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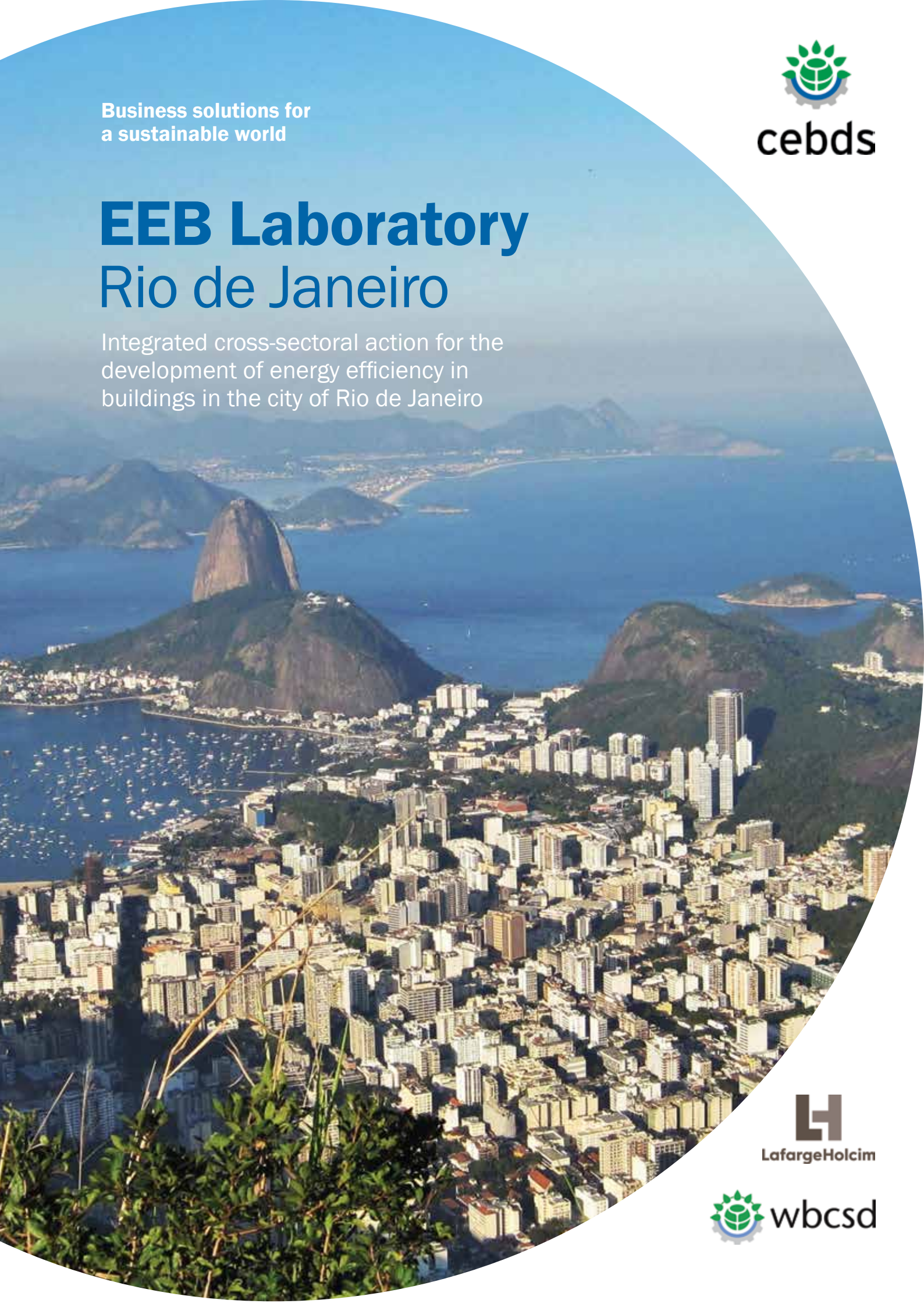
EEB Laboratory
Rio de Janeiro

Integrated cross-sectoral action for the development of energy efficiency in buildings in the city of Rio de Janeiro



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The World Business Council for Sustainable Development - WBCSD

The WBCSD is a global organization headed by the CEOs of more than 200 leading companies, working together to accelerate the transition to a sustainable world. They help make their member companies more successful and sustainable by focusing on maximum positive impact for shareholders, the environment and society. The WBCSD member companies come from all business sectors and all the major world economies, representing a combined revenue of more than US$ 8.5 trillion and 19 million employees. The global network of nearly 70 national business councils gives members unparalleled reach across the globe. The WBCSD is uniquely positioned to work with member companies along and across value chains to deliver effective business solutions to the most challenging sustainability issues. Together with companies, they are the leading business voice for sustainability; united by the vision of a world where more than nine billion people can live well and within the limits of the planet by 2050.
www.wbcsd.org

The Brazilian Business Council for Sustainable Development - CEBDS

The Brazilian Business Council for Sustainable Development (CEBDS) is a non-profit civil association that promotes sustainable development among companies operating in Brazil through articulation with governments and civil society, in addition to disseminating the most modern concepts and best practices in sustainability. It brings together more than 70 of the largest business groups in the country, with revenues that account for approximately 40% of Gross Domestic Product (GDP) and is responsible for more than one million direct jobs. CEBDS is the WBCSD network representative in Brazil and Latin America.
www.cebds.org

LafargeHolcim

“LafargeHolcim is the world leader in the building materials industry and is ready to meet the challenges in developing an increasingly urban world. Present in 80 countries, offering the most innovative solutions in cement, concrete and aggregates, we have a clear commitment to social and environmental sustainability. Our products are used in small construction projects, as well as in large infrastructure projects posing technical and architectural challenges. Operating in Brazil since 1951, it is one of the leading companies in the construction sector in the country. With approximately 2,000 employees, LafargeHolcim Brasil has production installations in three of the five regions of the country: Southeast (SP, RJ, MG and ES), Northeast (BA and PB) and Center-West (GO), which include cement plants and crushers, concrete production units and aggregate mining areas.”
http://www.lafargeholcim.com

Members of the Energy Efficiency in Buildings Project, WBCSD EEB 2.0

Lafarge (co-chair)
United Technologies (co-chair)
AGC
AkzoNobel
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ArcelorMittal
ENGIE
Infosys
Schneider Electric
SGS
Siemens
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Summary

1 Introduction

Over three days in April 2015, the 5th edition of the Energy Efficiency in Building Laboratory (EEB Lab)[1] was held in the city of Rio de Janeiro, a business sector initiative coordinated by the *World Business Council for Sustainable Development* (WBCSD), whose objective is to foster energy efficiency and improvement actions for buildings (EEB).

The laboratory brought together important stakeholders from several areas of the construction market to identify, through dialogue and experience exchange, non-financial barriers and identify solutions for the development of energy efficiency actions that have not been implemented in the city of Rio de Janeiro.

The laboratory in Rio de Janeiro is one of several WBCSD initiatives that endeavor to transform the market as a whole, since buildings, in general, are responsible for more than 30% of the world's primary energy consumption and carbon dioxide emissions (CO2; UNEP[2]).

KEY-ACTIONS OF THE LABORATORY

The laboratory brought together specialists and representatives from several parts of the construction sectors in Rio de Janeiro, including investors, architects, engineering companies, building management companies, users and public authorities. Through inter-sectoral discussions, four main areas of action were identified:

I. Knowledge and perception of value (of the benefits of energy efficiency);

II. Capacity-building of the workforce;

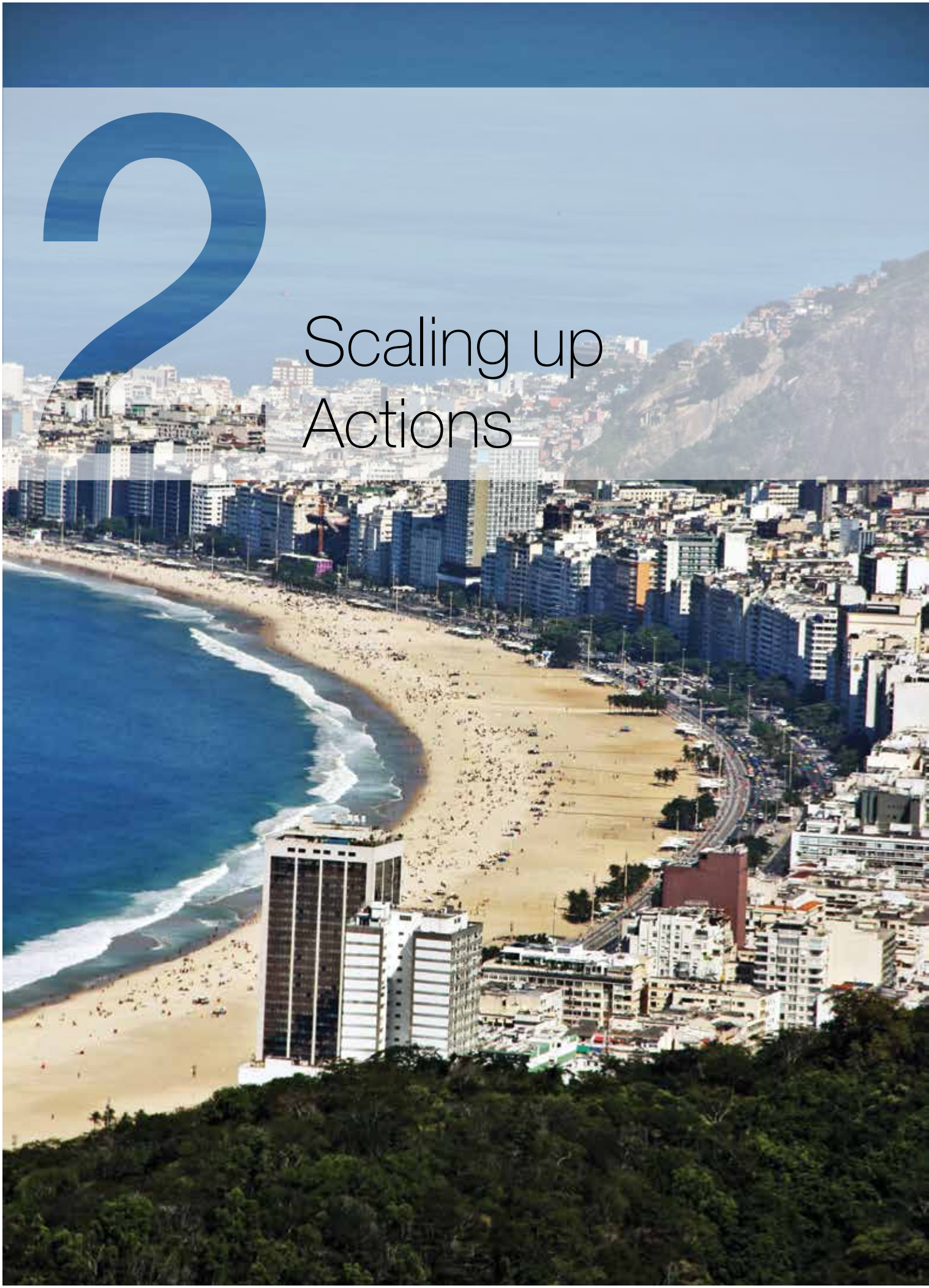
III. Investment and financing;

IV. Public policies and regulation.

Based on the knowledge acquired from the exchange of ideas between the various representatives of the construction sector, and considering the four key areas of action, it was possible to identify the main barriers and to prepare recommendations for actions to foster the development of energy efficiency in buildings in the Rio de Janeiro city. This data was used to create a *Roadmap* for transforming Energy Efficiency in the city of Rio de Janeiro, and identifies the main challenges and propose actions for each area.

[1] Previous editions of the laboratory were held in the cities of San Francisco (USA), Shanghai (China), Warsaw (Poland) and Houston (USA). For more details, see *Chapter 2 - Scaling Up Actions*.
[2] UNEP. Evaluation of Public Policies for the Reduction of Emissions of Greenhouse Gases in Buildings. São Paulo, 2009. Available at: http://www.cbcs.org.br/userfiles/comitestematicos/outrosemsustentabilidade/UNEP_capa-miolo-rev.pdf

2 Scaling up Actions



BUILDINGS ARE KEY ELEMENTS FOR ENERGY AND CLIMATE SECURITY

Buildings are the largest energy consumers in the world, accounting for approximately 30% of all final energy consumption and proportional levels of global carbon emissions (UNEP, 2009).[3] Although energy consumption in energy-intensive sectors, such as transport and heavy industry, is more visible, buildings also have an important role to play in any corporate or national strategy for energy security and climate change. That is the reason why the WBCSD created the Energy Efficiency in Building Laboratory (EEB) project, which seeks to operate in this important area of action aiming to guarantee energy security and the development of human contributions to mitigate risks and concerns about climate change.

THE BENEFITS OF ENERGY EFFICIENT BUILDINGS

Energy efficiency in buildings is a key global contribution for achieving the imperative goal to keep the global temperature increase below 2°C. Furthermore, improving energy efficiency in buildings offers a number of additional benefits.

Until recently, the calculated return on investment for energy efficiency in buildings was limited to the energy saved and associated cost savings. However, more efforts are currently underway to understand and monetize the wide range of benefits from energy efficiency, including:

- **For owners and occupants:** improved durability,[3] reduced maintenance, lower costs, higher sale value, lower vacancy rate, increased thermal comfort, improved business liquidity, more favorable insurance premiums, lower investment risk, improved productivity in administrative buildings and gains in health and safety.

- **For governments:** better air quality, lower social health costs, creation of new jobs, increase in the tax base and lower budget variation, increase in tax revenues and greater energy security.

- **For distributors:** reduction in energy losses over the distribution network and reduction of system capacity constraints.

- **For financial institutions:** new products for current customers; development of a new client portfolio; product alignment between developer and real estate buyer (*cross sell*); demonstration of leadership in sustainability; maintenance of a portfolio with low risks and high commercial value.

[3]

OVERCOMING BARRIERS TO TRANSFORM THE MARKET

After completing a four-year research process, the first phase of the *EEB Project* identified how to overcome barriers to energy efficiency in buildings. A *Market Transformation Report* was prepared, which created a roadmap and provided feasible recommendations for reducing energy consumption in buildings. The study revealed that this transformation requires actions throughout the construction industry chain, from developers and owners to *those responsible for creating public policy*.

FROM RESEARCH TO ACTION: EEB 2.0

The second stage of the *EEB Project* (EEB 2.0) began in 2013, seeking to implement recommendations and stimulate change. The objective is to increase investments in energy efficiency which are financially viable and which are currently not occurring due to financial, regulatory, organizational or other non-technical reasons.

The *EEB 2.0 Project* seeks to work with local and international stakeholders, with the objective of developing a business scenario favorable for energy efficiency in buildings where there are plausible implementation actions.

ENGAGEMENT TO STIMULATE MARKET ACTIONS THROUGH EEB LABORATORIES

The *EEB 2.0 Project* has developed a structured and replicable stakeholder engagement model that can diagnose and overcome barriers to energy efficiency in cities and the adjacent areas where commercial buildings are concentrated. It is a pioneering engagement model, involving ten markets:

1. Houston, USA
2. Warsaw, Poland
3. Bangalore, India
4. Jaipur, India
5. Rio de Janeiro, Brazil
6. The Netherlands and Belgium
7. Kuala Lumpur, Malaysia
8. Jakarta, Indonesia
9. Singapore
10. Shanghai, China

The *EEB 2.0 Project* operates as an organizer and facilitator of change, especially through the *Energy Efficiency in Buildings Laboratory (EEB Lab)*, which aims to:

- Create a clear understanding of the market by identifying barriers and facilitators able to drive local change;
- Define actions to overcome barriers and catalyze facilitators to assist in market transformation;
- Recruit key market stakeholders to develop and implement an action plan for changes across the market.

The *EEB Lab* brings together local stakeholders and technical experts to identify problems and priorities and build a coalition of actors that will drive transformation. This report presents the activities and results of the *EEB Laboratory in Rio de Janeiro*, which took place between April 14 and 17, 2015. In Brazil, the project was organized by the WBCSD in conjunction with CEBDS, a global partner of the institution, and the leadership of LafargeHolcim.

3

EEB Lab - Rio de Janeiro

3.1. WHY RIO DE JANEIRO?

Rio de Janeiro is one of the world's largest cities, the center of a metropolitan region with more than 15 million inhabitants,[4] and responsible for 6% of Brazil's GDP.[5] The city is a cultural and economic reference and has considerable national and international visibility. The choice to headquarter the Brazilian Energy Efficiency in Building Laboratory in Rio was due to a set of challenges and opportunities for the local construction sector and for the development of energy efficiency actions in buildings.

The city faces a number of challenges, including those related to the demand for energy, resilience and sustainability. Among them are: the Brazilian water crisis faced in 2014 and the consequent stress on the regional and national energy system; the hot and humid climate, which is intensified by its proximity to the sea; the lack of space for urban growth, given the limits imposed by the hills, beaches and vegetation; and the housing deficit in the metropolitan region of Rio de Janeiro, which was estimated to be almost 300,000 housing units in 2013 (6,7%)[6].

At the same time, in recent years, the city has offered a number of investment opportunities for change and innovation, due to the city hosting large-scale sports events, such as the 2014 FIFA World Cup and the Rio 2016 Olympic Games. Aware of this context, the municipality of Rio de Janeiro - in partnership with the State Government and the Federal Government - has implemented a policy over the last years for more engagement to become a more sustainable and resilient city.

In 2010, the Rio Operations Center was implemented, which concentrates and coordinates the actions of more than 30 municipal agencies and departments, 24 hours a day, seven days a week. The *Porto Maravilha* project was also created, the result of a Public-Private Partnership (PPP), which intends to invest US$ 4 billion in the transformation of the city's port region.

Good management practices and the effort to become more sustainable and resilient earned the city of Rio de Janeiro the *World Smart City Award*, granted during the *Smart City Expo World Congress*, held in Barcelona. Recognizing the results achieved, Mayor Eduardo Paes was elected for the 2013-2016 term as president of the *C40 Cities Climate Leadership Group*, a group that brings together the largest global cities, working together to develop actions to reduce greenhouse gas emissions and improve urban resilience to global and local climate risks.

Another important factor was the creation of a collaborative platform in Rio de Janeiro for the design of a plan for improvements in the city, prepared by the population of Rio. The document, *Visão Rio 500*, collected the population's aspirations for Rio de Janeiro until 2065, envisioning its implementation in the form of 59 initiatives and 68 targets, including the "Green, Sustainable and Resilient City" theme.

[4] IBGE, 2016.
[5] IPP and IBGE data from 2014.
[6] Source: Fundação João Pinheiro, 2015.

The city of Rio de Janeiro also developed a 2017-2020 strategic plan, defining the main projects to be implemented in the coming years. Within this plan is the "Rio Sustainable Construction" initiative, which seeks to reduce water and energy consumption in buildings in Rio de Janeiro in order to meet the target for reducing greenhouse gas emissions by 20% before 2020 (base year 2005) and guaranteeing the *Qualiverde* certification for 15% of new private and public buildings by 2020, in addition to implementing incentives for other buildings.

These efforts and achievements for a more energy efficient, resilient and sustainable city have their value enhanced by the visibility that the municipality has enjoyed in recent years, and serves as an example for other cities in the country. In short, the realization of the *EEB Lab* in Rio de Janeiro can be seen as an opportunity to prepare for the current and future challenges being faced locally, and as a chance to take advantage of the city's visibility and prestige to encourage dialogue and awareness about energy efficiency in buildings.

RIO DE JANEIRO IN NUMBERS

- **6,498,837 inhabitants**[7]
- Total area[9]: **1,200.179 km²**
- •Population density:[9] **5,265.82 pop./km²**
- Annual minimum and maximum temperatures (historic averages)[8] **21°C and 27.3°C**, respectively.
- Maximum average temperature above 30°C in January[10]
- Municipal GDP of over **R$ 282.5 billion**[9]
- Headquarter of large Brazilian companies, including Petrobrás, Vale do Rio Doce and Oi
- Energy consumption of **of 17,661,298 MWh** in 2015[10]

[7] IBGE, 2016
[8] Instituto Nacional de Meteorologia (INMET): historical climate averages from 1961 to 1990.
[9] IBGE, 2013
[10] Instituto Pereira Passos, 2015

3.2. EEB LAB - OVERVIEW

The dynamic of the Energy Efficiency in Buildings Laboratory was organized by the WBCSD as a three-day event. In the experience held in Rio de Janeiro, as in past editions, the key element for the success of this event format was the performance of the **Technical Committee**.

The members of the committee are responsible for analyzing the data gathered on the energy efficiency in buildings market, identifying barriers and proposing solutions to foster improvement actions. In the fifth edition of the laboratory, the committee was made up of **27 experts** with diverse knowledge on energy efficiency, including aspects related to architecture, construction techniques and materials.

3.2.1. Preparation and governance

The process of organizing the *EEB Lab-Rio* started months before the three-day laboratory event held in April of 2015. Two work centers were created with distinct roles and responsibilities: the **Executive Committee** and the **Technical Committee**.

- **The Executive Committee[11](CoEx)** was responsible for the general coordination of the event, creation and management of the Technical Committee, recruitment of leaders, contact with stakeholders and articulation between the public and private sectors. The CoEx members were:

WBCSD	CEBDS	LafargeHolcim
Roland Hunziker	Ana Carolina Avzaradel Szklo	Brenda Rühle
Delphine Garin	Raquel Souza	Thiago A. Carvalho

- The **Technical Committee** was responsible for conducting the dynamics of the laboratory, providing technical analysis of the energy efficiency in buildings scenario, conducting interviews with industry stakeholders, synthesizing information, identifying barriers and proposing actions to foster energy efficiency in buildings in the city of Rio de Janeiro. The Technical Committee was composed of 27 members from the following companies and organizations:

[11] The representatives cited for each company participated in the project in 2015.

WBCSD and CEBDS members	Laboratory partners
Siemens	Anima
Schneider	Casa do Futuro
LafargeHolcim	Centro de Tecnologia de Edificações (CTE)
	Conselho Brasileiro de Construção Sustentável (CBCS)
	Eletrobras
	Green Building Council Brasil
	Ipiranga
	LabEEE-UFSC
	Light
	Midea Carrier
	Ministry of Environment of Brazil (MMA)
	M++ Architectural Network
	Prátil
	United Nations Development Programme (UNDP)
	SEBRAE
	SECOVI - RJ
	Municipal Secretary of Environment
	Sinduscon - RJ
	Universidade Federal Fluminense (UFF)

3.2.2. Study on the energy efficiency in buildings market in Rio de Janeiro

In addition to the complementary work of both committees - conducted prior to and during the laboratory, a preliminary study on the energy efficiency in buildings market in Rio de Janeiro was also conducted during the preparatory phase of the event. The project was developed by the Laboratory for Energy Conservation and Environmental Comfort of the Universidade Federal Fluminense (LabCECA/UFF) with the objective of obtaining data on the EEB market in Rio de Janeiro, in order to provide a basis for the analysis of the Technical Committee during the laboratory.

3.2.3. Preparatory meeting for the project launch

In December of 2014, four months before the Laboratory, the project was officially launched in the city of Rio de Janeiro. At the time, the main stakeholders, considered key for the composition of the Technical Committee and the success of the *EEB Lab-Rio*, met to learn

about the project. The kick-off meeting outlined and detailed the key activity bases within the laboratory objectives. In parallel, the meeting also outlined the scope of work that would be conducted during the market study.

3.3. THE THREE DAYS OF THE LABORATORY

3.3.1. DAY 1 - **Interviews**

- On the first day of the laboratory, interviews were conducted with **38 stakeholders in the construction market**, who were invited to share their opinions and knowledge concerning the main challenges for the EEB market in Rio de Janeiro. The information shared was crucial to establishing an overview of the EEB scenario in the city, and as a basis for the proposed improvement actions. Each of the selected stakeholders was chosen according to their knowledge and relevance to the topic. The breakdown of the stakeholder areas in the construction market is shown in the table below:

Interviewees (participants on the 1st day)		
Stakeholder Category	Representatives	%
Supplier of Material and Equipment	8	21.05%
Designers and Architects	5	13.16%
Consultants	5	13.16%
Government	5	13.16%
Renters	3	7.89%
Construction Services	3	7.89%
NGOs	3	7.89%
Building Owners	2	5.26%
Residential Sector	2	5.26%
Commercial Sector	1	2.63%
Real Estate Agents	1	2.63%
	38	100.00%

To conduct the interviews, the Technical Committee was divided into seven groups (of 4 or 5 members each). Each of these groups conducted seven to eight individual interviews, lasting about one hour. The interviewers took notes on the interviewees' comments and used the knowledge acquired as the basis for the analysis on the construction market, carried out on the second day. The table below shows which institutions were represented in each stakeholder category:

Designers and Architects

Ipiranga (Architect)
Casa do Futuro
Loggia Architecture
IAB

Construction Services

Sindistal

Commercial Sector

PDG

Building Owners

Petrobras
Empresa Olímpica Municipal
PREVI
Arena Hotel
Windsor Atlântica Hotel

Residential Sector

PRISMA
Odebrecth (Ilha Pura)

Real Estate Agents

ADEMI/CONCAL

Consultants

Ecobuilding
Sitawi
Sustentech
B2E Engenharia (Consultant)
Presidente AHK
MITSIDI

NGOs

INEE
IBAM
UNDP

Government

Rio Cidades Sustentáveis
City of Rio
Eletrobras
RioUrbe
GIZ e Câmara Alemã

Supplier of Material and Equipment

Daikin
Siemens
General Electric
Green Ant
Eneltec

3.3.2. DAY 2 - **Analysis and recommendations**

On the second day, the members of the Technical Committee were divided into two Working Groups (WGs) to analyze the key findings from the interviews. The discussions and analysis were conducted in a round table and covered the four main themes of the laboratory:

I. Knowledge and perception of value;

II. Capacity-building of the workforce;

III. Investment and financing;

IV. Policy and regulation.

The main objectives of this dynamic were:

- Consolidate information on the energy efficiency in buildings market obtained during the interviews;
- Identify the main barriers to the development of EEB actions;
- Propose solutions and actions to overcome identified barriers;

The work of the WGs was guided and complemented by experts invited by the Executive Committee to coordinate the discussions and maximize results. Each WG worked on two specific themes and the members were **organized** according to their areas of expertise, as shown below:

WORKING GROUP 1

Round Table 1 - Knowledge and perception of value

Moderator: Antônio Raad (Engineer / Coordinator of the Energy Efficiency Program (EEP) at Light)

Objectives:

- Discuss and understand the level of knowledge of the various actors and sectors of the construction market in Rio de Janeiro with respect to EEB and its many benefits.
- Identify barriers that prevent more stakeholders from learning about the issue.
- Develop a proposal for creating value that is comprehensive and capable of benefiting the various interested sectors of the market.
- Propose the main solutions and actions to overcome barriers and increase knowledge on EEB.

Round Table 2 - Capacity-building of the workforce

Moderator: Myrthes Santos (SEBRAE Consultant)

Objectives:

- Propose the adequate level of knowledge and skills required in the construction supply chain to foster the wide-scale adoption of techniques and knowledge for the development of energy efficiency in buildings.
- Investigate the real availability of technological solutions in construction in the local market.

WORKING GROUP 2

Round Table 3 - Investment and financing

Moderator: Guilherme Teixeira (ESG - Sitawi Consultant)

Objectives:

- Discuss obstacles and barriers so that EEB potential may be used to reduce the risk perception of the actors involved and to make financial resources available for the implementation of EEB projects.
- Discuss the engagement of financial institutions (commercial and development banks, national and international), energy conservation service (ECS) companies, companies benefiting from energy conservation and the municipal government.

Round Table 4 – Public policy and regulations

Moderator: Pedro Rolim (Planning Manager - Municipal Department of Urbanism, representing the municipality of Rio de Janeiro)

Objectives:

- Map regulatory barriers to the development of energy efficiency actions.
- Identify current incentives and regulatory policies and their benefits and barriers for energy efficiency initiatives.
- Elaborate proposals for regulatory improvements to encourage the adoption of actions for the development of energy efficiency.
- Identify decision-makers and decision-making authority to guide action to encourage new EEB incentives.

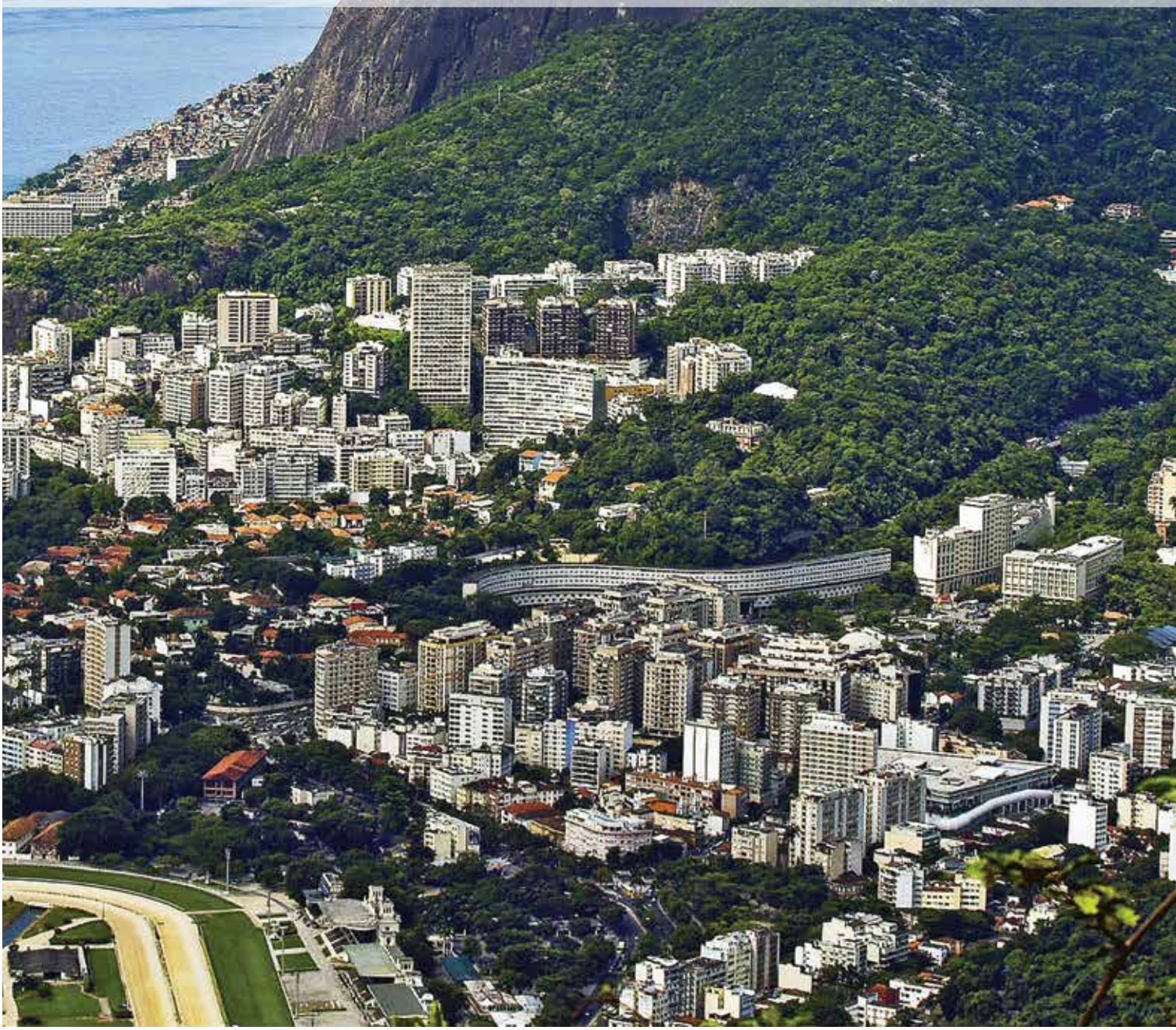
The conclusions and recommendations of the WGs were consolidated and served as the basis for the conclusions presented on the third day of the laboratory.

3.3.3. DAY 3 - **Plenary Session**

To close the third day of the laboratory, a plenary session was held with participants with advanced technical knowledge and relevance in the local scenario of energy efficiency in buildings.

The debate, open to a selected public, presented the conclusions and recommendations of the Technical Committee for encouraging energy efficiency in buildings actions in the city of Rio. The plenary session was held in the auditorium of one of the headquarters of the National Development Bank (BNDES), a project partner, in the city of Rio.

4 The market for Energy Efficiency in Buildings (EEB) in Rio de Janeiro



Current energy consumption scenario

Rio de Janeiro is home to one of the main economic hubs in Brazil. In 2013, the municipality accounted for approximately 6% of the national GDP[12] and for the consumption of 17,476,913 MWh[13] of power - or 3.8% of the country's total electricity consumption that year.[14]

The energy generation mix of Rio de Janeiro is predominantly from hydroelectric source and, consequently, the city has low greenhouse gas emissions, due to its relatively clean energy consumption. However, as a result of the national water crisis - observed since 2010 in the country - this scenario of low emissions has changed, due to an increase in the use of oil-fired thermoelectric plants for generating electricity as a substitute for hydropower.

With respect to the market of seals and certification, this has obtained timid results with regard to existing buildings and the national potential for new construction. The Brazilian regulations for energy efficiency in commercial, public and service buildings, as well as residential buildings (RTQ-C and RTQ-R[15], respectively) have been applied voluntarily by the construction sector and by owners of building projects. However, as of June 2014, all new federal public building projects must be developed or contracted under mandatory compliance with the National Seal of Energy Conservation (ENCE) Class "A" for buildings, that is, the maximum level of efficiency (Normative Instruction No. 2 of June 4, 2014 of the Ministry of Planning, Budget and Management - MPOG). This is expected to boost the market for energy efficiency in buildings certifications, both for this Ordinance as well as for the international LEED[16] and AQUA[17], certificates, which currently do not have a significant market share. Up to 2017, 61 LEED certifications, 33 AQUA certifications and 14 *PBE EDIFICA* seals were granted in the city of Rio de Janeiro.

In addition to these certificates, in 2012, the city of Rio de Janeiro developed a building sustainability certification called *Qualiverde*, aimed at encouraging projects that include sustainable actions and practices to reduce environmental impacts. Conceived by the municipal government and created by Decree No. 35.745 of June 6, 2012, *QUALIVERDE* is a voluntary certificate of compliance that establishes requirements for water management, energy efficiency and building design. As a building enterprise fulfills the stipulated criteria, its score is calculated and, finally, its classification of energy efficiency and degree of sustainability is granted (RIO DE JANEIRO, 2012).

As a way to stimulate its adoption, the system provides for the granting of exemptions and discounts on municipal property taxes (*Imposto Predial e Territorial Urbano - IPTU*) and property sales taxes (*Imposto de Transações de Bens Imóveis - ITBI*) for the purchaser of the property and ISS (Tax on Services) during construction, according to the classification of the building project. The more sustainable the building, the bigger the discount.

[12] IPP and IBGE data 2014.
[13] EPE, 2013.
[14] EPE, 2013.
[15] Ordinance No. 372, dated September 17, 2010, regarding the Technical Regulation of Quality for the Energy Efficiency Level of Commercial, Services and Public Buildings (RTQ-C) and Ordinance No. 18, of January 16, 2012 concerning the Technical Regulation of the Quality for the Energy Efficiency Level of Residential Buildings (RTQ-R).
[16] LEED (Leadership in Energy and Environmental Design), is a sustainable construction certification in operation since 1998, designed and awarded by the US Green Building Council (USGBC), according to criteria for resource rationalization (energy, water etc.) met by buildings.
[17] The AQUA-HQE certification is an international certification of sustainable construction developed from the French certification Démarche HQE (Haute Qualité Environnementale) and granted in Brazil exclusively by the Vanzolini Foundation.

However, the approval and feasibility of *QUALIVERDE* on a larger scale in the municipality depends on the approval of the City Council. The project, proposed in 2010, has been held up in the Council agenda for nearly seven years.

Estimated Energy Efficiency Potential

Both the current stock of constructed buildings and new buildings have great potential for energy conservation and energy generation using renewable solar energy, which is not being adequately exploited. During the widespread energy crisis of 2001, which became known in Brazil as the "Blackout," the consumption of electricity decreased, and the perception of value of this commodity increased.

Today, there is enormous potential for energy conservation programs for small residential and commercial buildings, but this potential is distributed over a large number of buildings, and depends on awareness campaigns and coercive measures for its implementation.

The municipality of Rio de Janeiro accounted for 31% of all air conditioners sold in Brazil in 2014, according to the Brazilian Association of Refrigeration, Air-Conditioning, Ventilation and Heating (ABRAVA[18]). Air conditioning, as we know, is energy-intensive and, therefore, together with lighting, represents great potential for improving energy efficiency. However, this potential has not been taken advantage of, due to a lack of mandatory or more stringent regulations, and the lack of perceived value of EEB by the market. There is the PROCEL Seal for air conditioners, which could persuade the consumer market to opt for more energy efficient appliances, and not just lower purchase cost. However, due to an absence of practices and policies that mutually attend the interests of consumers, the production chain, educational institutions and utility companies, this kind of purchase is not sufficiently informed.

Building Sector

RESIDENTIAL BUILDINGS:

Although the residential sector accounts for the largest constructed area - 361.5 million square meters (IPP, 2013) - and has lost the lead in absolute consumption to the commercial sector, there are no studies that analyze the level of energy consumption, by area, for the different residential typologies.[19] Residential consumers are classified by utility companies in consumption bands of kWh/month. Housing units that consume less than 80kWh per month and those that are in the Federal Government's Register of Social Programs (*Cadastro Único de Programas Sociais*), with consumption up to 200 kWh per month, receive a discount on their energy bill.

There was an increase of approximately two million square meters of new constructed area per year in the years 2012, 2013 and 2014 in Rio de Janeiro. In 2010, the Energy Research Company (EPE) revealed that the residential sector in Brazil could save the equivalent energy of a 7,500 MW hydroelectric plant. The same study also showed that electricity consumption could be reduced by approximately 4.1% for this sector in the period from 2010 to 2019, considering the maintenance of the historical dynamics of the previous period.

[18] www.abrava.com.br

[19] The residential typologies are Townhouse, Two-story house, Bungalow, Loft, Appended residence, Irregular expansion of existing residence, Flat, Kitchenette, Studio Apartment, Apartment and Villa

COMMERCIAL BUILDINGS:

The commercial building sector in Rio de Janeiro accounts for 21.7 million square meters (IPP, 2013). Between 2012 and 2014, the sector grew by approximately 750,000 square meters per year, or approximately 4% per year.

In contrast to what occurs in the residential sector, that still have little studies about, there is a considerable number of studies, research papers and publications on the commercial buildings sector. However, despite the varied composition - including administrative buildings, schools, shopping malls, clubs, libraries, museums, retail stores, bars and restaurants - most studies focus on large commercial buildings, neglecting small and medium sized buildings.

INDUSTRIAL BUILDINGS:

It has been shown that consumption in industrial buildings has been declining since 2008 (EPE, 2010). This sector represents 2.5% of the constructed area in Rio de Janeiro. The estimation of energy efficiency for the sector is directly dependent on the division by industrial segment, given the nature and consumption needs and patterns of each type of industry.

What works well

Rio's construction industry has grown significantly in recent years, driven by investments to prepare the city's infrastructure for the World Cup in 2014 and the Olympic Games in 2016. In this context, the buildings directly involved received financial incentives, such as BNDES *PróCopa Turismo*, for hotels classified as "A" under RTQ-C, and the stadiums and sports centers granted seals. Other lines of investment, such as BNDES PROESCO (support for energy efficiency projects), were also created.

The country has financing lines for energy efficiency amounting to R$ 400 million available, but only 30% of this amount is used by companies, due to the bureaucratic obstacles to obtain financing faced by large and small companies, as confirmed in a study by CEBDS[20]. The funds can also be obtained through financing lines not restricted to energy efficiency, but applicable to projects to increase efficiency in consumption in the industrial and commercial sectors, generally offered by BNDES, commercial banks and regional development agencies.

In addition, as previously mentioned, the country has EEB[21] regulations for Commercial, Public and Service Buildings (RTQ-C) as well as Residential Buildings (RTQ-R).

[20] *Destravando o financiamento à eficiência energética no Brasil, 2016*. Available for download at: cebds.org

[21] Technical Regulation of the Quality of Energy Efficiency Level of Public, Commercial and Service Buildings, published by MDIC ordinance No. 163, on 08/06/2009. www.pbeedifica.com.br.

5 Analysis and Recommendations

Based on the insights gained from the stakeholder interviews on the first day of the laboratory, and the technical discussions led by experts on the second day, a group of members of the Technical Committee undertook to synthesize the main barriers identified and the suggested solutions to overcome them.

These proposals were further analyzed and validated by the technical committee. Finally, during the plenary session on the third day of the laboratory, the proposals were presented in a wide-ranging debate, open to invited guests.

The proposed solutions are actions that seek to overcome the identified barriers and, thus, make the increase in energy efficiency in buildings feasible. The execution of the actions is divided among the main macro-themes and serve to order the implementation of the improvements. In this way, it is possible to consolidate actions in broad fields of action and coordinate the development of energy efficiency.

On the following pages, we will analyze the four EEB round table topics that were presented for discussion by the stakeholders in Rio de Janeiro. Following that, we will analyze the main barriers, recommendations and the mapping of the targets for their removal, based on the interviews conducted during the EEB Lab.

For each topic, detailed below, the four main areas of action to be undertaken by their respective transformation agents were proposed. The topics discussed were:

1. Knowledge and perception of value;

2. Capacity-building of the workforce;

3. Investment and financing;

4. Public policies and regulation.

These actions are of great relevance for the evolution of energy efficiency in buildings in the city of Rio de Janeiro. More than that, they are actions with considerable economic impact, taking into account factors such as the financial gains resulting from reductions in consumption and gains in efficiency, the activation of the various construction sectors, greater access to new financing lines etc.

The main points identified in the interviews:

INCREASED AWARENESS AND PERCEPTION OF THE BENEFITS OF EE FOR THE MARKET;

- Perception of the value of the benefits of energy efficiency is lacking, especially among the public.

- *PBE Edifica* (a type of labeling) was a step forward for public awareness in general.

- The University should provide day-to-day applied science in partnership with the municipality, industry and the construction sector.

- It is advisable to integrate the different actors involved in EEB into a market-oriented reference center, geared toward productive relations, with the involvement of the university, industry and the construction sector.

IMPROVEMENTS IN THE CAPACITY-BUILDING OF THE WORKFORCE;

- The University, in partnership with the municipality and class entities, could provide short courses for the training of technicians and professionals.

- SENAI, SEBRAE and the University could train professionals in the construction sector.

SOLUTIONS FOR FINANCING ENERGY EFFICIENCY IN BUILDINGS;

- The benefits of EEB must also be translated into direct financial returns.

- There is a lack of synergy between the drivers of decision-making in EEB.

- The benefits of EEB investments are divided. Analysis should be undertaken to integrate these benefits to facilitate decision-making by borrowers.

- There is a lack of integration and clarity in the access to financing.

NEED FOR PUBLIC POLICIES AND REGULATION.

- Changes in the Law 8.666[22] are recommended so that the author of the design can monitor the construction work. In addition, it is important to review the bidding process at the level of the basic design (blueprint), given the precariousness of the information provided in them.

- It is necessary to review, disseminate and implement the municipal government's *Qualiverde* certification. The financial advantages for the owner under *Qualiverde* are not clear.

- It is necessary to review the specifications to include new compositions related to Energy Efficiency in Buildings.

- Studies on the potential of energy conservation in the residential and commercial sectors for scenarios that include new policies, as well as the dissemination of information aimed at positive competitiveness, is recommended.

- It is necessary to obtain large-scale data on the consumption of electricity in commercial units and their areas for the dissemination of benchmarks for consumers and to support studies on energy conservation potential.

[22] Law 8666 of June 21, 1993 establishes general rules on public tenders and administrative contracts related to construction and services, and even publicity, purchases, liens and leases within the scope of the Powers of the Federal Government, States, Federal District and Municipalities.

Topic 1 Knowledge and perception of value

One of the most basic ways to develop energy efficiency actions is by disseminating information about their many benefits - from economic gains and thermal comfort to positive impacts on the climate. Awareness of these advantages is a basic precept for seeking investments, materials and techniques for efficiency. However, from the interviews conducted on the first day of the laboratory, it was concluded that there is a huge lack of awareness of these benefits among the various players in the construction market in Rio de Janeiro:

MAIN CONCLUSIONS:

- **LACK OF KNOWLEDGE AND AWARENESS**
  The interviews demonstrated that there is little awareness, on the part of the construction market and society at large, with regard to what energy efficiency is, and its benefits. This lack of knowledge is reflected in the lack of interest on the topic, and these negative impacts from both the supply and demand for more efficient buildings. There is a tendency to "continue building as it has always been done," since it involves fewer business risks.

- **INADEQUATE COMMUNICATION CONCERNING ACCESS AND WAYS TO IMPLEMENT EE**
  There is no comprehensive policy in Brazil to encourage and promote actions for energy efficiency. There is little knowledge and interaction between the various sectors of the market and society. National awareness campaigns are limited to encouraging the reduction of energy consumption and are more common in times of energy crises - as seen in 2001 and between 2014 and 2015, due to the water crisis, which affected the levels of the reservoirs of hydroelectric dams. Incentive policies are left to the municipalities and states, and are inadequately disseminated.

- **PERCEPTION THAT ALTERNATIVES ARE EXPENSIVE**
  The construction market and society in general have the misconception that improvements in energy efficiency greatly increase the final price of buildings and homes. Thus, developers and builders do not incorporate these improvements, since they believe that end buyers will not accept paying more for a more efficient building - even if this difference in price can be offset in the medium and long term. Research shows, however, that more efficient buildings are only 10% more costly, on average, and, in many cases, these buildings may even be cheaper than conventional buildings.

- **LACK OF PRICING METHODS AND TOOLS**
  The construction market is deficient in tools and techniques for pricing the benefits of energy efficiency, resulting from the current "fragmentation" of initiatives for the development of energy efficiency. The main certificates attesting to energy efficiency in Brazil and Rio de Janeiro are Breeam, Casa Azul (CAIXA), ACQUA, LEED, *PBE Edifica* and the Selo Procel Edificações.

- **LACK OF RECOGNITION OF THE INDIRECT BENEFITS**
  In general, the local market in Rio de Janeiro values only the direct and more easily quantifiable benefits of energy efficiency - such as reducing energy consumption, water consumption, and the consequent savings. The intangible and indirect advantages of energy efficiency are seldom, if at all, considered, such as the reduction of environmental impacts in the chain, resilience etc. There are also wasted opportunities in the private sector to take advantage of these benefits as added value for business and products.

RECOMMENDATIONS

The work of the Technical Committee during the laboratory revealed that, in almost every construction sector, there is difficulty in understanding energy efficiency in all its facets of benefits and advantages. Thus, the proposed solution should focus on a holistic approach to the issue. The actions should seek to inform and share good practices and basic knowledge among the various construction sectors and society. To this end, we recommend:

Topic 1 Knowledge and perception of value

- Identify the drivers to promote awareness among the agents involved in decision making in favor of the implementation of energy efficiency;
- Create communication material that presents intangible elements/externalities that increase the competitive advantage for adopting energy efficiency in buildings, including its multiple benefits;
- Map and develop campaigns targeted to the various segments of the construction market aimed at disseminating knowledge about the benefits of energy efficiency;
- Communicate success stories in the application/use of energy efficiency actions to reinforce their benefits;
- Structure different means and forms of communication for each market target public and for each media used;
- Communicate the advantages and ways to comply with the certifications currently in the market;
- Develop campaigns and incentive actions for energy management in buildings, including technological and bioclimatic architectural approaches and considering the behavior of the population;
- Demystify the high cost of energy efficiency with adequate communication of the benefits of its implementation, as well as develop attributes that promote compliance for each target public;
- Seek closer ties with city hall, taking advantage of IN No. 2/2014 of the MPOG, in order to propose the incorporation of energy efficiency among the guidelines for the resilience of the city, increasing the strength of the relation between both initiatives;
- Sensitize developers and builders to include the perspective of the life cycle of the materials used in construction, aimed at making energy efficient buildings viable;
- Provide incentives for the construction industry and use the energy efficiency perspective as a way to combat climate change by incorporating it into its marketing strategies for products and services.

Topic 2 **Capacity-building of the workforce**

MAIN CONCLUSIONS

The consulted agents presented the current situation of labor, in relation to EEB, as an important barrier, mainly due to the lack of professional training at different levels, the lack of an integrated design concept (the entire life cycle of the building) the lack of motivation among professionals to adopt EEB and the cost of existing training, which is still high.

RECOMMENDATIONS

Recommendations for addressing the current situation of labor training include:

2.1 Establish a commission to create a project of short-term courses in EEB for professional updating:

- At the project level
- At the practical/operational level
- At the management level

2.2 Reinforce the compulsory inclusion of EEB content in the basic curriculum at the undergraduate level for new professionals;

2.3 Create a reference center for the fostering of actors involved with EEB.

Topic 3 **Investment and financing**

MAIN CONCLUSIONS

Financing for EEB has been identified as an important barrier. Stakeholders reported that, in addition to the lack of financing lines for small and medium-sized projects, there is a lack of knowledge about the financing currently available.

The adoption of financing mechanisms with split benefits and liabilities, which have shown positive results in international experiences, could represent an alternative to the current scenario in which potential beneficiaries and financial institutions choose not to participate. However, the lack of familiarity with this type of mechanism among the actors is another barrier to be overcome.

The lack of standardization when presenting energy efficiency projects to the funding agencies and the lack of synergy were also identified, due to the fact that the various actors do not work in a unified manner.

RECOMMENDATIONS

Recommendations to address the current situation regarding energy efficiency financing in buildings are:

3.1 Create discussion forums involving financing agencies and other stakeholders;

3.2 Develop a user-friendly online platform, allowing for access to information on available funding lines for EEB projects;

3.3 Sensitize and clarify the market on the guarantee mechanisms, especially the EEGM (*Energy Efficiency Guarantee Mechanism*);

3.4 Promote a local program in the municipality to substitute equipment for ones with greater potential for energy efficiency (for example, air conditioners);

3.5 Develop specific EEB incentive mechanisms between City Hall and International Financing agencies for end users;

3.6 Systematize energy efficiency standards for access to funds and financing.

Topic 4 **Public Policy and regulations**

MAIN CONCLUSIONS

Regarding public policies and regulations, it should be noted that in Rio de Janeiro there is a regulation dedicated to encouraging the construction of more sustainable buildings, called *Qualiverde*, which contains many elements to encourage energy efficient buildings.

Stakeholders noted that the transparency of information on the indicator of electricity consumption (kWh/m^2), communicated in energy bills, would be very productive, as it would encourage the population to search for more widespread competitiveness. To do this, the constructed area of buildings should be provided to the electricity utility. Another comprehensive tool would be the municipal Building Code, which could incorporate energy efficiency in its requirements.

RECOMMENDATIONS

For the current situation of public policy and regulations, we recommend:

4.1 Qualify the *Qualiverde* municipal regulation, which should have greater interaction with *PBE Edifica*;

4.2 Proving transparent “energy consumption per square meter information” for individual consumption and the average of the region so that consumers can compare and interact with their contact network to improve individual participation and awareness;

4.3 Include content with a focus on sustainability in the Building Code;

4.4 Create performance standards for non-residential buildings;

4.5 Review the Set of Specifications of the municipal government of Rio de Janeiro (PCRJ).

Roadmap to transform Energy Efficiency in Rio de Janeiro

01 Topic 1
Knowledge and perception of value

Work Area	Proposals
1.1. Lack of knowledge and awareness about energy efficiency in buildings;	1. Map and develop campaigns targeted at the various segments of the construction market for the dissemination of knowledge about the benefits of EE; 2. Structure different media and forms of communication for each target public in the market and for each media used;
1.2. Lack of communication on how to find and implement energy efficiency actions, or how to take advantage of existing options and programs (certifications, programs, incentives);	3. Identify the drivers to promote awareness among the agents involved in decision making to implement energy efficiency; 4. Communicate the advantages and ways of complying with the certifications available in the market;
1.3. Perception of energy efficiency as an expensive alternative;	5. Disseminate success stories in the application/use of energy efficiency actions to reinforce their benefits; 6. Demystify the high cost of EE with adequate communication on the benefits of implementing EE, as well as developing attributes that promote compliance among each target public;
1.4. Lack of, and ignorance of, methods and tools for quantifying and pricing energy efficiency benefits in buildings;	7. Develop campaigns and actions to encourage energy management in buildings, including a technological and bioclimatic architectural approach and considering the behavioral aspect of the population; 8. Sensitize developers and builders to include the perspective of the life cycle of materials used in construction to make energy efficient buildings viable;
1.5. Little understanding of the intangible benefits of energy efficiency improvements in buildings;	9. Create communication material that presents intangible elements that increase the competitive advantage for adopting EE in buildings, including a perspective of its multiple benefits; 10. Work closer with City Hall, in order to propose the incorporation of EE in the guidelines aimed at the resilience of the city, strengthening the relation between both initiatives; 11. Encourage the construction industry sectors and use the EE perspective as a way to tackle climate change by incorporating it in their marketing strategies for products and services;

02 Topic 2
Capacity-building of the workforce

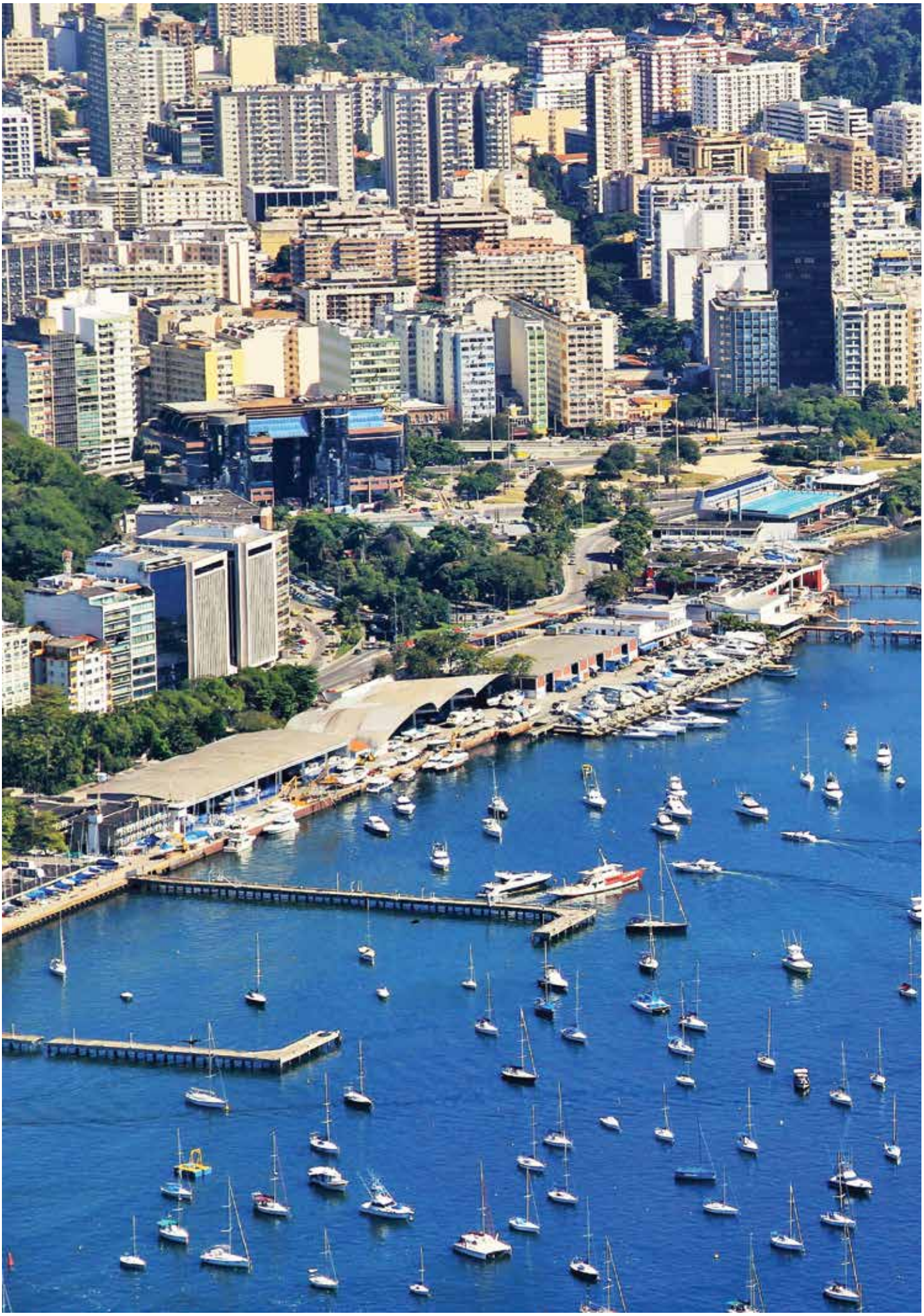
Work Area	Proposals
2.1. Create a commission to design short duration courses in EEB, aimed at refresh professionals;	12. At the project level (IAB, CAU, CREA, universities); 13. At the practical/operational level (Technical Schools, such as SENAI, SENAC and CEFET); 14. At management level (FGV, COPPEAD, IBAM and SEBRAE).
2.2. Reinforce the compulsory inclusion of EEB content in the basic curriculum at the undergraduate level for new professionals;	15. Propose meetings to discuss this topic with the Ministry of Education, class entities and educational associations (MEC, ABEA, CREA, CAU).
2.3. Create an integrated reference center for the actors involved with EEB to encourage synergy through physical proximity and interaction;	16. Propose meetings to discuss this topic and define needs (area) with City Hall, Light, PROCEL, universities, Petrobrás, Eletrobrás; 17. Propose a meeting to launch this idea with City Hall, Light, PROCEL, universities, Siemens, Petrobrás, Eletrobrás, ABESCO, INTRAL, Sitawi and other companies and class entities.

03 Topic 3
Investment and Financing

Work Area	Proposals
3.1. Conduct discussion forums between funders and other agents to disseminate information about credit lines;	18. Mobilize communication between investors and other actors, identifying existing lines and the needs of each actor.
3.2. Develop a user-friendly online platform that provides access to information on available financing lines for EEB projects;	19. Discuss the offer of financing lines for the research and development of a user-friendly online platform with FAPERJ and City Hall to provide access to information on financing lines available for EEB projects; 20. Promote interaction between the actors developing the user-friendly platform and the financiers to make the content available.
3.3. Educate the market about the guarantee mechanisms, especially the EEGM;	21. Engage ESCOS on the use of guarantee mechanisms to make EEB projects feasible; 22. Bring together financing institutions to develop communication material on guarantee mechanisms.
3.4. Promote a local program in the municipality to substitute equipment for more energy efficient ones (air conditioning, refrigeration, water heating and lighting);	23. Bring together public and private companies interested in developing a rebate policy (City Hall, Light, OSRAM, Philips, ABRAVA, Carrier and Eletrobrás).
3.5. Develop specific EEB incentive mechanisms for end users involving City Hall and International Funders;	24. Bring together City Hall and international funders (e.g. IDB, IFC) to map initiatives with greater EEB potential for the city and discuss financing solutions.
3.6. Systematize energy efficiency standards for access to funds and financing.	25. Bring together certifying organizations and financial institutions to discuss the benefits and challenges of the standardized adoption of the existing certifications in their financing lines.

04 Topic 4
Public policy and regulations

Work Area	Proposals
4.1. Qualification of the *Qualiverde* municipal regulation, which should have greater interaction with *PBE Edifica*;	26. Elaborate document requesting integration of *Qualiverde* and RTQ (CEBDS); 27. Audience with key people at the Rio City Hall - PCRJ (PROCEL, CEBDS, Secretary); 28. Officialize commitments with the responsible entity for program coordination; 29. Formalize a Working Group for the improvement of *Qualiverde*.
4.2. Provide transparent information (energy consumption per square meter) to engage consumers;	30. Formulate application and project for the Coordinator of the Low Carbon Program PCRJ (CEBDS and MMA); 31. Bring together technicians from Light and PCRJ to study their respective databases and evaluate how to coordinate the data (UFF, IPP, Municipal and Light Technicians); 32. Bring together Light and PCRJ to verify the possibility of providing the data of the units (managers); 33. Establish priority segments to start the implementation of data transparency (public, commercial and residential consumers).
4.3. Include content with a focus on sustainability in the Building Code;	34. Bring together technicians to discuss and elaborate the content (IBAM, City Hall, universities).
4.4. Create Performance Standards for non-residential buildings;	35. Forward request to ABNT and other entities; 36. Bring together technicians to discuss and elaborate the content (IBAM, City Hall, universities, CAU, CREA).
4.5. Update Set of PCRJ Specifications	37. Meetings with key people at PCRJ.



APPENDIX

The WBCSD EEB 2.0 Project

In response to climate and development challenges in the construction sector, the World Business Council for Sustainable Development (WBCSD) initiated the cross-sectoral project for the Energy Efficiency in Buildings (EEB) industry. During the first phase, between 2006 and 2010, the project sought to develop greater understanding and knowledge about the challenges and opportunities in the global construction sector.

The first achievement of the project was the launch of the "Facts & Trends" report, a summary document that combined the results of the research conducted at the time with the knowledge gained from dialogues, workshops and forums held with the most relevant stakeholders. The report also included extensive and revealing market research, which measured these actors' perceptions of sustainable buildings around the world.

The second milestone of the project was the launch of the second report, "Energy Efficiency in Buildings: Transforming the Market," published in 2009. The report is based on a unique simulation model that analyzes the energy use of thousands of building types and millions of new and existing buildings, both commercial and residential. This model shows how energy use in buildings can be reduced by 60% by 2050, which is essential for meeting global climate change targets. However, this target will require immediate actions to transform the construction sector.

Finally, the EEB project also developed a roadmap outlining the main short and medium term actions for the seven groups that can contribute to meeting the challenge, ranging from investors to government officials. The roadmap is an addendum to the main report, "Transforming the Market."

For more information, visit:
http://www.wbcsd.org/work-program/sector-projects/buildings/eeb-first-phase.aspx

THE WBCSD VISION FOR 2050: "9 BILLION PEOPLE LIVING COMFORTABLY WITHIN THE RESOURCE LIMITS OF THE PLANET IN 2050"

As the horizon of a timetable up to 2050 is too far away for companies to effectively plan, the WBCSD launched the **Action 2020** initiative, which identified priority action areas for business, based on scientific facts and social trends. A social "must-have" was defined for each priority area that business actions should seek to achieve by the year 2020.

The *Energy Efficiency in Buildings 2.0* Project will contribute to the "must-haves" related to global climate change, through a partnership with the member companies of the project. The goal is to achieve a sharp reduction in the energy consumption of new and existing buildings.

THE WBCSD CLIMATE CHANGE "MUST-HAVES"

With the objective of limiting global temperature increase to 2°C above pre-industrial levels, the world must have, by the year 2020, energy, industry, agriculture and forest systems that:

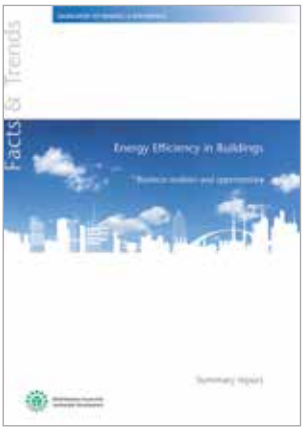
- Meet the society's development needs;
- Promote the structural transformation needed to ensure that cumulative net emissions do not exceed one trillion metric tons of carbon; and that there is a peak of global emissions by 2020 in order to maintain a target on a viable scale*;
- Become resilient to anticipated climate change.

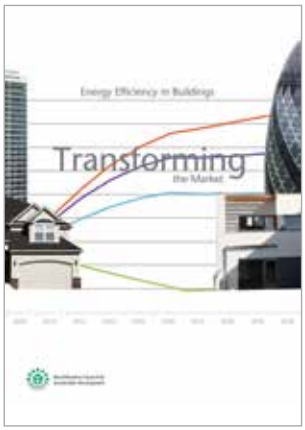
* Anthropogenic CO2 emissions at pre-industrial levels, as described in the IPCC Working Group's Fifth Assessment Report. One trillion metric tons of carbon = 3.67 trillion metric tons of CO2.

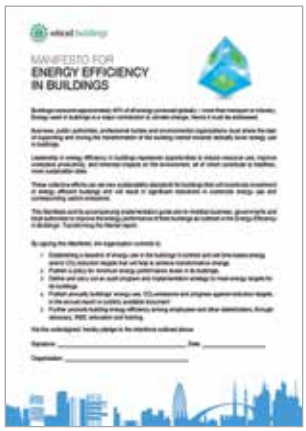
THE CEBDS CLIMATE CHANGE "MUST-HAVES"

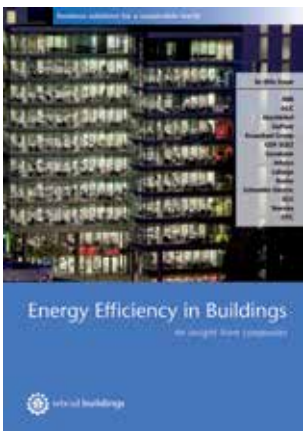
To contribute to the internationally established goal of limiting global temperature increase to 2°C above pre-industrial levels, Brazil should, as a priority, work to:

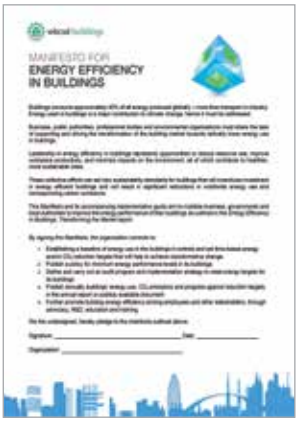
- Increase the share of renewable energies in the national energy mix to 50%;
- Significantly reduce emissions from agriculture and livestock;
- Achieve zero net deforestation in all Brazilian biomes and improve the control and monitoring systems;
- Increase the volume of investments and the number of projects for the low carbon economy;
- Identify, propose and implement adaptation strategies to increase urban resilience;
- Diversify the matrix of cargo and passenger transport and promote sustainable mobility.











As part of the EEB project, the WBCSD decided to issue a *Manifesto for Energy Efficiency in Buildings* for all its members, inviting them to take voluntary measures. By signing the Manifesto, companies continue the dialogue and send a strong message to the market, stakeholders and employees.

The Manifesto and the document complement the Implementation Guide, and detail five actions to be taken by companies:

1. Create a standard for the company's commercial buildings and establish energy and/or CO2 reduction targets aligned with transformational changes;

2. Publish a business policy establishing minimum levels of energy performance for the company's commercial buildings;

3. Define and develop self-auditing programs and implement strategies to achieve the efficiency targets set for their commercial buildings;

4. Disclose information on energy consumption, CO_2 emissions and progress made toward reduction targets in the company's annual corporate social responsibility report or in a similar report;

5. Foster the promotion of energy efficiency in buildings among suppliers, employees and other stakeholders through advocacy, marketing activities, research and development, education and training.

More than 140 member companies, non-members and regional partners have signed the Manifesto. For more information on the *WBCSD Energy Efficiency Manifesto* visit: http://www.wbcsd.org/work-program/sector-projects/buildings/eeb-manifesto.aspx.

In 2014, the WBCSD released two publications describing the successes and challenges of companies in implementing the proposed actions in the Manifesto:

Insight from companies, in April 2014, e ***A call to action***, in September 2014.

In December 2015, a toolkit for Energy Efficiency in Buildings was launched - a web guide for organizations for planning and initiating energy efficiency programs. The guide focuses on market cases that illustrate best practices adopted by companies.

www.eeb-toolkit.com

For more details, visit the WBCSD website at: http://www.wbcsd.org/buildings.aspx

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PROJECT LEADERS

François Thueux	LafargeHolcim
Frederic Billon	LafargeHolcim
Bill Sisson	Siemens
Brenda Ruhle	LafargeHolcim
Thiago Andrade	LafargeHolcim

WBCSD AND CEBDS

Ana Carolina Avzaradel Szklo	CEBDS
Raquel Souza	CEBDS
Tatiana Araujo	CEBDS
Raquel Bonelli	CEBDS
Delphine Garin	WBCSD
Roland Hunziker	WBCSD

TECHNICAL COMMITTEE

Alexandra Maciel	MMA
Antonio Raad	Light
Carlos Murdoch	M++ Architectural Network
Cristiano Brasil	Midea Carrier
Estefânia Mello	Eletrobras
Francine Vaz	CTE
Gisele Saveriano de Benedetto	Ipiranga
Henrique Gobbi	Prátil
Henrique Paiva	Siemens
João Krause	Eletrobras
Ludimila Diniz	UNDP
Luísa Marinho	SECOVI RJ
Lydio Bandeira	Sinduscon-Rio
Myrthes Marcele Farias dos Santos	SEBRAE
Bruno Galfo	Schneider
Paulo Senra	Light
Pedro Rolim	SMU
Raymundo Aragão	Anima
Roberto Lamberts	CBCS/LabEEE
Roland Ulman	Siemens
Rosana Correa / Danielle Garcia	Casa do Futuro
Felipe Faria	GBC
Louise Lomardo	UFF
Maíra Macedo	GBC
Marcia Sakamoto	Siemens

World Business Council
for Sustainable Development

Maison de la Paix, Chemin Eugène-Rigot 2,Case postale 246, 1211 Geneve 21, Tel: +41 (0)22 839 31 00
wbcsd.org

Conselho Empresarial Brasileiro
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Brazilian Business Council for Sustainable Development

Av. das Américas, 1155, Grupo 208 | CEP: 22631-000 | Barra da Tijuca | RJ