

Case Study

Open Government Data in

Rio de Janeiro City

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1 Introduction

Recent developments in Information and Communication Technologies (ICTs) have enabled the dissemination of large amounts of government raw data. The initiatives where governments released data in reusable formats that can be freely used for multiple purposes have been known as Open Government Data (OGD) initiatives. They have the potential of increasing transparency, promoting citizen control of public organizations, government innovation and enhancing public accountability.

While much of the focus on OGD has been given to countries through their national policies, cities are becoming crucially important. Some municipalities in Latin American, (where 84% of the population live in urban areas), have started to implement OGD policies, although with a certain degree of variation in design and implementation. Focusing on this underexplored area, this project aims to explain how OGD policies have emerged in a Latin American city, and to assess the impacts these policies are producing on local civil society and private sectors, looking in particular at how they have been using OGD for social accountability, transparency and public/private innovation.

This case study of Rio de Janeiro (Brazil) will examine the challenges for local public sector organization in terms of agenda setting, formulation of public policy, implementation and evaluation channels/models. It is designed around six sections related to:

1. Emergence;
2. Policy Design;
3. Supply and Information Resources;
4. Users;

5. Impacts; and,
6. Final Considerations.

In the creation of this case study we undertook structured visits to the open data portals of the city, carried out interviews with staff, managers and users of open data and conducted surveys of hackathon participants of Rio de Janeiro. It is important to highlight that Rio de Janeiro has more than one open data portal, each with different objectives and datasets. This report looks at a variety of open data efforts in the city. One of the authors has also been working inside the municipality over part of the period of this research, and so findings are complemented with participant observations where relevant. This data collection was carried out between June and October 2013.

1.1 Overview

The first section looks at the emergence of an open data policy, describing the main factors that led the city to adopt open government data and the format in which these policies were designed and implemented, as well as identifying the main actors involved in this policy formulation and implementation. This section explores the features of open data policies in Rio de Janeiro and examines the type of governance mechanisms established in the City Hall of Rio in order to solve problems, controversies and to ensure that data made available meets the eight principles open Government data (LATHROP, RUMA, 2010).

The section on data supply and resources aims to show what types of information and data are provided, including the platforms used and the challenges involved in the publication of this information. The subsequent section on users identifies who is using the data that is made available and asks about the interests of users, what types of information are most

useful, and what is the role of civil society in the generation of information. It also explores the identification of public sector strategies for creating awareness, disseminating and promoting use of open data by citizens. This includes initiatives such as hackathons. A final empirical section presents analysis of the type of impact to which emerging open data policy has contributed in Rio de Janeiro, and explores the challenges ahead in improving the city open data policy. It looks in particular at challenges of increasing engagement from citizens in using open data for citizen control of government, and challenges of promoting innovative new uses of government data.

As a result, this case study will contribute to better understandings of the governance of public data in cities, providing three different outcomes at a practitioner, academic and community levels. From a practitioners perspective the study will help activists, developers and civil servants to understand the potential and challenges of OGD. From an academic perspective, the study will contribute to several streams of research in OGD. And from a community level the study aims to contribute towards the consolidation of a network of researchers in this area.

1.2 Conceptualizing Open Government Data and its Principles

The field of open government data (OGD) policies is related to many other themes such as open government, access to information rights and public policy. It is important to define the framework that was used for investigating the situation of OGD policies in Sao Paulo and Rio de Janeiro, Brazil.

In spite of the fact that OGD as a concept has only very recently been the subject of study by researchers and practitioners, it is possible to mention some common characteristics used in defining it. Table 1 below shows a selection of definitions of open government data:

Table 1: Concepts and Authors of Open Government Data

CONCEPT	SOURCE
<p>"Open Government Data are all stored data of the public sector which could be made accessible by government in a public interest without any restrictions for usage and distribution".</p>	Geiger & Lucke (p. 269, 2012).
<p>"The two main elements of OGD are normally defined as follows: Government data: is any data and information produced or commissioned by public bodies. Open data: are data that can be freely used, re-used and distributed by anyone, only subject to (at the most) the requirement that users attribute the data and that they make their work available to be shared as well".</p>	Ubaldi (p. 6, 2013).
<p>"Definitions of open government data (OGD) generally require that the data must be accessible (e.g. online), in standard and re-usable formats, and under licenses that allow for data to be re-used in different contexts".</p>	Davies (p. 2, 2010).
<p>"Government data shall be considered open if it is made public in a way that complies with the principles below: complete, primary, timely, accessible, machine processable, non-discriminatory, non-proprietary and license free"</p>	Open Gov Data (2007).
<p>"Open government data has the following <i>defining</i> qualities: "Open" or "Accessible": Data must be online and available for free, in bulk, with no discrimination, and without the need to agree to a license that waives any rights the user might otherwise have. "Big Data" or "Analyzable": The complexity of today's governments necessitates the use of automation in any serious application or analysis of government data, such as to search, sort, or transform the data. Data must be machine-processable following the general guiding principle of making choices that promote analysis and reuse."</p>	Tauberer (2012).
<p>"What is Open Government data? By "open", we mean data that is open according to</p>	Open Knowledge

the Open Definition. In essence, "open" data is free for anyone to use, re-use and re-distribute. By "government data" we mean data and information produced or commissioned by government or government controlled entities"	Foundation (2013).
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Source: Developed by the authors (2014).

Therefore, generally, the definition of open government data is associated with the provision or use of data produced or controlled by public organizations, and that data possessing certain characteristics. The main characteristics found in the literature are that open government data should be free from restrictions of use, updated, raw, processable by machines, and under license terms free of restriction (VAZ et al, 2012).

Regarding the adoption of open government data by public organizations, Huijboom & Broek (2011) pointed out that national governments such as Australia, Denmark, United Kingdom and United States already have open data policies. Many subnational entities such as states and municipalities in various countries have also created their own initiatives for open government data, such as, Chicago and New York in the United States and Amsterdam in the Netherlands. The program of open data for transport and mobility Amsterdam won the World Smart Cities Awards prize in 2012.

Thus, policies of open government data are strategies that have been adopted by national and subnational government of various countries in order to promote the following benefits (HUIJBOOM & BROEK, 2011):

- Increasing transparency and accountability;
- Improving of participation;
- Increasing government efficiency;

- Stimulating innovation in business;
- Creating new uses for government data, including the expansion of knowledge.

Therefore, the benefits of open governmental data are expected in at least three dimensions:

- 1. In relations between government and society (citizens, businesses and non-governmental organizations):** the provision of open government data can generate a lot of activities related to the promotion of transparency, citizen control of governments, participation and collaboration between public bodies and society (VAZ et al, 2012). For example, organizations that control public spending can use open data to create new forms of analysis of the expenditure made by public bodies and can improve their oversight and control activity of government actions;
- 2. The activities of government:** another expected benefit in relation to the use of open data is the improvement of governmental activities through increased efficiency and improved public service delivery. The data exchange between the different sections of government can generate new forms of use of public data, bringing more information into use for diagnosing and solving problems, helping to improve services provided by government;
- 3. In the expansion of knowledge:** the context of the information society in which entrepreneurs and citizens can make innovative re-use of available data, the existence of open government data policies can provide key input for the construction of new applications, products and research, amongst others things, which can enlarge the economic and social development of a country. For

example, the re-use of public data can promote innovation and academic research.

There is clearly great potential in open data. However, it is necessary to present the limits, alongside the potential, of OGD policies. Zuiderwijk et al. (2012) point out many limits of open data policies in terms of socio-technical impediments. In other words, limits to realizing benefits of open data come in two types: human and technological impediments. Zuiderwijk et al. (2012) divide the impediments they identify along three dimensions, offered with respective examples (ZUIDERWIJK et al., p. 160-164, 2012):

- **Data Access Impediments concern the challenges of creating, opening, finding and obtaining the data from the government.** For instance, data is not available in the website or the information provided is incomplete;
- **Data Use Impediments are related to barriers to open data use.** Lack of quality information such as datasets have restrictive licenses or no inform policy for publishing data is adopted by public organizations;
- **Data Deposition Impediments deal with discussions about storing and providing feedback on datasets.** Examples of such impediments are the lack of process for dealing with user inputs and public participations mechanisms in the OGD policy.

It is also important to highlight that the impacts of OGD policies are not yet clear. Despite the expected benefits there are few studies and evaluations that measure the impacts of this type of initiative in the social, democratic and economic spheres (HUIJBOOM & BROEK, 2011). Another point that is not fully identified in the literature concerns political limits to

adoption of these policies. i.e., if there are barriers that are not restricted directly to the lack of technical and financial resources, but also the political will to implement the open government data in the institution public.

Huijboom & Broek (2011) presented four strategies that are generally used to implement open data policies:

- 1. Education and training:** knowledge exchange platforms, manuals, conferences, lectures and workshops;
- 2. Voluntary approaches:** general recommendations and programs;
- 3. Economic instruments:** competitions, contests and financing of open data portals; and,
- 4. Legislation and control:** laws, technical standards and monitoring strategies.

The existence of such strategies will be verified in the two Brazilian study cases presented here. In the assessment of open data from the city of Rio de Janeiro and Sao Paulo programs, the concept of open government data outlined by the eight principles of open data (Open Gov Data, 2007) and the five-star model for evaluation of Linked Open Data proposed by Berners-Lee (2010) will be used.

The eight principles define that open government data are:

- 1. Complete:** All public data are available. Public data is data that is not subject to valid privacy limitations, security or access control.
- 2. Primary:** Data are presented such as those listed in the source, with the highest possible level of granularity and without aggregation or modification.

- 3. Timely:** The data are made available as quickly as necessary to preserve its value.
- 4. Accessible:** The data are made available to the widest possible range of users and to the largest possible set of goals.
- 5. Machine processable:** The data are reasonably structured to enable automated processing.
- 6. Non-discriminatory:** Data are available for all without requiring application or registration.
- 7. Non-proprietary:** The data are available in a format over which no entity has exclusive control.
- 8. License-free:** The data are not subject to any restriction of copyright, patent, intellectual property or trade secrets.

Besides checking the Municipality of Rio de Janeiro and the City Council of Sao Paulo comply with the eight principles, this study also analyzed the level these policies reach in terms of the five star model for Linked Open Data (Berners-Lee, 2010):

- * The data are available on the web, regardless of format, using an open license;
- ** The data are available as machine-readable structured data;
- *** The format used is a non-proprietary format;
- **** The available data have structured URLs that allow its identification and referral;

- ***** Data offered are connected to other data publicized by other actors, which allows providing context.

2 Case Study of Rio de Janeiro

This case study will examine the challenges for local public sector organization in terms of agenda setting, formulation of public policy, implementation and evaluation channels/models. This case study will have six further sections related to:

- Emergence;
- Policy Design;
- Supply and Information Resources;
- Users;
- Impacts; and,
- Final Considerations.

First of all, Rio de Janeiro is described, setting out the background to the city and exploring the development of the Rio de Janeiro Open Data Policy.

2.1 Introduction to Rio de Janeiro Open Data Policy

2.1.1 Recent history & current context

Rio de Janeiro, also internationally known as Rio and renowned as a tourist hotspot, is a city that has a recent history of data collection and open data. Before the largest natural disaster in the city, a heavy rain in April 2010, municipal data management took place in an unstructured manner, with information management based on ad-hoc empirical and tacit data from employees. Analysis and sharing of these data were limited, and far from in-depth. However, following the April 2010 rains

that left thousands homeless, killed 72 people, and left the city in a situation of emergency, the mayor decided that the city needed to prepare much better in figure for natural phenomena that were only expected to occur in increasingly short cycles, bringing serious risks to Rio de Janeiro.

Thus, in a meeting with IBM (International Business Machines Corporation) after the heavy rains, the mayor initiated the construction of a four-story building fully geared to monitoring, collection, analysis and data transparency for the city government. Four months later the Center of Operations Rio de Janeiro (COR) was inaugurated. In this single location are secretariats of all the departments, which jointly have access to several layers of georeferenced information, many of which are derived from real-time data collection, covering issues such as the position of public transport, information gauges for rivers and tidal level, as well as 600 CCTV cameras throughout the city and much more.



Figure 1 – Center of Operations Rio de Janeiro (COR)

The COR does not only collect data, it also provides for rapid decision-making, delegated to more than 100 operators and their local coordinators. If for example, an accident with victim happens, what to do? Strategically positioned near each other, the secretary of transportation, municipal police, the health department and ambulance system talk to each other to put into practice quicker and more joined up decisions following previously agreed protocols created by the intelligence department. First they identify the location of the accident and its seriousness. If necessary a rescue team is sent to block the roads nearby and to cater to the victims and wounded, and then, an ambulance can be routed to the nearest hospital. All of this coordinated by one or more of the 80 control screens within the COR.

In gathering all of this data to support rescue operations, blocking roads and many other emergency services, the city decided that all these data should also be available to the public, and began a process of open government and open government data. Several initiatives have been taken towards this goal, such as creating an environment for journalists, to have simultaneous access with strong transparency, given a physical space on a mezzanine facing the screens of operators and engineers in COR. Everything is released simultaneously to the journalists of local and national radio and television. In addition, the COR's web portal has instant information on the main roads as well as the time it takes to travel in the city.

Recently, another department was created to support even more intelligent and strategic action from the COR. PENSA – IDEAS ROOM is a team responsible for the Big Data area of the City hall. Basically the team works in response to the problems of the city and analyses across a huge quantity of datasets to find creative solutions for Rio de Janeiro.

The first projects undertaken by PENSA was hosting a hackathon¹: an increasingly common approach used by governments to engage outside technical experts in an intense period of problem solving.



Figure 2 - Hackathon of Call Center 1746

The Rio Hackathon event brought together more than 80 computer programmers, who were all offered full access to the databases of the Central Service for 1746 reserved except for data that would undermine the privacy of users of the City Service Center. The Call Center 1746 is the place where citizens complain about the service and conditions of the city. The winner created a social application that tells the citizen that a guard is going toward your vehicle to give you a fine.

¹ <http://www.rio.rj.gov.br/web/hackathon>



Figure 3 - Application Call Center 1746 for Smartphones

An internal governance mechanism for open government data was created by civil servants in Rio de Janeiro. The Open Data Committee of Rio de Janeiro, with representatives of the major technology areas of the City Hall as well as agencies that were already providing data to citizens as part of transparency and open data activities.

Before looking further at the potential that the development of an open data landscape in Rio has to impact people's lives, promoting sustainable development, we need to step back to explore in more depth how the policy emerged. We can then investigate the impact of open data in civil society and the private sector, as well as identifying what are the challenges for local governments implementing and seeking positive results from transparency and open data.

2.1.2 Emergence

The roots of open data policy in the city of Rio de Janeiro are not recent if we consider other models of open data beyond the focus on open data portals that has been common amongst national, local and regional governments in recent years. Taking a longer history, it is possible to identify areas of the state that already had isolated initiatives that met

contemporary standards and protocols of openness and interoperability, developed not because of an ideology of open data, but because of the business of the departments and secretariats responsible for them. We can divide the emergence of open data in Rio de Janeiro into three distinct stages of evolution, focused on (1) interoperability; (2) issue specific information and data portals, often GIS² linked; (3) dedicated data portals. These phases are listed in the diagram below setting out milestones for the evolution of availability and use of open data in the city of Rio de Janeiro.

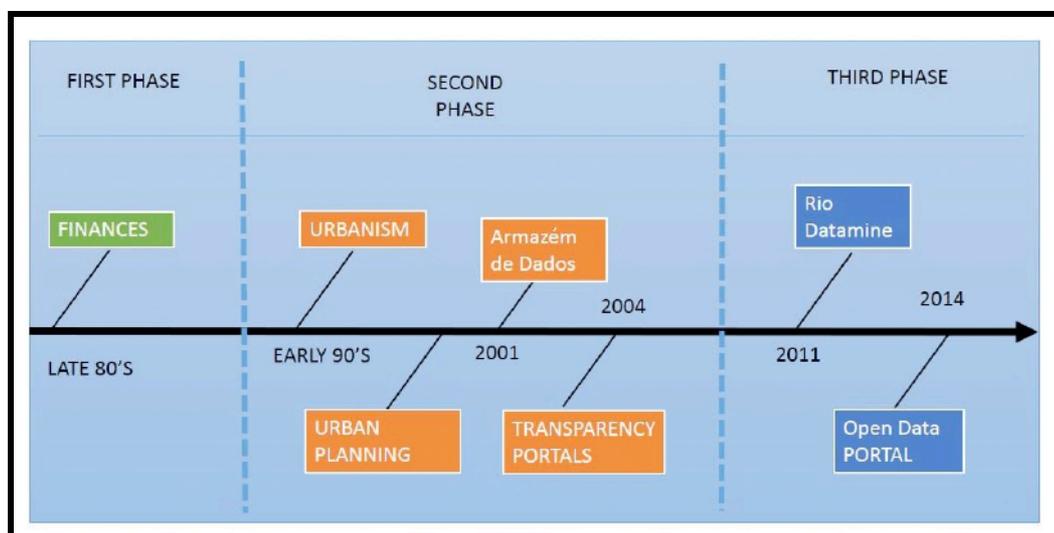


Figure 4 - Open Data Phases in Rio de Janeiro

For the first phase, the focus was on areas like finance and accounting. These are some of the oldest sections of the city with open standards for data exchange, including interoperable systems dating from the late 80s. However, although data files in open formats existed, they were not yet widely available to the public, much less powerful via networks such as the Internet.

² Geographic Information System

In the second phase, we highlight the area of urban planning and urbanism. Aware of the fundamental importance to standardize and to increase re-use of these specific kind of data, engineers and architects made use of Geographic Information Systems (GIS) to design and create data about the city based on open standards for geo-reference data. For the specific case of architecture, the Rio de Janeiro has a portal within an organ called Instituto Pereira Passos, which is responsible for statistics and planning the urban. In this portal called Armazém de Dados, created 12 years ago, there are thousands of datasets regarding the municipality, available in open formats, as well as layers, maps and geo-referenced shapes that businesses and citizens can freely use: for developing advocacy (often through civil society associations); for strategic planning; for developing commercial activities; as well as for several other purposes. The introduction of this data was a remarkable breakthrough although virtually unnoticed by citizens.



Figure 5 – Data Warehouse Portal (Portal Armazém de Dados)

Within this phase several other portals transparency were launched that can also be considered "open" in a way. Alongside trends in central

government where, since mid-2004, the Transparency Portal³ of the federal government was created, various departments and agencies created portals where datasets in an open formats and static spreadsheets were made available. In Rio de Janeiro examples of such portals include the Instituto Pereira Passos, Education, Rio Educa, Cidadão Carioca, Rio Transparency portal. These websites tend to be topic specific, and do not follow the current modernized model of single-channel delivery, where multiple layers and database are made available in an open format for viewing and download. Often information will be published in non-data formats. However, they are part of the context into which open data efforts emerge, and each have their own histories of development and maintenance.

In the third phase, which we mark as starting in 2010, several departments have established portals dedicated to only offering open data. One of the oldest cases of this contemporary phase is the Municipal Science and Technology Secretariat. Through the person of the Secretary Franklin Coelho, the Secretariat created a minimal structure of open data to meet the specific policies of this office regarding open data.

One of the first steps in this policy was the creation of the portal Rio Datamine⁴. This portal was the basis for two other initiatives of the Department of Science and Technology: Rio Ideas and Rio Apps. These project linked open data and citizen participation, inviting submission from citizens of both application, and policy ideas, to improve the city. There was a certain time-period when people could enter their ideas, and at the end of this period they were judged by an expert staff of government officials, journalists, and academics from Rio de Janeiro.

³ <http://www.portaltransparencia.gov.br/>

⁴ <http://riodatamine.com.br/#/homepage>



Figure 6 - Rio Ideias Portal

The Rio Apps is a project build on the application ideas from citizens. Assuming there was a minimal level and quantity of relevant data available through Rio Datamine, and also that the ideas of citizens could be adopted by the profile of Rio Apps participants (mostly hackers, programmers and web designers), the project was a contest to develop applications that gave life the ideas of citizens using the open data files available. The winners of this competitive project, or as it is popularly known “Hackathon” ranged from applications to trace bus lines to applications focused on managing taxi services.



Figure 7 - Rio Datamine Portal

The success of these applications was substantial. The winning BUUS application was, a few months later, taken to the city of São Paulo, the largest city in Latin America, where it is used today as one of the key applications for information on urban transportation lines in the city. In the case of the taxi application, EasyTaxi⁵, it has recently received financial support and now supports taxi drivers and citizens in over 12 countries around the globe.

In Rio, this third phase of open data development has been tightly linked to the idea of becoming a smart city. Secretary of Science and Technology Franklin Coelho, reports that the work of the secretariat followed the mayor's agenda to transform the city of Rio de Janeiro in a smart city and capital of innovation. Faced with the challenge to implement this vision, two dimensions were fundamental: firstly communication infrastructure in the form of Internet and capillary network of 300 km around the city; and secondly, open data as part of the content layer of the smart city.

⁵ <https://itunes.apple.com/br/app/easy-taxi/id567264775>

In interviews Coelho (interview, 2013) reported that the idea was to develop databases that could be useful to citizens, and that could also develop the city economically. The first three datasets that were available were on the topic of tourism, and not surprisingly, given the city's potential to attract tourists from around the world. He cited the example of EasyTaxi. The company makes money from the foundation of the city and supports the city when it comes to planning. For example, Coelho pointed out that knowing which taxis speak English, Spanish, German, etc., it is possible to plan for tourism at the World Cup and the Olympics more easily. If the city wanted to launch a plan for capacity building and training of these taxi drivers because of the app it can be possible to know who and where all the taxis are in Rio de Janeiro.

Another example of using data for planning draws upon the presence of the Center of Operations Rio. Through the various layers of information that were collected for as part of open data initiatives, and using the network infrastructures established for the smart city. In case the squares of knowledge, mixing local library, computer labs and space for entertaining in places with low and medium human development as the community Morro do Alemão, recently pacified by police in Rio de Janeiro.



Figure 8 - Knowledge Square (Praça do Conhecimento)

With this information in other organs was possible to know which schools were close, how people lived at that location, which the profile of the resident, what they consume and so on. Thus, it was possible to approach these people and offer public access to political information that really did the difference, seeing the city from the standpoint of strategic management for the construction of the town.

For example, the PENSA – Ideas Room, an agency of the Civil House Secretariat of Rio de Janeiro is already used as a provider of open data from their studies of improvements in processes and policies of the municipality. The point layer of flooding that is currently open data portal in Rio Datamine is the result of discussion of a project to prevent flooding in the city of Rio de Janeiro and to improve the condition of urban municipal taken by PENSA.

Most recently within this **third phase** of open data development, on the initiative of the Chief of Government, in March 2014 the Open Data Portal of Rio de Janeiro was launched, alongside the Decree of Open Government

and Data of the City Hall. The Portal Data.Rio⁶ was based in CKAN and started with more than 30,000 files within 1,200 datasets, shared in 13 categories:

- Call Center 1746;
- Public Administration;
- Social Development;
- Education;
- Entertainment;
- Sports;
- Taxes and Fees;
- Environment;
- Revenue and Expense;
- Health;
- Transport and Mobility;
- Tourism; and,
- Urbanism.

The front page of the Data.Rio is below, at figure 9:

⁶ <http://data.rio.rj.gov.br/>



Figure 9 –Centralized Open Data Portal of Rio de Janeiro

Then, Rio de Janeiro has three open data portals, each representing one of the three different generations of open data.

The first, Armazém de Dados, has no more than three datasets in fully open formats, but it is focused on providing interactive access to data using GIS technology for which the city selected proprietary rather than open platforms. Armazém de Dados emphasizes interactive and transparent access to information, but does not focus on providing data for re-use. .

The second, portal Rio DataMine, has a focus on coders and programmers from the city, and was created specifically for enterprises and start-ups users to create apps and present at the challenge of concepts. They have 46 datasets within three sections published in open data formats. However, all the data is only available via an API, so there is no bulk download or history of the datasets, violating full open data principles.

The third, differently from the Armazém de Dados and Rio DataMine, the Centralized Open Data Portal Data.Rio has more than 30 thousand files, within 1200 datasets of 7 secretariats, agencies and departments. All of them are in open data format (CSV) and three of them are available via APIs, but also have bulk data files for download, with the history of the dataset. The API options were offered because of the size of certain datasets: for example the GPS data from public buses, which can total more than 4 Gigabytes per day of storage if accessed in bulk.

2.2 Policy Design

The open data policy of Rio de Janeiro has traces of a 'Top Down' model, where city bureaucracy are deciding, for now, what datasets will be disclosed, the model and architecture of the portal, and what opportunities there will be for citizens to participate. Discussions with researchers focused on other city-level open data initiatives in Latin America suggest this policy orientation is similar to that observed in Baía Blanca and Sao Paulo (Figure 9)

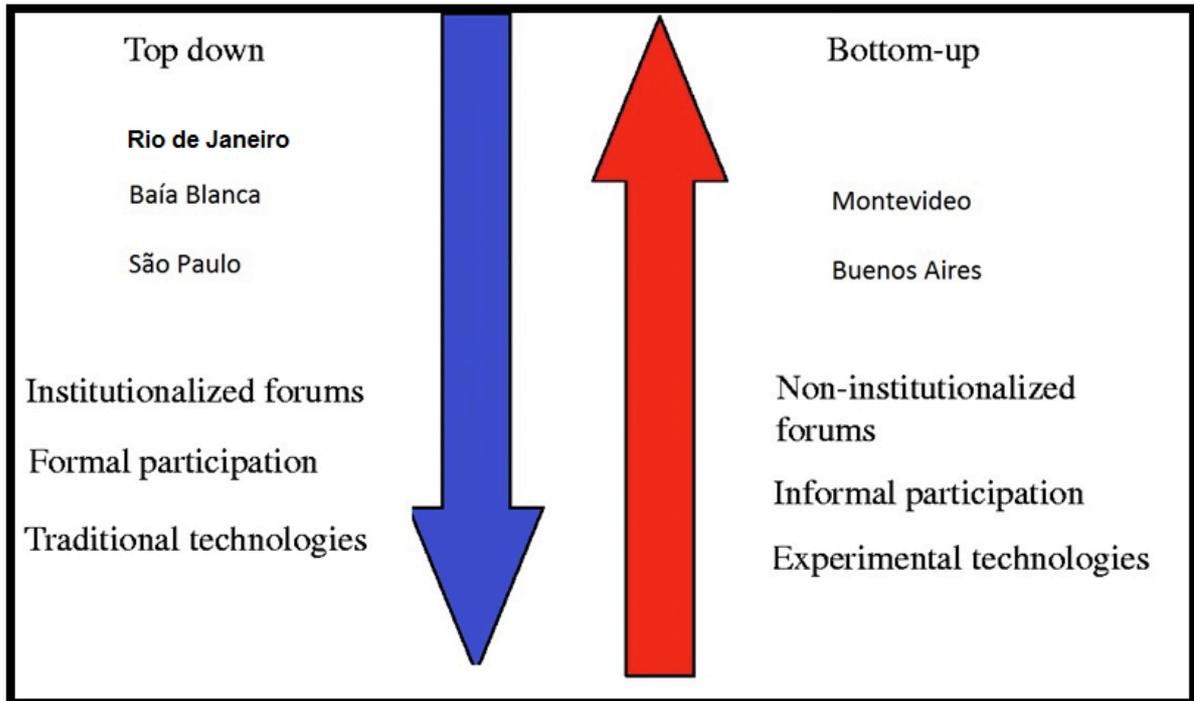


Figure 10 - Top-Down Bottom-Up Public Policy Approach
Based on Montevideo Open Data Research Workshop - June 2013

In the case of the Rio Datamine, according to the interview with the Secretary Franklin Coelho, first a small number of issues pertaining to the economy and society of Rio de Janeiro, such as tourism, were selected and then related data was published in open data portal. From this, there was a request that the population utilizes specifically these datasets to build applications. In accordance with the secretariat, some spaces for citizen participation are being planned, with three approaches considered:

1. Allowing space for requesting new dataset in accordance with the interest of citizens;
2. Third-party applications and websites created using open data;
3. Creating an online fórum to discuss the datasets and transparency of public policies.

In the first case there will be a channel where people can ask for datasets which they are interested in for various reasons. Hackers and programmers who want to support the city to create applications can also use this channel to request data.

In the second case, there will be opportunity for NGOs to suggest websites that support citizen control of spending or help enhance the quality of public policy using data, or for hackers and developers who have created commercial applications to highlight these. For example, the work of Gisele Craveiros in São Paulo city, in Brazil, is a reality of open data usage by citizens and high impact. The “Cuidando do Meu Bairro”⁷ (Caring for my Neighborhood) could be a good example of third-party that can be highlighted by the portal Rio DataMine, in accordance with the interview of

In the third situation an online forum will provide an opportunity for citizens to critically discuss, in real-time, which datasets are not yet published, and will provide space to unite people interested in the same topic, creating larger projects for social control or even social entrepreneurship through these data.

Nevertheless, the city has also made strategic partnerships with private sector companies for national and international collaboration, alongside provision of open data. Through these agreements, the municipality provides map data, changes in routes, operational information, and transit accident data, traffic levels and other information. It is framed as a win-win for everyone involved including the citizens. Applications such as Waze, Google Maps, Buus, Easy Taxi, Moovit are all gaining data through

⁷ <http://www.gpopai.usp.br/cuidando/>

partnerships agreements with the city, all of them providing free services to the end-user.

Another aspect of Rio de Janeiro's smart city and open data policies comes in the constant pursuit of partnerships through agreements with international experts in the world. Currently there are agreements with Harvard University and Massachusetts Institute of Technology (MIT) in the United States, and potential partnerships is being developed with Delft University of Technology, The Netherlands, in Europe. Besides academics, there are friendly relations with the government of New York, through the personal friendship between the former Mayor of New York Michael Bloomberg and Mayor of Rio de Janeiro, Eduardo Paes.

2.3 Information Provision and Resources

Looking for Rio de Janeiro municipality is possible to identify two main portals that have information in open data formats. A structured exploration of the websites were done in April 2014.

The first portal was Rio Datamine, belonging the Secretariat of Science and Technology. The second is the 'Data Warehouse' (Armazém de Dados) which can also be considered a portal with data in open format, although it is focused on geo-referenced data and statistics and does not follow the classic conceptual model of dedicated data portal.

On Rio DataMine the datasets are the ones that Secretariat have judged in accordance with the main objectives of the municipality strategic plan. There are data in open format (JSON and KML) about water (2 datasets), demography (3 datasets), infrastructure (6 datasets), meteorology (1 dataset), municipality (6 datasets), transit (9 datasets), transport (9

datasets) and tourism (10 datasets). The complete table of available data can be found in the annexes, at table 1.

At the Armazém de Dados, there are several kind of information about statistics, maps and researches of Rio de Janeiro. There is information about territory and environment; population; economy; education; health; Culture; Tourism, Sport and Leisure; infrastructure; land use and real estate dynamics; transport; social development; housing; public safety; and, general indicators about the municipality.

Lastly, the Centralized Open Data Portal Data.Rio is the portal that has the most information in terms of number of datasets, in open format, drawing on data from a wide range of secretariats, agencies and departments. This cross-departmental status positions it distinct from Armazém de Dados and Rio DataMine. It has developed in this way because it's objective is different, and because the technology now available also more advanced and cheaper from that which was available to the government in 2001 when Armazém de Dados was first created, and even when Rio DataMine was launched in 2011.

The technical capacity to both generate and share data varies across Rio de Janeiro departments. For example, while some departments have a strong focus on informatics with a reasonable level of interoperability and openness⁸, other don't have a minimum level of structure, in terms of computers, software, openness of data, interoperability, server capacity,

⁸ When interviewed Franklin Coelho reported that the core open data team being put together should have knowledge of PHP, Python, Javascript, HTML, C++, C#, DOTNET, Frameworks mobile. For the databases, MySQL, Oracle, SQL Server, Postgresql and MongoDB. The team also aims to have some members with knowledge of Gimp, Inkscape, Google API, ARCGIS, Adobe Premiere, Cinlerra, Blender, Google Sketchup, AR Plugin, Photoshop, Corel Draw, CAD, Illustrator and FLEX. Within a digital team, the operating systems in use are diverse, such as Linux, iOS, Android and Windows. The people being recruited were developers with some knowledge with frameworks and who have concluded university in the area of computer sciences, suggesting the city can count on a good knowledge of the data modeling, data structures, and algorithm.

etc. There is a huge gap between the most ICT advanced departments and the least, where many processes may still be managed on paper. This has consequences for the kinds of data that can be made available on the data portal, and how easy data from different departments will be to make transparent.

In terms of the practical co-ordination of the Data.rio platform, the creation of a centralized data index was managed within the PENSA team and the actual upload or insertion of datasets records was carried out by IPLAN-Rio, the municipal enterprise of technology. Although the index of datasets was created based in only one organization, the Municipality of Rio de Janeiro, a dataset could exist across multiple categories of the 13 currently hosted on the platform, because some of them, for example, have two, or sometimes three secretariats responsible for aspects of the data or related public services.

The top-down design of the Rio de Janeiro open data policy means that the lead Secretariat responsible go out to collect data and information from other secretariats. Where the municipality articulates an interest in particular data, getting as open data for people can involve negotiating with the different departmental owners of the data, and the central open data team may need to transform original datasets into open data, making it available for download or through an API. The open data portal acts as an intermediary between the public and the departments from whom data actually originates.

2.4 Users

This dimension of the study seeks to understand who are the users of open data portals open government data, and to explore how they relate to other groups both inside and outside of government.

Unfortunately, in the case of Rio de Janeiro is not possible to know exactly who are all the users of open data portals given that there is no registration requirement to access open data. However, the list of datasets with the highest downloads since March of 2014, and until August 2014, is presented below in the table 2:

Table 2 – Name of Datasets and numer of Downloads per dataset

Name of Dataset	Month	Year
Frequency and index of school approval	30	468
Barrios of Rio de Janeiro (Map of Rio)	19	389
Buses positions (GPS)	13	383
1746 Type 0002	11	306
School of the City	10	300

Further that, it is possible to identify a small sample of people using city open data through two initiatives of the city: the Hackathon of Call Center 1746 and the Rio Apps project from the Secretariat of Science and Technology.

In considering questions of inclusive development as a result of open data it is useful to consider the background, motivations and activities of these key intermediaries.

On the other hand, in an interview with one of open data user, Vinicius Brás, we found that despite the direct open data users being middle class residents of the city center and having a high level of technical skill it is

possible for there to be integration between the demands of the residents of the periphery the city, where there is less human development, and the actions of middle-class developers. For example, Brás commented that ideas for applications and websites that could affect their lives suggested by residents of the suburbs were adopted and worked upon by hackers and programmers from the city center.

For this model, Vinicius Bras used the name "social agenda", depicted diagrammatically in Figure 10. A similar model was put forward by Leonardo Elói, another interviewed and winner of the Hackathon:

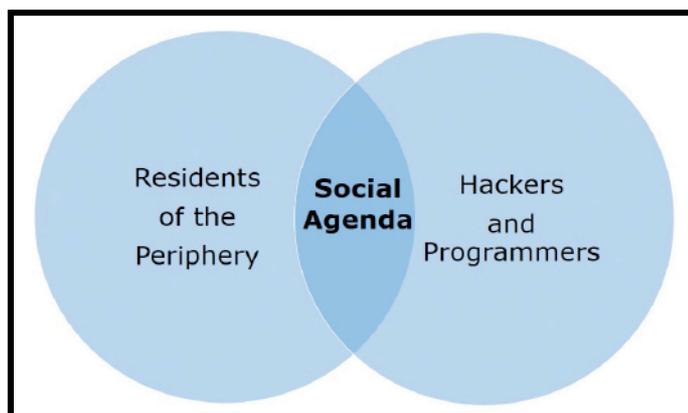


Figure 11 - Social Agenda

Among the respondents in the survey conducted with participants of the Hackathon, we found that most of them had some kind of knowledge of open data for over a year. Moreover, it was interesting to identify that many had not found the data they sought or had some difficulty to find this data in open data portals, such as the Rio Datamine. In an interview with Andre Ikeda, it was revealed that hackers and programmers also

have different agendas to those of the municipality and its leaders such as Secretary Franklin Coelho.

For example, some responses of hackathon participants in a survey did in 2013 after the 1746 hackathon, indicated that they need datasets not available on the open data portal. For example, bus routes, traffic information. All those information are under on the private companies of buses and it is necessary to contact them to receive this information and then open it. Internally is not a job to be done in days.

Together with a hackathon participant, André Ikeda, a developer, created an app that collect in real time the API with buses GPS information. This app has a map and search buses from your position to your destination with a search tool bar. With all this information from the API in the Open Data Portal of Rio de Janeiro, developer Ikeda could create an estimated time of arrival (ETA) for every trip that app users do, including showing the real time position of the buses in a map, saving time and organizing better the life of citizens.

Another issue observed is the seasonality of data demand. For example, the protests in June 2013 against the condition of public transportation increased the people interested on the subject and developers that created apps and websites to improve and/or control de quality of this public service.

Similarly, in the summer rains usually make thousands of people homeless throughout Brazil, when people don't die because of floods. If Rio again has heavy rains such as in 2011 when more than 70 people died, it is expect demand for data about the rains, flooding and landslides to increase considerably.

One data user Leonardo Eloi proposed such a model in his interview and the model is presented diagrammatically in Figure 7 below. With this model there could be a development and maturity in the availability of data, making it more transparent and harmonious with the wishes of civil society and balancing demand with what is possible for the government.

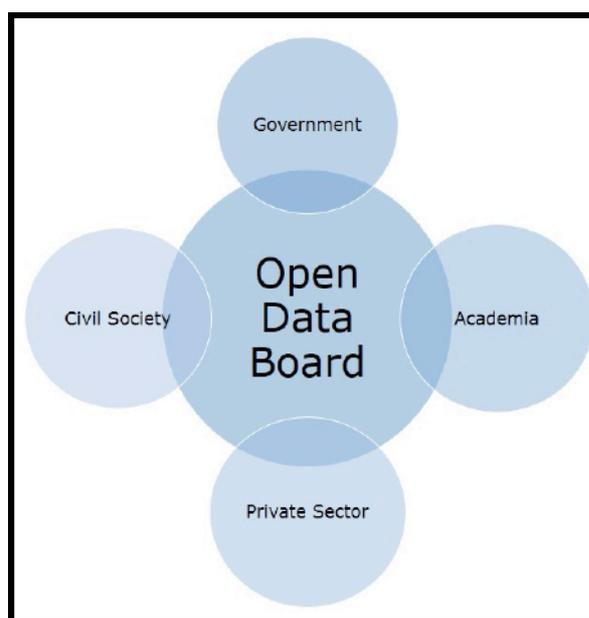


Figure 9 – A suggested model for a multistakeholder Open Data Board (Source. Leonardo Eloi – interview. Authors representation)

In accordance with Bäckstrand (2006), the multistakeholder is one of the best model created to solve important problems that can happens in organizations.

For example, Rio de Janeiro has the City Council to solve those problems internally, however, is necessary to advance this topic because the participation of citizens is important, mainly to decide what will be opened or not and the line of open data production. Otherwise this policy will keep the old trajectory of transparency portals, opening what government

judges be the best for the society and not what civil society, enterprises and including the own government (secretariats that cannot access data from other secretariats) want.

2.5 Impacts

This section seeks to understand the emerging impact of open government data policies in Rio de Janeiro. It is possible to divide the kinds of impacts observed in research, and discussed by interviewees, into two broad groups: Impacts on internal organization of the city government providing open data, and secondly the impact on citizens, through use of data to build applications for social control, improved public services, or provision of applications and services outside of the public sector of Rio de Janeiro.

Figure 12 presents a model of impact of open data public policies based on this distinction. This mode is still in the experimental stage, and needs to be improved and validated with users and public managers.

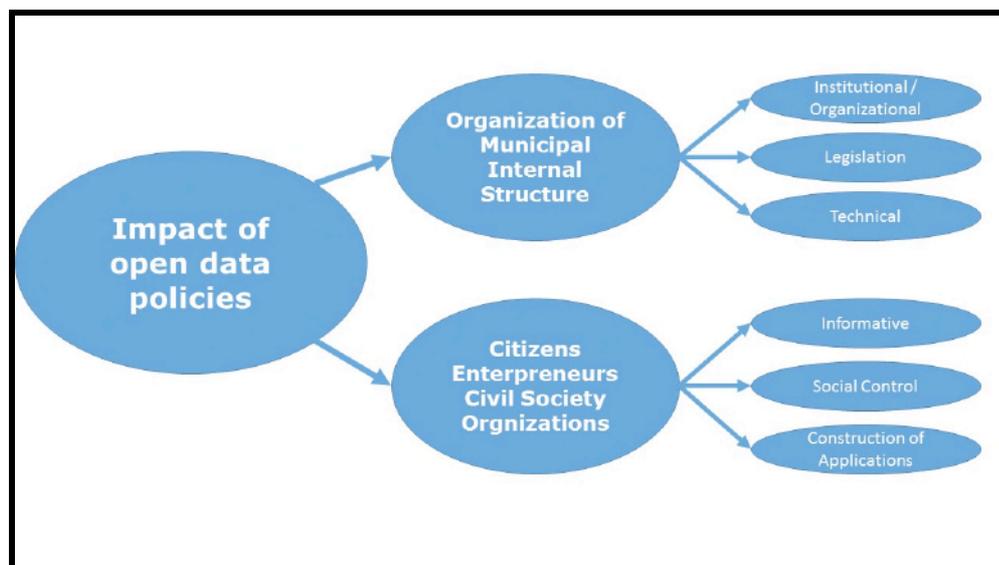


Figure 10 - Model of Impact of Open Data Public Policies

Applying this model to Rio de Janeiro we first note how the organization of municipal internal structure has had to adapt to the opening of data. Interviews and observation highlighted a number of important institutional changes such as:

- Creation of hackathons;
- Creation of the PENSA – Ideas Room;
- Creation of the Working Group on Open Data;
- Change from departmental projects to an inter-departmental open data project, and
- Creation of centralized Portal for Open Data – Data.Rio.

These changes, enacted in part to implement an open data policy, also have potential knock on impacts, in creating interactions across departments and introducing new working practices (hackathons, idea competitions etc.) which might in future be applied in a wide range of different ways.

To the side of impact on citizens we can identify three profiles of users of open data: users seek information only and do not work the data; users collect information to conduct advocacy and social control; and users who collect data to create applications for other citizens about public services or the creation of other services not necessarily related to public service.

Projects like Hackathon 1746 and Rio Apps help catalyze the second kind of use, resulting in visible impacts of applications created that address city issues.

For the case of Rio Apps, this can be seen in the winners:

- First-Place

- **The BUUS:** Social Application that tells the location of the bus and its current status (full or empty).⁹
- Second Place
 - **Pacificados:** Classifieds service to communities pacified Rio de Janeiro, where you can register and query services, products and job opportunities facing communities pacified.¹⁰
- Third Place
 - **Desapego:** Application that finds the nearest public restroom to use. Especially designed to Rio Carnival.

In the case of BUUS, the API with GPS buses position is since March of 2014 in Data.Rio Open Data Portal, which Andre Ikeda, the start-up BUUS owner was the first user. He is plotting maps of the city where the buses make their paths and helping citizens make better planning of routes and origin-destination.

For the Hackathon 1746 the list of winners demonstrates the way in which hackathons can identify citizen priorities and interests – and how applications can be developed for citizens to monitor the state, or open up new channels of communication with the state. Unfortunately the apps are not yet available for people:

- First-Place
 - **Penalty Information via Smartphone:** Social Application that tells the citizen that a guard is going toward your vehicle to give you a fine.

⁹ <http://buus.com.br/>

¹⁰ <http://www.pacificados.com.br/>

- Second-Place
 - **Monitoring of lighting:** Through sensors installed on poles, automatically the Power Company would know which posts require repairs.

- Third-Place
 - **1746 on Twitter and Facebook:** Opening called the Service Center 1746 by Twitter and Facebook, giving more flexibility to the citizen.



Figure 11 - Hackathon Call Center 1746 Portal

In addition to the applications identified at hackathons, through a structured search online and information collected in interviews and questionnaires we also identified examples of open data used for social control of the city as well as for the promotion of information important services to citizens. One such example is the portal

Meu Rio¹¹, which carries out the social control of public sector activities in the municipality of Rio de Janeiro. Recently they received the prize of 500 thousand of US dollars from Google to expand the same project of social control of government actions for more ten cities in Brazil, based on what they do together with the Municipality Rio de Janeiro¹².

We asked developers in our survey how impacts of open data should be measured. Respondents pointed first to quantitative measurement:

1. How many views are made on the portal daily, weekly, monthly and annually;
2. How many downloads of datasets are performed at the same time of visits;
3. What are the datasets that are made more downloads;
4. How many and which applications are created from open data;
5. How many and which are the portals created from open data.

However, it should also be possible to identify qualitatively the impacts of to open data, through questions such as:

1. What is the social gain that the application offered to society;
2. What is the practical relevance of the application offered to society;
3. What application reliability offered to society;
4. What is the social gain that the website offered to society;

¹¹ <http://www.minhascidades.org.br/organizations/1>

¹² <https://www.google.org/global-impact-awards/challenge/>

5. What is the practical relevance of the website offered to society;
6. What is the reliability of the website offered to society;

For example, on the economic gains of entrepreneurs using open data from the city Rio de Janeiro there is the aforementioned application Easy Taxi, which uses information from taxi drivers in Rio de Janeiro and connects the passenger demand to taxi drivers. Currently they are already collaborating with people in 12 countries and financial support obtained by the developers amounts to 15 million dollars¹³.

In the case of social issues, the app "Loosening" offers a social benefit to revelers in Rio de Janeiro. During the Carnival is always a big problem for the city and residents in carnival areas on the outskirts as revelers use any wall or tree to meet their physiological needs, leaving a stench and dirt all over the city. The city's goal is to reduce this problem to zero by 2016 and the application, which helps locate public toilets, is one of the weapons the city is using, beyond building awareness and providing more chemical toilets along the focal points of the Rio de Janeiro Carnival.

¹³

<http://lavca.org/2013/10/24/easy-taxi-picks-up-us7-million-from-imena-to-take-on-the-middle-east/>

3 Final Considerations

It can be seen that Rio de Janeiro has been moving towards a clear institutional strategy for open data, aligning with all departments of the city government. Initiatives such as the creation of the Center of Operations Rio de Janeiro strengthened other integration initiatives and policies aimed at creating interoperability and open data throughout the municipality, since in extreme emergency as heavy rains, it is necessary to present data, reliable and open format, so dispatchers to respond to emergencies can do it actually with as little asymmetric information as possible. This connections between state agendas for interoperability and open data is key to note.

Drawing on Huijboom & Broek’s framework (2011), it is possible to define the strategies of open data policies in the Rio de Janeiro as presented in the table below:

Table 3: Rio de Janeiro’s open data strategies

Type	Strategies
Education and training (knowledge exchange platforms, manuals , conferences , lectures and workshops)	<ul style="list-style-type: none"> • Open Data Forum • Participation in working groups and conferences on open data • Technical Open Data Manual (for the internal public) • Open Data Manual (for the general public and available on the open data portal)
Voluntary approaches (general recommendations and programs)	<ul style="list-style-type: none"> • Task force unit for opening data • Data index from secretariats and agencies
Economic instruments (competitions, contests and financing of open data portals)	<ul style="list-style-type: none"> • Hackathon in 2013 • Rio Ideas (annually) • Rio Apps (annually)

<p>Legislation and control (laws, technical standards and monitoring strategies)</p>	<ul style="list-style-type: none"> • Specific regulation for open data policy • Adoption of international manuals on good practices in open government data • Monitoring of newspapers, enterprise and civil society usage of open data.
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Source: Developed by the authors (2014). Based on Huijboom & Broek (2011).

Compared to other city open data approaches in Latin America, Rio de Janeiro has adopted a relatively top-down approach. This brings a fast decision making process for data release, but it leaves little space for discussion over data releases, particularly with respect to transparency data. Rio would do well to explore the creation of better structures to engage civil society, both to discuss data that is desired, and to discuss and address issues of citizens privacy that might arise from planned data publication (LEVY, 2007). If Rio de Janeiro could transition from it's current approach to include more bottom-up elements then the public policy of open data would be closer to a balance between public participation via civil society, and the harnessing of high skilled and trained teams in order to both create transparency and enhance work with data inside the government.

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5 Anexxes

5.1 Table of Datasets in Portal Rio Datamine

Data	Períod	Format	Update
Points of Flooding	2013	JSON, KML	2013
Hydrography	2013	JSON, KML	2013
Neighborhoods	2013	JSON, KML	2013
Slums	2013	JSON, KML	2013
Susceptibility Map	2013	JSON, KML	2013
Fire Stations	2013	JSON, KML	2013
police stations	2013	JSON, KML	2013
schools	2013	JSON, KML	2013
Health Units	2013	JSON, KML	2013
Bathrooms Cemusa	2013	JSON, KML	2013
Olympics	2013	JSON, KML	2013
Rain Gauges	2013	JSON, KML	2013
Comlurb - Fleet Cleaning	2013	JSON, KML	2013
attendance in 1746	2013	JSON, KML	2013
Emergency works	2013	JSON, KML	2013
Public Works	2013	JSON, KML	2013

building permits	2013	JSON, KML	2013
Logradouros	2013	JSON, KML	2013
Avenue Brazil	2013	JSON, KML	2013
Red Line	2013	JSON, KML	2013
Yellow Line	2013	JSON, KML	2013
Rio-Niteroi Bridge	2013	JSON, KML	2013
reversible	2013	JSON, KML	2013
circulation Road	2013	JSON, KML	2013
semaphores	2013	JSON, KML	2013
Occurrences Transit	2013	JSON, KML	2013
Runways Avenue Brasi	2013	JSON, KML	2013
Metro lines	2013	JSON, KML	2013
Metro Stations	2013	JSON, KML	2013
Stations Tram	2013	JSON, KML	2013
BRT lines	2013	JSON, KML	2013
Line BRT stations	2013	JSON, KML	2013
Airports	2013	JSON, KML	2013
stations Waterways	2013	JSON, KML	2013
SuperVia	2013	JSON, KML	2013

Line stations SuperVia	2013	JSON, KML	2013
Samba Schools	2013	JSON, KML	2013
sports	2013	JSON, KML	2013
Water Sports	2013	JSON, KML	2013
Air Sports	2013	JSON, KML	2013
Sports Ground	2013	JSON, KML	2013
events	2013	JSON, KML	2013
where to Eat	2013	JSON, KML	2013
where to sleep	2013	JSON, KML	2013
What to do	2013	JSON, KML	2013
beaches	2013	JSON, KML	2013