with average annual growth of 2.7% in real terms since October 2014. Previous to such, it was growing at a rate of 52.2%. The outstanding CCI balance, in turn, totaled BRL105.442 billion, with real average growth of 3.4% per year since October 2014. Between 2007 and 2014, the average rate of change was 66%. LCI's stock reached BRL189.246 billion on October 21, 2016, with an annual average growth of 5.0% since 2014. The real expansion rate between 2007 and 2014 was 41% per year.

In order to ensure the continued growth of these sources, the Provisional Measure No. 656/2014, transformed into the Law 13,097 of January 19, 2015, has introduced measures that guarantee

greater protection of investments in the event of insolvency of the issuer and foment the development of the capital market by increasing the liquidity of securities. The way to increase the guarantee of the real estate papers in force (LCI and CCI) and to reduce the credit risk was the creation of a new title, called the Guaranteed Real Property Letter (LIG), which, in case of insolvency of the issuer of such securities, guarantees the rights of buyers. In the event of the bankruptcy of the issuer and the need to liquidate its assets, among them the set of assets to which the real estate securities are linked with, the purchasers of such securities have priority to receive their credits, since the assets that comprise the portfolio submitted to the fiduciary regime constitute the patrimony of affectation, which is not confused with that of the issuing institution.

This legal device, which was one of the flags of the last editions of ConstruBusiness, will allow the approximation of Brazilian real estate securities to the so-called covered bonds, a real estate financing mechanism in the parameters described above, which is widespread in Europe. The titles of this modality represent considerable percentages in the total value of mortgage-backed real estate loans in European countries. In the case of Brazil, however, these securities reached the market in a period of credit reduction and interest increase, and did not have operations yet.

Another important advance in the long-term housing finance area was the expansion of housing subsidies for the low-income population. In addition to reducing the need for real estate credit, since it slashes part of the value of the property, the subsidy acts as a reduction of credit risk, encouraging the payment of financing agreements. This acts as a complementary stimulus to the real estate loan. Housing subsidies have been significantly expanded under the Minha Casa Minha Vida Program, which entered its third phase in 2015. As housing demand will increase in the coming years and considering that there is still a high social deficit in Brazil in this area, ConstruBusiness advocates that the program be transformed into a state policy, guaranteeing its continuity and stability until the housing shortage in the country has been remedied.

In addition to the urgent need to reduce interest rates, in order to allow for a resumption of fund raising and financing under the SBPE, ConstruBusiness proposes a set of actions to further improve the real estate financing mechanisms.

Actions:

- To accelerate the implementation of the Guaranteed Real Property Letter (LIG) as a way to reduce credit risk and increase funding for real estate market.
- To improve the traditional financing mechanisms of the Housing Financing System (SFH), with a view to increasing the availability of FGTS funds and savings accounts for housing investment.
- To support the transformation of the PMCMV into a State policy, guaranteeing the resources for subsidized financing for at least 50% of the Brazilian housing demand outlined in Chapter 4 of the publication.
- To support the development of a social rental policy as an alternative to financing policies for the purchase of real estate for specific segments of society in projects that can be financed by institutional investors and non-governmental organizations in the long term.
- To employ the mechanisms of public-private partnership in structuring and real estate developments for housing of social interest (item detailed below).

Public-private partnership

The public-private partnership (PPP) was established by Law 11,079 / 2004. According to the law, the PPP is an administrative concession contract that can be entered into by the sponsored or administrative modality. The common concession, governed by Law No. 8,987 / 1995, does not constitute a PPP. As in the common concession, the contracting of a PPP is governed by competitive bidding.

The sponsored concession is the delegation of public services or public works in cases which the user fees are not enough to compensate the investments made by the private partner. In this case, the public power complements the remuneration of the private company with regular budgetary resources (public service payments), in addition to the user fees charged. The administrative concession is the contract for the provision of services in which the public administration is the direct or indirect user. In this case, it is not possible or convenient to collect user fees for such services. The remuneration of the private enterprise is entirely from regular contributions of budgetary resources of the public power.

With the PPP, it became possible to increase funding for works, reduce project costs and improve the quality of services provided. As a result, the PPP affected the sectors of services rendered to families and companies, utilities, infrastructure and also the housing area. By enabling the expansion of investments, it contributed to the expansion of the industry that provides building materials.

The government of the Federal District (GDF) was innovative in the area of PPP, taking the modality to the housing field. In two recent experiences, Terracap, the state-owned company that owns the public lands in the Federal District, has given counterpart public lands to real estate projects. In one case, the Jardins Mangueiral housing project, belonging to the PMCMV (Lanes 2 and 3), Terracap entered the land and GDF granted the maintenance services of the area for ten years to the construction company. The company built the properties and sold them at a reduced cost. In the second case, the GDF, also through Terracap, donated an area to build a bridge over the Paranoá Lake, in the northern region of Brasília.

The São Paulo State Government - through the State Department of Housing and the Casa Paulista program -, in partnership with the Municipal Department of Housing of the City of São Paulo and the Metropolitan Housing Company of São Paulo (Cohab-SP), also started the PPP line in the housing area in 2015. The program foresees the construction of approximately 14 thousand homes in the central districts of São Paulo (Bom Retiro, Santa Cecília, Brás, Pari and Belém) in four lots of partnerships with the private initiative. In addition to expanding the form of housing finance, this initiative helps to reduce the problem of urban mobility. By bringing the population to the center, the initiative reduces the demand for public and private transport, helping to reduce traffic in the central city area.

In 2016, the demand for lottery is already being registered for 2,260 housing units of social interest in the expanded center of the capital, built on investments made through public-private partnerships. Of these units, 80% will be destined to applicants who prove residency in the city of São Paulo outside the central area and work in the central region, and 20% of the units will be destined to applicants who prove residence and work in the central region.

In the context of strong fiscal constraints and reduced investment in infrastructure (as discussed in Chapter 5), PPPs will play an increasing role in financing investment in the next few years, whether in the areas of infrastructure, housing or public services, such as security.

Actions:

- To encourage public-private partnerships in housing to expand land supply in priority urban areas.
- To promote the use of PPPs in the areas of public services for security, education, sanitation, health, urban transport, airports, highways, ports and environmental projects.
- To consolidate PPP programs in the housing area, by expanding them to other areas of the country.

Productive chain

Technology: Industrialized construction

As discussed in the introduction to this chapter, between 2007 and 2016, labor productivity in the Brazilian construction production chain fell by 0.4%, on average, negatively impacting the competitiveness of companies. Part of these negative impacts was mitigated by strategies to increase the use of machines and equipment, to adopt more efficient construction methods, and to increase the scales of operation. However, the adoption of constructive methods with high labor productivity in the construction site is still incipient and encounters high barriers, both tributary and other (cultural, for example).

Case studies of the effects of industrialization on labor productivity and construction costs were presented in 2013, in a publication coordinated by the Brazilian Association of the Construction Materials Industry (Abramat)[1] . One of the cases presented deals with housing destined for the middle-class public, but it well illustrates the extent of the economy with the labor force and the potential to reduce costs and prices of real estate[2]. One of the methods of construction used was the use of precast concrete made at the construction site, with technological support from the precast company. Although more expensive, the choice of method was given for marketing reasons: the speed of sale and the undertaking delivery.

The technology employed could involve precast parts at the factory, not at the construction site. This alternative would bring productivity gains and efficiency gains from the industrialization process, as well as environmental benefits. Factory pre-molds employ higher technology and capital content, which raises labor productivity, as well as greater quality control. The production of parts in the construction site, on the other hand, uses machines and equipment below its potential production, in addition to the fact that the workforce is less productive than in the factories.

However, factory precast technology is more expensive than the precast system produced on site. This is due to the lack of tax isonomy: the pre-molded parts in the factory pay the Tax on Circulation of Goods and Services (ICMS) and those produced in the works, Tax on Services (ISS), which implies a large tax differential. Thus, the differential of the cost of construction caused by the tax obstructed the best use of economic resources (labor, capital and energy), with indirect effects on the environment.

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[1] The study Taxation, Industrialization and Technological Innovation in Construction (2013) was sponsored by the following entities: Brazilian Chamber of Construction Industry (CBIC), Brazilian Association of Building Materials Industry (Abramat), Brazilian Association of Industrialized Concrete Construction (Abcic), the Brazilian Steel Institute and the Brazilian Drywall Association.

[2] The project was a residential complex with 3 blocks of buildings in the metropolitan area of Vitória, in the state of Espírito Santo. In total, the undertaking consisted of 277 housing units, of which 138 were 2-bedrooms apartments (approximately 58m^2) and 139, 3-bedrooms apartments (approximately 69m^2). The average expected value of the sale of 2-bedroom properties was BRL180 thousand and that of 3-bedrooms, of BRL230 thousand. These project parameters gave a potential overall sales value (PSV) of BRL56.81 million.

The study data indicated that the project construction cost made with precast on site was BRL29.8 million. As a part of this amount, 44.1% corresponded to costs for labor and services and 55.9% for materials and equipment. The construction cost partaking in the general sales amount (VGV) reached 52.4%. The portion of the ICMS on materials in the undertaking construction cost was of 6.4% and on the VGV of 3.4%. On the other hand, the cost of precast construction made at the factory was budgeted at BRL30.6 million, or BRL805 thousand more than the pre-molded construction site. Labor costs and services would account for 45.7% and materials and equipment, for 54.3%. In this constructive alternative, the participation of building costs in the VGV would reach 53.9%, indicating a loss of gross margin of 1.4 percentage points. The weight of ICMS on materials in the cost of building would be 9.7% and in the VGV of 5.2% (Table 7.2).

In order to identify the main barriers to the expansion of industrialized construction in the country, and to propose institutional actions to overcome them, the Working Group on Deconcic-Fiesp's Industrialized Construction was created in 2014, composed of 37 entities from the construction production chain. The working group has developed intensive work over the three years, resulting in a set of action proposals.

In addition to tax disincentives to the adoption of more productive and sustainable technology, companies and industry representatives indicated that there are other barriers to technological change in construction. The main ones are: lack of information and training of agents of the productive chain and public and private decision- makers on concepts and characteristics of the technologies available in the country for industrialized construction systems; contracting models; inadequate measurement and resource release mechanisms for works that adopt industrialized construction systems; and demand for more integrated solutions and project coordinates for adoption of new technologies. To address these issues, three sub-groups were created: (i) Taxation, (ii) Communication and (iii) Projects.

The Communication subgroup advanced in the discussion of actions to disseminate information on the subject to the decision-makers in the construction chain, and defined the Industrialized Construction Manual - Concepts and Steps - Volume 1: Structures and Sealing, published in November 2015 by the Brazilian Agency for Industrial Development (ABDI). The publication was supported by several entities of the sector, such as Abramat, Deconcic-Fiesp, CBIC, Abcic, Abcem, the Brazilian Steel Institute, CBCA and the Brazilian Drywall Association, and provides concepts and guidelines for decision- making in all stages of public enterprises and private companies that adopt technologies of industrialized construction systems. The publication also includes the detailing of 5 technologies for structures and sealing - concrete, steel, drywall, steel framing and wood frame (ABDI, 2015).

The Subgroup on Projects advanced the discussion of the importance of valuing projects, the technical qualification of professionals in the field, and the contracting of detailed and coordinated projects so that the maximum benefit can be obtained from the adoption of industrialized construction technologies, which add productivity, quality and sustainability.

In the area of taxation, the subgroup realized that the adoption of industrialized construction systems, which presuppose the production of part of the work outside the construction site (in industrial facilities), cannot be taxed in the same way as conventional where production is carried out integrally within the construction sites. The subgroup is developing proposals to guarantee a similar tax treatment between these two models of production, thus seeking the tax isonomy.

Actions:

- Promoting tax isonomy between industrialized and conventional systems.
- To stimulate the production and dissemination of technical information to improve the training of agents of the productive chain and of public and private works who are technologies-makers for industrialized construction.
- To stimulate the valuation of the projects and contracting models more integrated for the undertakings, seeking to make the industrialization feasible in the construction.
- To propose new models for contracting and measuring works which are suitable for use of industrialized construction systems.

Construction Materials, Machinery and Equipment

The rapid growth in construction, combined with transportation infrastructure deficiencies in the country, led to serious logistics and distribution problems of construction materials between 2007 and 2014. Sometimes, the building projects were forced to reduce their pace due to the lack of raw-material, which ended leading to an unexpected increase in costs, compromising the plans and the return to the companies. However, from 2014 on, the downturn of the credit and the cutting back in public investments led to emerging a huge idleness in the industrial complex of materials, construction machinery and equipment, as displayed in Chapter 2. Practically all industrial sectors of the construction chain experienced investment expansion in their installed capacities and today there is not enough demand to generate the necessary flows to their payment.

Besides the question of demand, the offer problem is particularly serious with respect to mineral goods. The environmental regulation and the new Mining Code, which is still going through the National Congress, generate uncertainties with respect to the offer of mineral goods for construction – sand and gravel, mainly. In various regions, there is the distance from the mining areas to the consuming locations, with impact on the transportation costs. In other regions, county prohibitions have hampered the mining activity, with consequences for the construction companies in their own counties.

There is, further, a lack of planning in relation to the types of materials employed in the undertakings. This is often occasioned by problems of quality in the projects. There is also the uncertainty in relation to the use of construction machinery and equipment, which may remain idle, even having been contracted, thus incurring additional building costs for the construction companies.

The production costs in the industry of building materials have increased markedly, at a pace that has not been followed by the price of materials in the market. This resulted in the reduction of margins, as discussed in Chapters 2 and 3. The increase in costs was determined by the actual increase in labor salaries (much higher than the gains in labor productivity) and by the raising of cost in electric power, natural gas and fuel oil – particularly important for the industries, intensive in energy (chemical, cement, aluminum and copper metallurgy, steelworks, glass and ceramic products, for example).

In this aspect, it is necessary an urgent review of the energy policies in the country, which could restore the competition in the national industry, with reduction of charges, taxes and the primary cost of energy itself. Particularly important are the costs of electric power for the free consumers, who dispute with the energy distributors the concessions of new and old energy under unequal conditions: such energy is resold more expensive, obtaining profit with the operation; for the industry, the energy represents a cost that, for what it concerns the competition, shall hold parity with the values practiced abroad. Another priority point is the price of natural gas, which in Brazil costs approximately three times more than in the United States, for example.

Furthermore, in the period of growth of construction activities, there was a strong advancement in import of products that did not comply with Brazilian technical standards. Later, with the retraction in the activities of the building production chain in 2014 and ahead, informality grew and the technical noncompliance among the Brazilian producers, thus threatening the manufacturers that comply with the technical standards and the legislation. The initiatives to fight the technical noncompliance, whether within the 26 Quality Sector Programs – in the Brazilian Program of Quality and Productivity of Habitat (PBQP-H) – of the Ministry of Cities, or by the Systems of Certification of the National Institute of Metrology, Quality and Technology

(Inmetro), which are attaining an important role. However, these actions need to be expanded and improved, to counteract the actions of unfair competition with nonconformity either from national manufacturers as well as from importers.

The environmental agenda is a priority in the construction business. The construction sector is pioneer in Brazil in implementing the assessment of the cycle of life (ACV), within the Brazilian Program of Evaluation of Cycle of Life. In 2014 the Civil Construction workgroup was created, coordinated by the National Confederation of Industry (CNI). The area of materials and building components, coordinated by the Deconcic-Fiesp group and by Abramat, have already begun their work, adopting a methodology of ACV modular (ACVm), which is coherent with the rules of the International Organization for Standardization (ISO). The ACVm shall enable that companies of all sizes manage their environmental impacts, demonstrating to the clients the results of their efforts.

The methodology, developed by the Brazilian Council of Sustainable Construction (CBCS), jointly with the University of São Paulo (USP) and with the support of the Brazilian Association of Portland Cement (ABCP) and the Brazilian Association of Concrete Block Industry (BlocoBrazil) it was successfully tested in a pilot project in the area of concrete blocks. In 2015, the program was structured, with the creation of the necessary technical normalization and it was expanded to other productive chains.

Actions:

- Monitor the progress in the new Mining Code in the National Congress, avoiding submitting to vote amendments that bear an unnecessary and excessive impact on mining and construction sectors.
- Accelerate the programs of logistics and integration in transportation modals in the country, enabling the reduction of costs at medium term.
- Support policies to reduce the primary cost of electric power and of changes and taxes on electricity.
- Support policies to increase the offer of natural gas for industrial use and reduction of energy price placed in factory.
- Improve and expand mechanisms of fighting nonconformity of construction materials through coordinated actions from Inmetro and PBQP-H of the Ministry of Cities.
- Support the implementation of ACV, structuring the program with the creation of the necessary technical normalization and applying norms and methodologies in other productive sectors.

Labor

Two problems in the construction productive chain are the low qualified workforce and the growing salary costs, which continue to be raised even after the crisis. These two factors became more evident in the last years, with the retaking of activity in the sector. Up to 2014, the employment grew expressly in almost all sectors of economic activity, with the systematic reduction of the employment rate in the country. During this period, the system of forming professionals in Brazil was incapable of properly raising the rhythm of labor qualification.

These factors generate a shortage of qualified workforce, which has become highly disputed from 2010 through 2014. The lack of laborers and the low skilled workforce affected the construction companies in a direct and indirect way. There were qualification problems of workers hired directly by the companies, and the lack of labor caused delays. Also, there were serious qualification problems and shortage of labor in other links in the construction productive chain. There was lack of qualified machine and equipment operators, which affected the leasing companies of capital goods. Another sector that requires qualification is that of industrialized constructive systems, whose productivity depends on specialized labor force. These two sectors are exactly those that raise the productivity in the job sites, and the professionals qualification of these areas becomes more strategic.

With this in mind, ample programs of professional qualification are priority for the building productive chain, even considering that the moment is of low production. The technical courses should be given priority for professionals of medium qualification and applied directly in the construction jobs. This qualification may be accomplished by the company itself. The motivation that shall enable to allow this initiative of qualification the employees is the concession of tax credits, such as adopted in countries of high labor productivity: Canada, France and United States. Furthermore, it is necessary to approach the university courses of Engineering and Architecture to the market needs of construction labor, integrating the teaching institutions and the companies and adapting the university curricula.

Actions:

- Create fostering lines of capacitation performed by competent and accredited institutions, prioritizing professionals that shall effectively be used in construction jobs.
- Stimulate the companies to qualify and certify their labor force, granting discounts in rates or taxes (Labor Environment Risk) [RAT], for example.
- Stimulate the planning of human resources, anticipating the actions of capturing and capacitating the human capital, valuing and most important asset for process development.
- Stimulate partnerships, stages and shared research between the corporate world and the academy.

Labor Cost

The exoneration of Payroll in some sectors of the building chain brought benefits along 2013 and 2014, which has to be reverted shortly. Although few industrial sectors have been included in the list of exempted products, the constructing companies, the engineering and architecture offices, the testing and technical analysis companies, and the construction material stores obtained benefits. Each segment has entered in different moments since the end of 2012, but all have realized considerable economic gains.

According to data from the Brazilian Internal Revenue Service, in 2014 the civil construction companies collected contributions to the Social Security (INSS) in the amount of BRL10.948 billion related to the Social Security Contributions on the Gross Income (CPRB) or to the Social Contribution from Employers (CPP), which corresponds to 20% of gross salaries, to the National Social Security (INSS), and 3% of RAT rate. In direct form, this was one of the factors that contributed to generating job positions in the country in the years 2013 to 2014, when the construction companies were responsible for the opening of more than 200 thousand formal jobs.

Bearing in mind the gains in competition generated with the exoneration of payroll, the labor group of Compete Brazil Program from Fiesp concluded that the maintenance of this policy, with the extension to other segments of the chain, would be positive. In the 11th ConstruBusiness the proposal was included of maintaining the exoneration of payroll, thus expanding the beneficiary segments.

However, Law No. 13,161, of August 31, 2015, removed almost all benefits of exoneration on the civil construction payroll. Since the law became effective in December of 2015, the collection of employers' contributions of last year did not undergo any meaningful change due to such contribution. The total employers' contribution was BRL9.953 billion – amount 9.1%, lower than collected in 2014 – due to the drop in the mass of salaries observed in 2015.

According to the law, the companies now may choose between the contribution of 20% on the salaries paid or 4.5% rate on the gross income. The new rule is valid fort new undertakings, which filed a registration of the Specific INSS Register (CEI) from December 2015. In practical terms, taking as reference the amounts of salaries, contributions and incomes appointed in the Annual Study of the Construction Industry (Paic) from IBGE of 2014, for the great majority of companies and of segments of civil construction, 20% of salaries represents a lower value than 4.5% of gross income. This is equivalent to say that, when all projects built are new, that is, when all undertakings registered at the CEI during the period of the previous rule of exoneration have been completed, the construction sector shall again contribute to the INSS an amount close to 20% of gross salaries, wiping out the exoneration gains. For the construction jobs that had exoneration, the change of rule is equivalent to an increase of 32% in the tax burden on the payroll.

This shall generate impacts on construction costs, with negative reflex on investment. Based on the National System of Costs and Index of Civil Construction (Sinapi) from IBGE, the difference of direct costs of labor from a project with the benefit of exoneration and another without such benefit was of BRL74.41 per square meter, in September of 2016, which results in a difference in total costs per m^2 of 6.8%.

Besides the exoneration on payroll, there is another part of building companies charges that may be saved without damage to the society. The building companies pay amounts by the RAT. The RAT is a company contribution, which on the risk of economic activity, and based on which a contribution is charged to finance the social security benefits stemming from the degree of labor disability. The rate of contribution to RAT in construction is 3%[3], which means the activities are considered of serious risk. The tax rate falls on the whole compensation[4].

RAT rates may be increased in 100% or reduced in 50%, according to the Accident Prevention Factor (FAP). FAP varies according to the quantity, the seriousness and the cost of accident occurrences in each enterprise, in relation to its economic segment. Its objective is to expand the culture of accident prevention and reduction of labor occupational diseases and to encourage the flexibility of tax rates, with a bonus to the companies that invest in labor accident prevention.

In order to reduce the FAP rates applied on the civil construction in São Paulo, on April 25, 2016, Fiesp signed a Protocol of Intent with the Labor Union of Civil Construction in São Paulo (Sintracon-SP) having Senai-SP as consenting party. With the protocol, the intention is to obtain the cooperation between the parties for the preparation of proposals with the purpose of making possible the reduction of tax rates through the professional certification (personal certification).

Actions:

- Return the exoneration of payroll in the sectors of construction chain, thus expanding the beneficiary segments, reducing the cost of investment in the country.
- Reduce the RAT rate to 1% in the case of administrative employees and to all employees holding professional certification.
- To expand the original scope of the Protocol of Intent, going through a general review in the FAP system, considering: to exclude the accident from going and coming back from work from calculation statistics for the reduction or increase of the rates of Labor Accident Insurance (SAT), as well as accidents with leave lower than 15 days, where the INSS is not called upon; and reevaluate the relation between illnesses and activities developed by the employee in the construction sector, as included in the Technical Epidemiological Nexus of Social Security (NTEP).

[3] Include all activities of the families of the National Classification of Economic Activities (Cnae) 41, 42 and 43, with exception of the activities at Cnae 43.291 – other installation jobs, whose tax rate is 2%, equivalent to activities of medium risk.

[4] Should there be exposure of workers to hazardous agents that permit the granting of an especial retirement, there is addition to the tax rates according to current legislation.

Attachment

Accounting-economical definitions

The **gross income** is the sum of incomes resulting from the exploitation of primary and secondary activities exercised by a company. The **net income** is obtained by excluding the taxes and contributions falling on revenues related to the sale of services on installments, the cancelled sales and the deductions and unconditional discounts. Gross and net incomes from an economical activity does not include the financial income and active monetary variations (monetary correction) nor the non operating revenues resulting from the disposal or sale of fixed assets, as well as revenues of reversal of provision for losses.

The **gross value of production** is defined as the net revenue of the sale of products and services, plus the variety of inventory of finished and in process products and the own production realized for fixed assets.

In case of the civil construction sector, the most important concept is that of **value of undertakings and services.** This concept is defined by the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística, IBGE).as the value, at market prices of finished jobs in one given year. It's different from the company's gross income value which may incorporate values invoiced in a period of jobs previously carried out. The value of construction work and services correspond in accounting to the value of investment in construction or of the gross formation of fixed capital in construction.

The gross amount of production of a company (VP) may be divided into two components: the **intermediary consumption (CI)**, which corresponds to the sum of expenses with raw-materials and services (inputs), Produced by other companies and which have been acquired in the productive process, having as destination the production, and the **added value (VA),** the portion of final value that was produced by the company.

VP = CI + VA

For a company, the **intermediary consumption** is the result of the sum of the following expenses and costs: consumption of raw-materials: services contracted with third parties; maintenance services and repair of machinery and equipment connected to the activity (rendered by third parties); the consumption of fuel and lubricants: rent and leasing: expenses with advertising, insurance premiums; royalties and technical assistance; and non-operating expenses

The VA is, by construction, defined as the difference between the gross amount of production and the intermediary consumption: VA = VP – CI. **The amount added** by a company, also is equivalent to the sum of revenues received by employees and capital holders, since it is fully utilized in the production factors.

VA = FP + EO

In what FP **payroll** and EO is the **gross remuneration of capital** or the gross exceeding surplus. Alternatively, **the gross remuneration** of capital may be obtained by the difference between the value added and payroll.

In this respect, the value added is, by definition, equal to the cost **with production factors**. This concept is quite distinct from the notion or **operating cost (CO)** which is equivalent to the sum of expenses with labor, services and raw-materials, that is, CO = FP + CI. This means that the operating cost is the difference between the gross value of production and the operating surplus (which includes the remuneration of capital): CO = VP - EO.

From the aggregated point of view, when we consider a specific economic sector as the industry of construction materials, the most important definition is that of **aggregated production of the sector**. A first approximation, quite intuitive, would be to consider it as the sum of gross value of production of the various companies that comprise the sector. Notwithstanding, the production value of a company already incorporates in its intermediary consumption the production value of other companies of the same sector. For this reason, if the production values of all companies in the industry were freely added, we would incur a problem of double counting, which would overestimate the production of the sector.

The form to avoid this problem is to add the values added by all the companies in the sector. Since the value added is the difference between the gross value of production and the intermediary consumption of a company, it already discounts the value added by other companies. By analogy, we understand the production of a region as the sum of the value added by all companies that operate in a certain geographical extension.

Database

All databases that bring such accounting statistics are the annual survey from IBGE:

- **An annual survey of Construction Industry (Paic):** contains information on the financial-economic situation of companies of the civil construction chain. There is information on employment, salaries, costs, job amounts, among others.
- **Annual Industrial Survey (PIA):** contains financial-economical information that enables to estimate the basic structural characteristics of the company segment of industrial activity in the country and to accompany its evolution over time. It brings information on hired personnel, salaries, withdrawals and other remunerations, income, costs and expenses, production value and value of industrial transformation.
- **Annual Trade Survey (PAC):** brings information on the productive structure of the Brazilian business segment; displays data on incomes, expenses, personnel involved, salaries, withdrawals and other compensation items, purchases, inventories and trade margins, among other aspects, with emphasis on companies holding 20 or more employees; besides regionalized data on sector distribution and configuration.
- **Annual surveys on Services (PAS):** contains data on incomes, expenses, hired personnel, salaries, withdrawals and other remunerations, as well as the value added, among other aspects, standing out the large companies with 20 or more occupied persons, besides regional data on the distribution and configuration of the service sector.

To update the data of these bases, information has been used from monthly surveys carried out by IBGE in industry, commerce and service companies. The information on labor market comes from the database of the Ministry of Labor and from the National survey by sample of continuous domiciles. (Pnad), from IBGE. The price information comes from the National System of Survey on Costs and Indices of Civil Construction (Sinapi) also from IBGE, and from the database of the Brazilian Chamber of Construction Industry (CBIC). The data on tax collection comes from IBGE and from the Brazilian Internal Revenue Service. All other sources of information are mentioned along the text and are displayed in the Bibliography section.

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novembro de 2014, 8.987, de 13 de fevereiro de 1995, 10.925, de 23 de julho de 2004, 12.096, de 24 de novembro de 2009, 11.482, de 31 de maio de 2007, 7.713, de 22 de dezembro de 1988, a Lei Complementar nº 123, de 14 de dezembro de 2006, o Decreto-Lei nº 745, de 7 de agosto de 1969, e o Decreto nº 70.235, de 6 de março de 1972; revoga dispositivos das Leis nºs 4.380, de 21 de agosto de 1964, 6.360, de 23 de setembro de 1976, 7.789, de 23 de novembro de 1989, 8.666, de 21 de junho de 1993, 9.782, de 26 de janeiro de 1999, 10.150, de 21 de dezembro de 2000, 9.430, de 27 de dezembro de 1996, 12.973, de 13 de maio de 2014, 8.177, de 1º de março de 1991, 10.637, de 30 de dezembro de 2002, 10.833, de 29 de dezembro de 2003, 10.865, de 30 de abril de 2004, 11.051, de 29 de dezembro de 2004 e 9.514, de 20 de novembro de 1997, e do Decreto-Lei nº 3.365, de 21 de junho de 1941; e dá outras providências. Available at: http://www.planalto.gov.br/ccivil_03/_ato2015-2018/2015/lei/L13097.htm. Access on: 16/11/2016.

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Credits

Productive Chain of Construction

Sindicates associated to Fiesp:
Union of the Industry of Rock Dust, China Ceramics, Porcelaine, and Earthenwear of the State of São Paulo - **Sindilouça**; Union of the Industry of Ceramics for the Construction Industry of the State of São Paulo; Union of the Civil Construction Industry of Large Structures in the State of São Paulo - **SindusCon-SP**; Union of the Industry of Construction and Furniture of Santa Gertrudes – **Sincer**; Union of the Industry of Heavy Construction of the State of São Paulo – **Sinicesp**; Union of the Industry of Non Metalic Mineral Extraction of the State of São Paulo; Union of the Industry of Cabinet Making of São Bernardo do Campo – **SIM**; Union of the Industry of Electric, Electronic and Similar Devices of the State of São Paulo – **Sinaees**; Union of the Industry of Iron and Metal Artifacts, and Tools in General of the State of São Paulo - **Sinafer**; Union of the Industry of Nonferrous Metals in the State of São Paulo - **Siamfesp**; Union of the Industry of Processing and Transformation of Plane Glass and Cristals of the State of São Paulo - **Sinbevidros**; Union of the Industry of Wood Fiber Plates and Chipboards of the State of São Paulo - **Sindifibra**; Union of the Industry of Electric Conductors, Cold Drawing, and Nonferrous Metal Lamination of the State of São Paulo - **Sindicel**; Union of the Industry of Window Frames and Metallic Construction of the State of São Paulo - **Siescomet**; Union of the Industry of Electric Gas, Hydraulic and Sanitary Installations of the State of São Paulo - **Sindinstalação**; Union of the Industry of Electric Lamps and Lighting Electric Devices in the State of São Paulo - **Sindilux**; Union of the Industry of Marbles and Granites of the State of São Paulo - **Simagran**; Union f the Industria of Plastic Marterials of the State of São Pauo - Sindiplast; Union of the Industry of Crushed Stone of the State of São Paulo - **Sindipedras**; Union of the Industry of Rattan and Wicker Furniture, Brooms, Brushes and Paint Brushes of the State of São Paulo - **Simvep**; Union of the Industry of Paint, Gipsy and Decoration of the State of São Paulo - **Sipigedesp**; Union of the Industry of Cement Products of the State of São Paulo - Sinprocim; Union of the Industry of Protection, Treatment Surface Conversions of the State of São Paulo - **Sindisuper**; Union of the Industry of Refrigeration, Heating and Air Treatment in the State of São Paulo - **Sindratar**; Union of the Industry of Saw Mills, Carpentry, Cooperage, Plywood and Laminated Lumber of the State of São Paulo - **Sindimad**; Union of the Industry of Paints and Varnishes in the State of São Paulo - **Sitivesp**; Union of the Industry of Plane and Hollow Glass and Crystals of the State of São Paulo - **Sindividro**; Union of the Industry of Furniture of Mirassol; Union of the Industry of Furniture of São Paulo - **Sindimov**; Union of the Industries of Construction and Furniture of Leme; Union of the Industries of Limestone for Agriculture Purposes of the State of São Paulo -**Sindical**; Union of the Industries of Sanitary Ceramics of the State of São Paulo - **Sindicerâmica**; Union of the Industries of Riverbed Sand Extraction in the State of São Paulo - **Sindareia**; Union of the Industries of Rock Dust China Ceramics, Porcelaine, and Earthenwear of Porto Ferreira - **Sindicer**; Union of Industries of Furniture of Votuporanga - **Sindimob**; Intermunicipal Union of Itapeva of the Industry Processing Lumber; National Union of the Industry of Industrial Machines - **Sindimaq**; Nacional Union of the Industry of Ferrous Metal Call Drawing and Lamination - **Sicetel**; National Union of the Cement Industry - **SNIC**; National Union of Steelworking Industries.

Entities of the productive chain:
Brazilian Association of Industrialized Concrete Construction - **Abcic**; Brazilian Association of Metallic Construction - **Abcem**;Brazilian Association of the Industry of Concrete Blocks - **BlocoBrasil**; Brazilian Association of Lighting Industry - **Abilux**; Brazilian Association of Floor Slabs - **Abilaje**; Brazilian Association of the Industry of Machines and Equipment - **Abimaq**; Brazilian Association of Construction Materials Industry - **Abramat**; Brazilain Association of the Industry of Ornamental

Rocks - **Abirochas**; Brazilian Association of the Industry of Metal Tubes and Accessories - **Abitam**; Brazilian Association of the Plastic Industry - **Abiplast**; Brazilian Association of the Electric and Electronic Industry - **Abinee**; Brazilian Association of the Railway Industry - **Abifer**; Brazilian Association of Infrastructure and Base Industries - **Abdib**; Brazilian Association of Private Concessionaires of Public Services of Water and Sewage - **Abcon**; Brazilian Association of Building and Industrial Maintenance Engineering Companies - **Abempi**; Brazilian Association of Concreting Service Companies - **Abesc**; Brazilian Association of Energy Conservation Service Companies - **besco**; Brazilian Association of Asphalt Distribution Companies - **Abeda**; Brazilian Association of Mortgage Loan and Saving Entities - **Abecip**; Brazilian Association of Industries of Firefighting Equipment and High Pressure Cylinders - **Abiex**; Brazilian Association of Industries and Distributors of Asbestos Cement - **Abifibro**; Brazilian Association of Ceramics - **Abceram**; razilian Association of Portland Cement - **ABCP**; Brazilian Association of Highway Concessionaires - **ABCR**; Brazilian ssociation of Plane Glass Processors and Distributors - **Abravidro**; Brazilian Association of Building Systems Engineering - **Abrasip**; Brazilian Association of Structural Consulting Engineering - **Abece**; Brazilian Association of Industrial Engineering - **Abemi**; Brazilian Association of Civil Engineers - **Abenc**; Brazilian Association of Foundry - **Abifa**; Brazilian Association Real Estate Developers - **Abrainc**; Brazilian Association of Metalwork, Materials and Mining - **ABM**; Brazilian Association de Technical Standards - **ABNT**; Brazilian Association of Building and Mining Technology - **Sobratema**; Brazilian Association of Aluminum - **Abal**; Brazilian Association of Copper - **ABCobre**; Brazilian Association of Drywall; Brazilian Association Architecture Offices - **Asbea**; Brazilian Association of Manufacturers of Sanitary Materials - **Asfamas**; Brazilian Association of Manufacturers of Paints - **Abrafati**; Brazilian Association Of Manufacturers of Concrete Tubes - **ABTC**; Brazilian Association for the Conformity and Dfficienty in Installations - **Abrinstal**; São Paulo Trade Association - **ACSP**; Vale do Paraíba Building Association- **Aconvap**; Association of Sand Miners of Vale do Ribeira and Baixada Santista - **Amavales**; National Association of the Ceramics Industry - **Anicer**; National Association of Highway Working Companies - **Aneor**; National Association of Entities of Producers of Construction Aggregates- **Anepac**; National Association of Manufacturers of Steel Frames; **Afeaço**; National Association of Manufacturers of Aluminum Windows Frames - **Afeal**; National Association of Construction Materials Business Entities - **Anamaco**; National Association of Manufacturers of Ceramics for Lining, Sanitary Ceramics and Counterparts - **Anfacer**; Paulista Association of Lining Ceramics - **Aspacer**; Paulista Association of Producers of Construction Aggregates - **Apepac**; Paulista Association of Public Works Entrepreneurs - **Apeop**; Brazilian Technical Association of Automatic Glass Industries - **Abividro**; Brazilian Chamber of Construction Industry - **CBIC**; Brazilian Center of Steel Construction - **CBCA**; Ceramic Center of Brazil - **CCB**; FIESP Committee of Mining Productive Chain- **Comin**; Brazilian Concil of Sustainable Construction - **CBCS**; São Paulo Architecture and Urban Planning Council - **CAU/SP**; Brazilian Corporate Council for the Sustainable Development - **CEBDS**; Regional ouncil of Engineering and Agronomy of the State of São Paulo - **Crea-SP**; Polytechnic School of the University of São Paulo - **Poli-USP**; Senai School -SP Orlando Laviero Ferraiuolo; Federation of Assets Trade, Service and Tourism of the State of São Paulo – **Fecomercio SP**; International Federation of Real Estate Agents - **FIABCI-Brasil**; Carlos Alberto Vanzolini Foundation; Brazilian Industry of Trees - **Ibá**; Brazil Steel Institute; Brazilian Institute of Architecture Development - **IBDA**; Brazilain Institute of Building Rights - **IBDIC**; Brazilian Institute of Waterproofing - **IBI**; Brazilian Institute of Mining - **Ibram**; Brazilian Institute of Copper - **Procobre**; Brazilian Institute of Concrete - **Ibracon**; Brazilian Institute of Chrysotil; Institute of Architecture of Brazil (São Paulo Department) - **IAB-SP**; Engineering Institute; Nonferrous Metal Institute - **ICZ**; Instituto of Guidance to Housing Cooperatives of São Paulo - **Inocoop-SP**; Institute of Technological Research of the State of São Paulo - **IPT**; Brazilian Real Estate Registration Institute - **IRIB**; PVC Institute; Falcão Bauer Quality Institute; Civil Construction Social Service of the State of São Paulo - **SeconciSP**; Union of Real Estate Purchase, Sale, Location and Administration of Residential and Commercial Companies of the State of São Paulo - **Secovi-SP**; National Union of the Heaby Construction Industry - **Sinicon**; National Union of the Cement Products Industry - **Sinaprocim**; 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Federation of Industries of the State of São Paulo - Fiesp

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BRAZILIAN ASSOCIATION OF MANUFACTURERS OF SANITATION MATERIALS – ASFAMAS

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