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INTRODUCTION

1. Objectives

The overall objectives of the project are to diagnose and clearly explain to interested sectors of society of the State of Rio de Janeiro: 1) the current state of Guanabara Bay; 2) the main threats impacting the health of the Bay; and 3) a plan of action with specific, short-term milestones that must be achieved to restore the Bay and demonstrate to all sectors of society that the necessary progress is being achieved on schedule. These objectives will be accomplished with stakeholder input and incorporation of public comments at each step of the project.

The results are presented in a report called “*Estado da Baía*” (The State of the Bay), which is a picture of “*A Baía que Queremos*” (The Bay We Want) developed in conjunction with the local community, businesses and scientists who live around the Bay and make use of its resources.

The State of the Guanabara Bay Report clearly present the level and the kind of threats that have caused the severely degraded conditions in Guanabara Bay and describe the actions that must be taken now and in the future to restore the Bay. The information is clearly presented in a form that can be compared to monitoring data and can be tracked by the public in an on-line digital platform described more fully below.

The governmental sectors responsible for the management of the Guanabara Bay will find in the State of the Bay Report an important tool to support the decisions necessary for the development and successful implementation of an Environmental Recovery Plan of the Guanabara Bay, the “PRA Baía”, which will require the support of all sectors of society.

2. Approach

The project assembles and analyzes important existing reports and data that are currently available for Guanabara Bay and its watershed, which also includes a brief summary of the existing environmental and economic information. The assessment of Guanabara Bay will be compared to



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the information available in other coastal bays, including the Chesapeake Bay, to identify and adapt approaches used in other areas that would be helpful for Guanabara Bay and the State of Rio de Janeiro.

Of particular value for this project is the comparison of the situation in Guanabara Bay to approaches used in other areas of the world, such as Chesapeake Bay, that include the analysis and summary of available information that is presented to the general public in a form that is clearly understandable and facilitates incorporation of recommendations from all sectors of society. In this manner, the public gains a shared understanding of the environmental condition of the Bay and the causes of its degradation that provides a firm foundation for the development of a shared vision for the restoration of Guanabara Bay.

The knowledge gained through the compilation and analysis of the key information related to Guanabara Bay, coupled with the comparison to Chesapeake Bay and other similarly successful restoration efforts, will provide the basis for development of recommendations for a comprehensive restoration plan for Guanabara Bay. At key points of the project, preliminary analysis and recommendations are being shared at workshops with interested sectors of society to obtain their review and recommendations.

A Guanabara Bay “Report Card” similar to the digital platform developed for the Chesapeake Bay restoration effort, called “BayStat”, will be developed and published by the University of Maryland Center for Environmental Science (UMCES) using a separate additional source of funding to allow the public to easily check on progress in the restoration of the Guanabara Bay. The Report Card will be supported by monitoring data that is currently being collected from Guanabara Bay, by State and local agencies, universities and others, that can be accessed on-line as part of a digital platform. The digital platform will also include a library of documents used for the assessment, a description of the recommended restoration plan and clear implementation milestones that can be monitored by the public to ensure that the restoration plan is being implemented. All information compiled for this project, analysis and recommendations will be published in an easily accessible format on the internet so that it is available for public review.

3. Methodology



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Based on a review and analysis of key existing reports and available data, the KCI Project Coordinator and staff works collaboratively with scientists from UMCES, the Federal University of Rio de Janeiro (UFRJ) and other interested scientific and technical institutions to review existing reports on the water quality of the Bay, including physical-chemical, biological and bacteriological parameters. We also prepared a survey of the main economic activities that take place in the watershed of the Guanabara Bay Basin, including copies of relevant existing maps of land use and users, to provide a comprehensive overview of the factors that most influence the Bay's ecosystem health.

In consultation with public and private institutions, the project summarizes existing projections of the increase of industrial, port, and service sectors activities due to population growth in municipalities that surround the Bay and other factors. The study will provide a broad overview of the factors that are expected to most influence the Bay's ecosystem now and in the future, based on available projections.

The draft analysis of the "State of the Bay" was prepared, and it was presented and discussed at the 1st workshop organized by the Technical Cooperation, which was held on April 29, 2016, with representatives from interested sectors of society, academic institutions, non-governmental organizations, businesses and government agencies. The objective of the discussion with these stakeholders was to receive their recommendations and achieve consensus as much as possible on the current environmental conditions, main factors affecting the health of Guanabara Bay and the most appropriate indicators of environmental conditions that must be monitored.

The process of information sharing through public education is critically important to the success of the Bay restoration because it will provide a clear explanation of the environmental condition of Guanabara Bay to allow citizens, professionals, academicians, and decision-makers to understand the impacts and participate in developing additional actions needed to reduce the pollution impacting the ecosystem of the Bay and mitigate and/or eliminate pollution entering basin and coastal waters.

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Using the digital platform and the Guanabara Bay Report Card developed by the University of Maryland under a separately funded project, KCI and UMCES will work with the Technical Cooperation, other agencies suggested by the Technical Cooperation and UFRJ to identify and summarize information describing the State of Guanabara Bay and the Guanabara Bay Restoration Plan for on-line display. The Report Card and digital platform will also include links to existing on-line information from PSAM, INEA, UFRJ and others that have information that would be helpful for users of the digital platform.

The digital platform and Report Card will provide citizens with a clearly understandable description of the State of the Bay, the restoration plan (including long-term and short-term milestones) and the status of the restoration effort based on on-going monitoring and reporting of key indicators included in the Guanabara Report Card. The digital platform will also include web links to the library of important documents compiled and reviewed by KCI in the first phase of this project and catalogued using SharePoint.

A 2nd Workshop was held in June of 2016 to present initial recommendations and obtain public comments on priorities for long term restoration goals for Guanabara Bay and its basin (“The Bay We Want”). The restoration plan will include short-term “2-year Milestone” goals to make sure the restoration stays on track and appropriate indicators to be included in the Guanabara “scorecard” being developed by the University of Maryland to measure and report on the status of the restoration effort.

A 3rd Workshop, to be held in September, 2016 will include a presentation and discussion of the recommended restoration goals, 2-year Milestones and digital platform and “scorecard” that will be used to track progress toward the ultimate goal of “the Bay We Want”.

Finally, the project will provide recommendations for a restoration plan, based on the outcome of three public workshops, similar to plans prepared in Chesapeake Bay and other Bays around the world. By looking at the Guanabara Bay conditions and restoration requirements in comparison to those of other bays, the State of Rio de Janeiro and its citizens will be able to benefit from the experience of others to ensure that the best available approaches are being used in the Guanabara Bay restoration effort.

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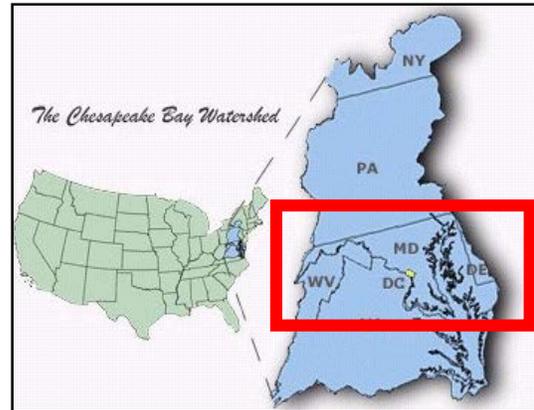
In addition, the digital platform and report card will provide a framework that Rio's government agencies, the UFRJ and other universities, the Watershed Committees and other interested citizens of Rio de Janeiro can build upon and improve in the future to guide and publically report progress on the environmental restoration of Guanabara Bay.

4. Relevance of Maryland's Chesapeake Bay Experience to Guanabara Bay Restoration

The States of Maryland and Rio de Janeiro signed a Sister-State agreement in 1999. This was the first step in a long-standing relationship between the governments and citizens of the two states. Initially activities under the agreement focused on medical and educational exchanges. More recently, in 2011, Governor Martin O'Malley of Maryland and Governor Sérgio Cabral of Rio de Janeiro signed a Memorandum of Understanding (MOU) to establish a technical cooperation program for work related to education, culture, science and technology, energy, technical and job training, health, social services, sports, youth and the environment. In 2014, the States entered into an agreement to conduct a technical cooperation project under the terms of the 2011 MOU to *"to share experiences in Governance, Environmental Technology and Sanitation Systems for Guanabara Bay and Chesapeake Bay and will work together toward the promotion of environmental restoration of the Guanabara Bay, with sustainable development and preservation of biodiversity."*

Chesapeake Bay is the largest bay in North America. The Bay itself spans two states, Maryland and Virginia. The Chesapeake Bay watershed is much larger, at over 165,000 km² compared to 4,000 km² for Guanabara Bay watershed and spanning parts of 6 states and the District of Columbia. Although the Chesapeake Bay is much larger, it faces many of the same challenges as Guanabara Bay, including:

- Uncontrolled population growth and development
- Poor land use management
- Pollution from sewage, industrial effluents, urban runoff, agriculture
- Bacterial contamination
- Water quality standards violations
- Harmful algae blooms and fish kills
- Extensive low to no summer dissolved oxygen conditions - “dead zone”
- Loss of critical habitat: forest, wetlands, submerged aquatic vegetation
- Depleted fisheries: oysters, striped bass
- Invasive species: MSX and Dermo



In addition, Guanabara Bay and its basin share many similarities with the Baltimore-Washington Metropolitan Area (BWMA). These two heavily populated areas are of similar land area, population density and both discharge to bays that are stressed by pollution.



Population

BWMA – 9.3 million

RJMR – 8.6 million (basin pop.)

Political

BWMA – 2 states, 13 counties and 3 major municipalities

RJMR – 1 state, 15 municipalities (watershed)

Sanitation problems

BWMA – deteriorating sanitary infrastructure, \$4.8 B sewage/drainage system restoration underway; RJMR – 70-80% of sewage untreated, major infrastructure development is underway.

Chesapeake Bay is also further along in the restoration process and may provide some helpful insights to benefit the Guanabara Bay restoration. Restoration requires a long-term commitment



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and strong public support. The Chesapeake Bay restoration effort started in 1972, with the signing of the federal Clean Water Act. This was followed by extensive scientific studies into the reasons for the decline of the Bay. The original Chesapeake Bay Agreement, signed in 1983 after completion of the scientific studies, was a simple, one-page pledge signed by political leaders to establish the governance structure of the Chesapeake Bay Program. The engagement and commitment of political leaders in the jurisdictions of Chesapeake Bay proved to be essential to the long-term success of the restoration. The most recent 2014 Agreement was signed by the Governors of six states, the mayor of Washington, DC and the federal government represented by the Administrator of the US Environmental Protection Agency. The 2014 agreement builds upon a long history of restoration efforts, but the work of restoring Chesapeake Bay is still not done.

We learned the hard way in Chesapeake Bay that long-term goals alone are not enough. Two prior commitments for Bay Restoration were not met: the 1987 commitment to achieve a 40% nutrient reduction by 2000 and a second commitment in 2000 to restore water quality by 2010. It was clear that decade or longer commitments were not effective, so in 2009 the leaders of the Bay Agreement jurisdictions agreed to set short-term 2-year milestones to track progress: 2011, 2013, 2015, 2017 ... 2025 and publically report progress every year. In this way, even a Governor or mayor who only served one term would have at least two formal Bay restoration commitments to meet. This two-year milestone commitment has proved to be effective now for three Governors in Virginia and two Governors in Maryland and all of the other states.

In Maryland and the other Bay Watershed jurisdictions we have found 10 critical factors that have led to the success of the restoration effort:

1. Federal, state and local government agencies, universities, businesses, NGO's and public are engaged in all aspects of the restoration -- **ALL PARTIES MEET REGULARLY TO PLAN AND COORDINATE THE RESTORATION**
2. Restoration plan based on good science to achieve shared vision of "The Bay We Want" - **PEOPLE UNDERSTAND WHAT IS NEEDED AND MAKE SURE THEIR LEADERS FOLLOW THROUGH ON COMMITMENTS**
3. Political leaders' have signed a formal agreement and the Federal, State and local governments are all involved and committed to the restoration -- **GOVERNORS,**

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MAYORS, EPA ADMINISTRATOR OTHER LEADERS MEET ANNUALLY --
CABINET SECRETARIES MEET QUARTERLY.

4. Dedicated funding – funding for the restoration is committed and is not diverted to other needs
5. Fair and equitable restoration plan
6. Measurable commitments and deadlines, including long-term goals and short-term, “2-year Milestones”
7. Monitoring of restoration actions and water quality
8. Transparent, understandable and regular public reporting of key indicators of progress
9. Everyone is held accountable for their actions or lack of action toward the restoration
10. Public education on the environment is required at all levels of school

There are many restoration needs in Guanabara Bay and its basin. For example:

- The existing sewage treatment system needs to be renovated and new sewage collection and treatment systems must be built. PSAM has compiled the municipalities plans and has mapped out the short, medium and long term plans in a geographic information system.
- There needs to be better enforcement of sewage and industrial pollution laws. INEA has a contractor working now to review the inspection programs and identify gaps.
- At this time, new homes are being added without proper sewage treatment and collection. Steps must be taken to prevent further expansion of unauthorized developments into steep slopes, flood plains, mangroves and other areas where sewage collection is not available.
- Drainage and flooding problem areas must be corrected by relocating residents that have set up unauthorized housing in flood plains and river channels and by cleaning the channels and floodplains to improve drainage, similar to what has been done in the Iguacu project.
- Improvement of solid waste collection and disposal
- Remove contaminated sediments from canals and Bay
- Protect and restore mangroves

Although there have been previous restoration efforts for Guanabara Bay and its basin that have not achieved their objectives, some progress has been made and it is possible to take steps to ensure that the restoration effort continues to improve in the future. It is very important that:

1. The restoration is to achieve a Shared public vision for the Bay – “The Bay We Want”

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2. The restoration plan is developed with public input and support
3. That the plan includes short-term milestones to demonstrate progress
4. That the plan maintain credibility by reporting progress using simple, highly visible metrics
5. The plan and the restoration effort must be fully transparent with regular public reporting
6. Finally and most important, federal, state and local government, universities, businesses and the public must work together to achieve the restoration.

5. Overview of the State of Guanabara Bay

Rio de Janeiro is world famous for its beautiful sub-tropical scenery and beaches, and one of the region's most famous natural features is the Guanabara Bay. The bay is a significant ecologic and economic resource to the state, a key touristic destination, an important fishing resource to locals, and the area represents the densest industrial and commercial hub in the State of Rio de Janeiro, housing thousands of industries. But with approximately 8.6 million people living in the 15 municipalities that comprise the highly urbanized watershed, the environmental conditions of the tributary rivers and streams and of the Bay itself are seriously degraded.

The Guanabara Bay and its watershed suffer from:

- poor sanitation services and solid waste handling
- industrial contamination
- floating debris
- high bacteria, with associated public health risks
- high levels of biochemical oxygen demand and nutrients
- contamination by metals
- algal blooms and low dissolved oxygen
- sediment contamination
- limited fisheries
- impacted marine biodiversity



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Sections of the report present a summary of existing information on the State of the Bay compiled from recently published literature, including:

General characteristics of Guanabara Bay and its Watershed, encompasses the physical geography and main features of the Guanabara Bay and its hydrographic basin.

Hydrodynamics of Guanabara Bay, briefly describes how the hydrodynamic forces act in the bay, and it also attempts to explain why there are greater concentrations of pollution in certain regions of the estuary.

Water Quality, compiles and analyzes water quality information from multiple existing reports, studies and monitoring data gathered over time by the State of Rio de Janeiro. It also summarizes the main sources of pollution and their effects on the water quality of the different sections of Guanabara Bay, its watershed and internal beaches.

Metals in Guanabara Bay, gives an overview of the sources and aspects of contamination related to heavy metals in Guanabara Bay, including background concentrations, main sources of metals in the watershed, and spatial distribution of heavy metal sediment contamination in the different regions of the bay.

Marine Biodiversity, includes an overview regarding the following marine organisms: phytoplankton, zooplankton, benthos, ictiofauna and fisheries, and cetaceans. The information listed for each of the groups include general special distribution, species present in the system, and how abiotic factors and pollution affect the presence and spatial distribution of those organisms in Guanabara Bay.

Aquatic Habitat, contains information about mangrove systems in Guanabara Bay, their importance as marine nurseries, and the anthropic aggressions that threaten the existence of the remaining mangrove forests. The section also encompasses a brief overview of submerged aquatic vegetation in Guanabara Bay, and how more studies are necessary to increase the knowledge base about this important marine habitat in the estuary.



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Watershed Land Use and Land Cover, gives an overview of land use and land cover in the Guanabara Bay watershed, and it contains the following itemization: urban areas; rural and agricultural areas, and areas comprised by forest resources including the federal, state, municipal and private units of conservation located in the basin. The section also includes estimates of the spatial distribution of the different uses in addition to future projections.

The Rivers of Guanabara Bay, lists and describes the main rivers located in the Guanabara Bay watershed, including a brief description of their respective drainage areas and approximate monthly flow, and an overview of the land use and industrial activities observed in each of the main sub-basins.

Solid Waste, encompasses the origins, the causes and the effects of solid waste pollution in Guanabara Bay and its watershed, and it explains the reason why the estuary is often the final destination for mismanaged trash that is produced in the watershed. Additionally, the section includes and describes the programs that have been adopted by the State government to help control the solid waste pollution that is pervasive in the estuary and its watershed.

Sanitation in the Basin, explains the sanitation services available in the different municipalities of Guanabara Bay watershed, and the disparity between sewage collection and treatment. It also describes the different programs and efforts performed by the government over time related to sanitation, and defines the sewersheds and sewerage systems present in the region.

Industries in Guanabara Bay, encompasses an overview of the industrial sector in the Guanabara Bay watershed, the types of industries present in the area, and their influence over the water quality of the tributary rivers and the bay itself. The section also includes a summary of the industrial pollution controls utilized in the region, and the concentration of industries in the different regions that compose the basin.

Socioeconomic Aspects, this section of the report aims to highlight the most important features for understanding the organization, the socio-economic aspects and territorial dynamics of Guanabara Bay, distinguishing gaps and issues that deserve special attention. The document addresses the topic that relates to the sense of belonging and the vulnerability of the inhabitants and users of the

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bay and its watershed, conflicts between uses and users, and the perception of integration between the bay and its watershed.

SUMMARY OF THE FIRST WORKSHOP

1. Objectives

Public workshops are a critical part of the Technical Cooperation Project. The purpose of the workshops is to ensure that there is significant stakeholder input and incorporation of public comments at each step of the project. The objectives of the 1st Workshop, held on April 29, 2016 at the Museum of Tomorrow were to:

- (1) Provide an overview of the State of Guanabara Bay and receive recommendations from the public and obtain consensus, to the extent possible, regarding the current environmental conditions and the main factors affecting the health of the Bay and its basin; and
- (2) Provide an initial selection of environmental indicators that could be used to measure progress in the restoration of the Bay and its basin for public review and obtain public comment to identify the most appropriate indicators of environmental conditions that must be monitored and measured to track the progress of the environmental restoration.

2. Presentations

In the first public workshop about the Environmental State of Guanabara Bay, held in Museum of Tomorrow, in the city of Rio de Janeiro, on the 29th of April, 2016, there were approximately 180 participants representing several sectors and institutions involved with Guanabara Bay and its watershed. The workshop started with the speech of the current Environment Secretary, André Corrêa, affirming the importance of the Guanabara Bay Restoration Plan and the necessity to develop a communication tool to aid the society, the several institutions and the decision makers, in the municipal and state level, in the task of tracking the progress of the Restoration Plan foreseen



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for Guanabara Bay and its watershed. The Secretary also stated about the need of transparency through sharing information, and highlighted the lack of resources and the current economic situation of the State are the main problem preventing the full social-environmental development of Guanabara Bay's region.

After the welcome remarks, the first presentation entitled “Technical Cooperation Project: Overview on the Current Environmental State of Guanabara Bay” was presented by Dr. Robert Summers, senior environmental scientist at KCI Technologies Inc. and former Environmental Secretary from the State of Maryland in the USA. His presentation included a comprehensive explanation on the Technical Cooperation Project, which is a project financed by the Interamerican Development Bank (IDB), and it is a partnership between the State of Rio de Janeiro Environment Secretariat (SEA); the Executor Unit of the Program of Sanitation of the Municipalities Surrounding Guanabara Bay (UEPSAM); the KCI Technologies Inc., the Brazilian Sustainable Development Foundation (FBDS); and the University of Maryland Center for Environmental Sciences (UMCES), with the support and contributions from research centers and regional universities, the Watershed Committee, and the civil society as a whole. The presentation also included a brief comparison between Chesapeake Bay and Guanabara Bay, highlighting the similar problems and features, such as the high load of nutrients and the great urbanization rate in its surroundings, with main emphasis on the developments faced by Chesapeake Bay related to sewage collection and treatment, which currently is pointed as the major threaten for Guanabara Bay.

Since Chesapeake Bay has been implementing its own Restoration Plan for a longer time, one of the main objectives of the Technical Cooperation is that through the experience of Maryland, Guanabara Bay can recover faster basing on the successful measurements in the case of Chesapeake Bay. Among the main critical factors for the development of a consistent and efficient Restoration Plan, Dr. Robert Summers reiterated that it is important the engagement of all segments and sectors involved with Guanabara Bay, such as NGOs; local, state and federal governments; the universities; the private sector; and the society. Other essential factors for the success of the Restoration Plan include the use of the extensive and detailed scientific knowledge which exists for Guanabara Bay as the basis for the plan; the involvement and commitment of the political leaders (federal, state and local); dedicated funding and financial resources exclusively



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for the revitalization of the Bay; deadlines and commitments that can be measured and easily monitored by all in order to track the restoration progress through short and long terms goals; transparent, regular and comprehensible communication of the main indicators to be tracked; and the implementation of public education in all levels. In addition, the plan needs to be fair and equitable, and all components involved need to understand that they are responsible for their actions or the absence of their actions.

The presentation of Dr. Summer ended with a broad overview on the current environmental state of Guanabara Bay and its watershed, with provision of information on the physical characteristics of Guanabara Bay, the main sub-basins of the watershed, land use, mangroves, conservation units, sewerage systems, solid waste management, industrial presence, sediments` contamination, fishing activities and water quality. The preliminary conclusion was that is necessary some actions such as: renew and build new sewage collection and treatment systems; strengthen the enforcement and the industrial control programs; prevent the expansion of irregular occupations on floodplains, hills and riparian areas; improve trash solid waste collection and disposal; remove contaminated sediments from the Bay and the rivers; protect and recover fauna and flora affected by poor environmental conditions in the region.

Differently from all other already developed plans in the past for Guanabara Bay, the current discussed Restoration Plan will be created through a shared vision of the “Bay we Want”, developed with broad inclusion and support from the public, with short goals to track the progress and provide credibility through simple and visible metrics. The transparency on information will be essential and will occur through regular public Report Cards to be developed by University of Maryland Center for Environmental Sciences, in conjunction with local, state and federal governments and all the other important stakeholders of Guanabara Bay.

The second presentation was ministered by Professor Bill Dennison, Vice President from UMCES. Entitled “The Guanabara Bay Report Card” the presentation introduced the UMCES and the Integration and Application Network (IAN) and commented the experience of the institution in promoting the integration and application of theoretical studies, putting them in practice to generate solutions. The presentation focused on the Environmental Health Report Card which is being developed for Guanabara Bay and that will allow a better communication to enable changes.

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The Report Card will assess the environmental quality of the region of Guanabara Bay communication complex information in a simple, concise and transparent way, basin on real data and consequently engaging all the stakeholders of Guanabara Bay.

Professor Bill Dennison presented the results already obtained through a small workshop conducted on the 25th of April 2016 at the SEA/INEA auditorium, in which, with the contribution of some important stakeholders of Guanabara Bay, it was preliminarily delimited the reporting areas in the Bay and in its watershed. In the development of the Report Card is important the participation of the public on the selection of the indicators that should be regularly monitored in the follow up of the progress of the Restoration Plan for Guanabara Bay. Among the indicators, both for the saline waters of the Bay and freshwaters from the rivers of the waters, some physical-chemical, biologic and social parameters stood up. These parameters were dissolved oxygen, nutrients, nitrates, water transparency, chlorophyll, bacteria, fishes, pH, turbidity, dissolved solids, aquatic mammals, mangrove areas, crab contamination and sea horses.

It was also highlighted during the presentation the fact that the existing scientific database for Guanabara Bay is extensive and allows a rigorous and transparent process for all to track the progress of the restoration of the Bay. The professor also reiterated that this is a unique opportunity to accelerate the recuperation profess through development of regular Environmental Health Report Cards, because its creation involves several experts and build consensus among different opinion groups. In synthesis, the Report Card development process consists firstly on the identification of the values and threatens for the analyzed ecosystem, followed by the selection of the indicators to be reported and limits and thresholds to be attended. After these determinations, there are the calculus of the grades and scores for each reporting region, and then, the report card is ready to communicate results, becoming an important tool to aid everybody to track the progress of the restoration. The Report Card is also a strong tool to help on the identification of the environmental areas that most need attention and care. Examples of Environmental Health Report Cards developed by UMCES for other bays and water bodies in world were illustrated, with emphasis on the report cards for Chesapeake Bay, in the US; the Mississippi River watershed, in the US; the Long Island Cove, in the US, the Mexican Gulf and even the Great Barrier Reef in Australia.

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The third presentation named “ Rio and the Guanabara”, presented by Dora Negreiros, representative from Baía de Guanabara Institute (IBG), focused on the historical data about Guanabara Bay. The panelist briefly commented about the history of Guanabara Bay and reported that several environmental problems faced by the Bay now, originated from an in-existent environmental awareness in the past, which allowed the installation of polluting industries in the surroundings of the Bay, the occurrence of environmental accidents, the anchoring of vessels, the presence of big shipyards, the lack of solid waste management and the development of a sewerage network that did not follow the demands of a crescent urbanization occurred in the region.

The guest presenter mentioned some of the projects and programs already conducted in the past which had as objective the environmental revitalization of Guanabara Bay, emphasizing on the water quality monitoring program from the extinct FEEMA, the loans with IDB and JBIC to implement the PDBG, and the most recent program PSAM. With an extensive number of programs already conducted aiming the restoration, she suggested that the current Restoration Plan should not be one more plan, but instead, it needs to be a new step for the full and effective environmental restoration of Guanabara Bay.

In the afternoon the workshop followed with the presentation of Pedro Navalón, representing the consortium Labaqua/Aqualogy, entitled “Improvements for the Water Quality Monitoring”. The consortium was contracted to develop and make the industrial and environmental monitoring process more efficient, and also to enforce the INEA’s laboratories. Among some punctual measurements, the consortium is being responsible for the selection of some of the most polluting activities aiming to strengthen the monitoring and inspections of these activities. Other goals of the contract include the monitoring and enhancements on the Autocontrol Program for Atmospheric Emission and Liquid Effluents (PROCON-Ar and PROCON-Água, respectively), and the critical evaluation of the environmental licensing and proposals for improvement. For the natural environment, the contract foresees the control of the rivers and the water mirror of Guanabara Bay, through a more regular collection of samples, monitoring and results reporting.

In the same section, Professor Bill Dennison from UMCES returned to foment an interactive discussion with the audience to explain what was already conducted in the precedent



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small workshop held on the 25th of April 2016, where some stakeholder got together to initiate the process of development of the Guanabara Bay Environmental Health Report Card. In addition to printed report cards for other iconic regions of the world, the professor handled to the audience a Newsletter previously created and containing information on the results obtained in the small workshop. Open to inputs and suggestion it was also distributed a short survey to collect additional information to be incorporated in the Report Card development process.

The last presentation entitled “Guanabara Bay: a socioeconomic approach” was given by the sociologist Nair Palhano, component from KCI Technologies Inc. staff. The panelist highlighted some important socioeconomic aspects stressed that everything that reaches the water mirror of Guanabara Bay reveals the lack of belonging sense of the population with the rivers and consequently with the Bay. She also explicated that Guanabara Bay is an arena of conflicts and that these conflicts need to be managed in a way to give visibility, participation and intervention capacity for all social subjects involved. The sociologist explored the fact that is needed to restore the belonging relationships creating basic conditions of sanitation, controlling the irregular occupation process and making the rivers of the watershed part of the life of the population. The panelist talked about the impacting uses of the Bay and its watershed, related to oil and gas industry, ship industry, port activities and basic sanitation, and also stressed the impacted sectors, such as public health, tourism, fishing activities and recreation. Aiming to acquire more inputs of the public with respect to social and economic indicators to be incorporated to the Restoration Plan and the Report Card, she ended up the presentation reinforcing that one of the biggest challenges for the restoration of the Bay is the communication, and that this challenge needs to be surpassed to provide visibility and promote articulation among all stakeholders and institutions involved with Guanabara Bay.

Before the closing remarks, the workshop ended with a debate where the audience could comment and give contributions on the topics, which were the theme of the meeting.

3. Summary of the Public Input Made During the Workshop



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One of the objectives of the First Public Consultation Workshop was to identify indicators and environmental conditions that are most appropriate to be measured to monitor the progress of the restoration of Guanabara Bay. Among the most suggested indicators related to biological and physic-chemical parameters of water quality were (already widely used in assessments of national and global water bodies): Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), concentration heavy metals, total dissolved solids, chlorophyll, turbidity, bacteria, viruses, and other nutrients. Other suggested indicators include the monitoring of the population of seahorses, and aquatic mammals such as whales and dolphins. These suggestions are consistent with the ease of obtaining data for these indicators because there is already extensive databases and monitoring data by institutions involved with the Guanabara Bay. For example, the State Environmental Institute (INEA) already performs regular monitoring of various physical and chemical parameters and has a contract with the Consortium Labaqua / Aqualogy to improve the methodology of quality monitoring of the water used. Additionally, the University of Santa Ursula, according to a representative present, is already studying the presence of seahorses and could provide information for this indicator. The very PSAM maintains a digital platform with a Geographic Information System (GIS) in which are contained the areas of the basin where there are networks of collection and / or treatment of sewage and information on solid waste management, which were indicators of possibilities also explored. In addition, the SEA has signed a contract with Prooceano, the company responsible for managing the ecobarcos in Guanabara Bay, providing the boats with a GPS and enabling real time tracking of the boats via the website of routes, position and productivity in collecting floating trash.

There was a strong consensus among the participants that the biological and physico-chemical indicators are of great importance for the monitoring of the planned Restoration Plan progress. However, the need to include socioeconomic indicators was also widely mentioned by the attendees of the public consultation. Socioeconomic indicators allow monitoring of changes in social inequality that is intensely present in the basin of Guanabara Bay. It was also noted that social inequality deepens social exclusion, reduces the feeling of belonging among the population, and consequently intensifies environmental degradation.

Among the suggestions and ideas for socioeconomic indicators included:



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- Transparency of investments: public spending on sanitation, education, health and the environment;
- Land use processes: investment in housing, water supply, transportation, health and energy;
- Infant mortality and life expectancy, which are indicators that have improved in recent years in Brazil especially because of vaccination campaigns, water supply and pre-natal care;
- Slums and irregular occupations: monitoring irregular and disorderly occupation of the territory, as the quality of water resources is associated with land use. It was mentioned that every day new irregular occupations are established without proper sewage treatment without supervision of the county and state and / or in floodplains;
- Garbage collection and solid waste: quantification of the amount of solid waste collected in the bay waters and on each sector of the watershed, through initiatives such as Ecobarreiras and Ecobarcos;
- Fishing activity: increase in fisheries production over time with the improvement of the quality conditions of the waters;
- Variation of the rate of violence over time;
- Deforestation and reforestation: preservation of existing areas of Atlantic Forest and other important ecosystems for the maintenance of environmental quality, such as mangrove areas and buffer zones that retain the pollution;
- Expansion of environmental education programs at all levels.

Despite several ideas for indicators, we reached the conclusion that the task of proposing and building indicators in general, especially for the socio-economic ones is complex and challenging in the case of Guanabara Bay. For example, much of the data available, such as the Human Development Index (HDI), do not meet the spatial scales considered for the recovery plan, which are the sub-basin of the river basin of Guanabara Bay. The HDI has a municipal basis that would not meet the geographic boundaries that should be adopted to understand and monitor the socio-economic dynamics of the Guanabara Bay watershed.

Among the other topics mentioned in the workshop regarding the overview of the current state of Guanabara Bay and that could be further analyzed by the Recovery Plan, include:



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- Dissatisfaction with sanitation currently offered in the basin and mistrust in the ability of current public agencies in the maintenance and expansion of this public service, which leads to the need for a new and differentiated strategy for the effective improvement of the watershed. It was mentioned the use of Public Private Partnerships (PPPs) for the broad distribution of collection and treatment of sewage services, which is being discussed by the Metropolitan Chamber;
- The questioning and controversy over the implementation of Guapiaçu dam for water supply in some municipalities of the western basin region at the expense of areas currently benefit from the course of the river;
- The conditions of precariousness of sewage treatment plants (STPs) on the basin, caused by insufficient maintenance services and underutilization of treatment capacity that affect the future viability of the machinery;
- The implementation of better and more efficient wastewater treatment technologies in the basin, including alternative methods such as digesters and other processes that require smaller investments for implementation and maintenance;
- Greater integration between fifteen (15) municipalities of the basin and increased representation of municipalities in the restoration process;
- Increased presence and transparency in the CEDAE in this process of creating the Recovery Plan;
- Greater transparency in the sharing of existing information, and easier access to tax and environmental data for the recovery of the Guanabara Bay.

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