

City Completion Report: Betim, Brazil

Local Renewables Model Community Network

July 2010







gtz

The BMZ commissions the GTZ to work worldwide to encourage sustainable development and international cooperation.

The Local Renewables project: a set of final reports

The **Local Renewables Model Communities Network** (Local Renewables project) was implemented by the ICLEI South Asia Secretariat in India, the ICLEI Latin America and Caribbean Secretariat in Brazil, the ICLEI European Secretariat for working with European cities and ICLEI's International Training Centre as global project manager.

This report is one element of a set of reports compiled after five years of working at the local and global levels. References to other reports and available case studies are made as well.

India

Bhubaneswar City Completion Report

- Case Study # 108: Pioneering RE and EE application in India's municipal health sector
- Case Study #109: Installation of energy efficient lighting at the Lord Lingaraj Temple

Nagpur City Completion Report

· Case Study # 110: Water sector audit enables efficient use of water and energy resources in Napgur

Coimbatore City Completion Report

• Case Study # 111: Reducing carbon emissions while improving Coimbatore's municipal public services

Country Completion Report for India

Brazil

Betim City Completion Report

- Case Study # 112: Solar heaters in low income housing: Energy and financial savings
- Case Study # 115 (Portuguese): Cemig leva Eenergia Elétrica elétrica chega à a comunidade de baixa renda com apoio do CRER Betim

Porto Alegre City Completion Report

 Case Study # 114 (Portuguese): Energia Solar é Incentivada em Lei sobre Compensação Vegetal em Porto Alegre

Country Completion Report for Brazil

• Case Study # 113: Stakeholder involvement groups for Local Renewables in Betim and Porto Alegre

Global

Global Completion Report including information on the European Resource Cities

- Case Study #104: Freiburg, Germany: Long-term strategies for climate protection in Green City Freiburg
- · Case Study # 116: Växjö, Sweden: Becoming Fossil Fuel Free with citizen and stakeholder involvement
- · Case Study # 117: Milan, Italy: Improving the district heating system with RE and EE

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Local Renewables project, Betim City Completion Report, July 2010

What we have achieved

May 2004: National governments from all over the world met at the International Conference for Renewable Energies Bonn 2004 to discuss how they could work together to promote renewable energy on the global energy agenda. ICLEI organised the local government input to this international conference, boosting local governments as strong allies in the process. Where Agenda 21 was translated into Local Agenda 21 and became a prominent world-wide approach, ICLEI's intention was to similarly develop **Local Renewables** as an implementation concept.

More than just a term, Local Renewables (LR) today is the vision of many cities and towns around the world - of strengthening and unifying their efforts, thereby creating a tangible contribution to the proliferation of renewable energy.

The roles, responsibilities, planning activities, implementation of actions, and even investments of local governments are extensive, and highly relevant to the generation and use of energy. The ambition of many cities and towns to move to clean, sustainable energy solutions is motivated by many different issues: sufficient and affordable energy for all, climate protection, climate change adaptation, local economic development, etc.

Local Renewables = renewable energy (RE) + energy efficiency (EE) + energy savings on the local level

ICLEI's definition of "Local Renewables" in short

A growing group of local governments have set targets and out-

lined roadmaps to achieve improvements – from very specific targets for a specific sector e.g. achieving 100% renewables for government operations by 2012 (Yarra, Australia), to highly ambitious targets for the whole community such as becoming a 100% fossil fuel free community by 2050 (Stockholm and Växjö, Sweden) or a CO_2 neutral city by 2025 (Copenhagen, Denmark). More typical approaches are incremental increases of renewable energy e.g. switching 4% of total energy consumption in the community to RE by 2010 (Beijing, China) or 10% by 2013 (Bilaspur, India).

Through the ICLEI Local Renewables Initiative, the intention is to strengthen, guide and support those local governments around the world which want to become leaders in the field, acting as model communities or beacons for their peers. We are proud that many ICLEI members are among the most advanced cities in the field of RE and EE, also that in many countries the collaborative work in ICLEI-led projects provides the impetus to unfold their potentials.

RE used to be considered a solution for rural energy challenges, or a hobby theme of the rich, high-tech focused Western world. Since the 2004 conference however, it has increasingly been seen as a viable energy solution for a wider spectrum of the global community, and an area for important investment in cities. Our ambition is to demonstrate and prove that Local Renewables not only make a great deal of sense in urban areas in both the Global South and Global North, but are key and vital for economic and sustainable development for all.

We sincerely thank the **German Federal Ministry for Economic Cooperation and Development (BMZ)**, (especially its representative Mr. Manfred Konukiewitz) which took up our proposal to support cities in developing countries as an official conference pledge for a project on "Local Renewables" at the Renewables 2004 Conference.

Thanks to the generous financial support by the BMZ and the helpful and motivating guidance of the **GTZ** as the managing agency for the Ministry, India and Brazil were selected as countries to launch a multi-year project designed to develop and support model communities. Special thanks are expressed to Dirk Aßmann and Marian Rzepka from the GTZ headquarters who have helped to develop and shape this project into a unique, high-impact action, representing a new approach

for German development cooperation and who gave us continuous support throughout the project.

Between November 2005 and June 2010, the city governments of Nagpur, Bhubaneswar and Coimbatore (India), as well as Betim and Porto Alegre (Brazil), were respectively supported by the ICLEI South Asia Secretariat in Delhi and the ICLEI Latin America and Caribbean Secretariat in Sao Paulo – assisting the audit of their energy needs, developing a LR strategy and policy, setting up action plans and starting to implement projects. These cities are all models for many more communities and are in contact with networks of satellite (observer) cities in the two countries. All **model communities** have opened Resource Centers for RE and EE and started to involve stakeholders in their activities, from the planning phase onwards.

In parallel, the European Resource Cities, including Malmö and Växjö (Sweden), Bonn and Freiburg (Germany) and Milan (Italy), supported the learning communities under guidance of the ICLEI European Secretariat in Freiburg. They offered advice, motivated change, provided relevant examples of policy and technology approaches, and shared reference projects with the Indian and Brazilian model communities.

With the project coming to an end, we leave a **multi-faceted legacy**: from baseline energy inventories, to new directions for energy policies developed by councils, energy teams in local administrations, stakeholder groups who meet regularly, and technology applications such as solar thermal systems providing stable hot water in hospitals. Local business see markets developing and citizens are learning about sustainable energy options for their daily lives, also recognizing that their councils are addressing stable, affordable and clean energy in the community.

We also leave useful case studies to guide other cities and towns plus city and country completion reports that document what can be achieved through such a project, a global completion report that records lessons learned and experiences made, as well as a public report to encourage many more to follow the examples of the LR model and resource communities.

A **network** of committed cities has been established, communities which have experienced – despite language barriers and travel challenges – that they all head towards a sustainable energy future, only made possible with a strong contribution from the local level.

There is also a legacy at the global level: We have established cooperation and networks between cities, and have improved the understanding among national and regional government representatives that strengthening the local level is a success factor for reaching their own goals¹.

ICLEI's involvement in the UN climate negotiations has helped to include LR in the global advocacy efforts and addresses governments on all continents. The cooperation with REN21 has led to the development of a **web portal** on Local Renewables (www.localrenewables.org), our "Local Renewables Conference" series in Freiburg and other cities brings interested and motivated city representatives together, and our regular contributions

¹ Within the project "Local Renewables Model Communities Network" the success is measured with 4 indicators, which had been developed at the project start in 2005. Therefore references to them are made in the text.

to the **Global Status Report on Local Renewable Energy Policies** have demonstrated that Local Renewables go from pioneering to mainstreaming.

We are pleased that many leaders who strive for a low carbon economy have understood the "local" message, and have intensified work between different levels of governments. Slowly but steadily, LR on the local level is becoming a theme of growing importance also for science, business and the media.

As project managers over a four and half year period, our sincere appreciation is extended to the local leaders and on-site implementers in the model communities, satellite cities and resource cities – people who share this vision and have contributed to make it a reality. Gratitude is also given to many colleagues in the various ICLEI offices² who have been helping cities and towns to establish "Local Renewables" policies and processes, and who have developed a set of very convincing arguments on the need for LR.

ICLEI is committed to continue and increase its efforts to promote Local Renewables, in particular through extending the "model cities in a model country" approach to more regions.

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³ Due to internal reorganization, the International Training Center, which had been the project manager for the last years, is transformed to the new ICLEI Capacity Center which keeps responsibility for the Local Renewables Initiative.

List of abbreviations

REEERC	Renewable Energy and Energy Efficiency Reference Center, also known as CRER
CEPD	Master Plan Executive Commission (Comissão Executiva do Plano Diretor in Portuguese)
CIGE	Internal Commission on Energy Management (Comissão Interna de Gestão Energética
CREA	Regional Council of Engineers, Architects and Agronomists
CRER	Centro de Referência em Energias Renováveis e Eficiencia Energética
EE	energy efficiency
FIEMG	Federation of Industries and Businesses of Minas Gerais
GHG	greenhouse gas
ICMS	circulation of goods and services tax
MCMV	Minha Casa Minha Vida
MoU	Memorandum of Understanding
PUC-MG	Pontificia Catholic University of Minas Gerais
RE	renewable energy
REEEP	Renewable Energy and Energy Efficiency Partnership
SG	stakeholder group (Grupo Consultivo – GC in Portuguese)
SWH	solar water heater

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1 Summary: The Local Renewables project in Betim

Local governments play a key role in promoting sustainable energy at a community level. They have a political mandate to govern and guide their communities, provide services and manage municipal assets. They have legislative and purchasing power that they can use to implement change in their own operations and in the wider community. Local governments can further play a role as a model in their region or country, showing how policies and local actions can be shaped to guide communities in the transition to a sustainable energy future.

The Local Renewables Model Communities Network (Local Renewables project) supports and strengthens local governments in their renewable energy and energy efficiency policies in the urban environment. The focus is on the roles and responsibilities of local governments as the driving force for innovation and investment in their communities. Thus, the project contributes to ICLEI's global Local Renewables Initiative.

The selected model communities show regional leadership by encouraging other cities to switch to local renewables by sharing their experiences and expertise. In India and Brazil selected model cities receive special support, due to generous funding from the German Federal Ministry for Economic Cooperation and Development and the GTZ.

In **Brazil**, this project was launched in two phases. During the first phase, Betim in the State of Minas Gerais became the first Model Community for renewable energy and energy efficiency in Brazil in **2005**, in this first stage co-funded by the British Embassy in Brazil (2005-2007).

For the purposes of this report, we will focus on the projects in Betim as a Model Community from 2008 onward when the Local Renewables project funded by the German Federal Ministry for Development Cooperation was extended to Brazil and Betim became an official project city next to Nagpur, Bhubaneswar and Coimbatore in India.

Although Betim has been active in the renewable energy field since 2005, this new phase and changes that occurred in 2008 led Betim to establish a new internal strategy that influenced their work plan as well as determined a closer relationship with ICLEI who is responsible for the international Local Renewables project.

Since 2008, Betim's work can be characterized through the following strategic approaches

- Continuation of the promotion of RE and EE despite the change of the city leadership;
- Strengthening the LR Resource Center CRER;
- Anchoring RE and EE in local laws, especially on solar water heaters and building codes, as well as inserting the RE promotion into the local master planning process;
- Focus on solar water heaters as a key source of electricity consumption;
- Starting a new "waste to energy" priority as waste management is on the city agenda in any case;
- Documenting and monitoring of achievements of past decisions and activities on RE, also as basis for extension and increase of respective policies;
- Using these local examples for influencing the national debate on SWH in social housing programs (Minha casa Minha vida).

Thus, through the LR project, Betim not only maintained but also extended its position as one of the leading Brazilian RE cities having an impact on the national debate and the development in further Brazilian cities.

2 Basic Information on Betim

2.1 Betim in brief

The municipality of Betim in the Brazilian state of Minas Gerais is located 30 km from the state capital Belo Horizonte, and is part of its metropolitan area. Its strategic location and easy assessibility has attracted businesses and industries searching for low transportation costs and fiscal incentives. These comparative advantages have been mainly sought by the automobile and petrochemical sectors since the beginning of the 1970's.

Betim's economic prosperity and the development of the municipality's industrial park has resulted in a considerable increase in population due to the migration of those searching for better living conditions and opportunities.

As a result of this trend the local environment has been strongly impacted. New industries and population growth are responsible for the majority of green house gases (GHG) emissions in the region, according to the GHG Inventory developed by the city with ICLEI's support in 2002. The growing contamination of the city's river and the increase of waste generation are also a result of this development.

Due to the above mentioned activities, energy consumption in Betim is extremely high (2,95 GWh/year). Therefore the development of the renewable energy sector is essential for the continuation of the city's development in a sustainable manner.

Population:	435,000 (2008)
Area of municipality:	360 sq km (2008)
Annual budget:	R\$ 1,151 billion (2009), equivalent to €521,000

2.2 Betim's role in the project

In 2002 the City of Betim joined the ICLEI Cities for Climate Protection Campaign (CCP). Under the framework of this campaign the municipality developed its own GHG Inventory and committed to stabilize and reduce its GHG emissions. It is in the renewable energy sector that Betim's work has been most succesful, mainly in regards to the use of solar energy as an energy source for low income communities. This work resulted in Betim being chosen as the first Brazilian model community of ICLEI's Local Renewables Initiative in 2005.

Over the years the city's involvement proved to be fruiful. The city administration took the lead in establishing long-lasting partnerships with relevant stakeholders which provided support for the project even in the face of change. After the 2008 municipal elections, the new administration decided to continue the city's work in renewable energy and energy efficiency and has taken more ambitious steps such as closely engaging the powerful industries in their city to incorporate sustainable energy policies and support the city in its work.

2.3 Staffing within the city government

One of the selection criteria for Model Communities is the commitment of the local government to allocate its own resources, including staff, office equipment and office or exhibition space. This allows the cities to build internal capacity that will remain when the more active participation of ICLEI comes to an end. Betim, just like the other Model Communities, has allocated staff capacity to the project, mainly through the Reference Center (CRER - Betim).

Throughout the Local Renewables project, since 2008, three full time municipal staff members and one part time intern were involved in the promotion of RE and EE, policy preparation, and the implementation of projects. The CRER was established under the structure of the Environmental Secretariat and its team report directly to the head of the Secretariat. Both the CRER team and the Secretary worked closely together with ICLEI staff and were responsible for the implementation of the project vis a vis the project funders.

For more information on CRER please see chapter 7.

2.4 **Project history in Betim 2005-2007**

The inception of the Local Renewables Model Communities Network in Brazil differs a bit from the project's roots in India. Before the project involving Indian and European cities commenced, staff of the ICLEI International Training Centre shared the LR Network proposal with ICLEI colleagues in Brazil, who submitted the idea to the British Government and were able to receive funding from the British Government's Global Opportunity Fund (now called the Strategic Program Fund) through the British Embassy in Brasilia in 2005. As their decision making process was quicker than the one in Germany, activities in Brazil were already underway when the LR Network project began in India and Europe.

During this initial phase, between 2005 and 2007, ICLEI staff in Europe, India and Brazil worked closely together to link the two sister-projects and make the most of the synergy among its participants. Thus, ICLEI Brazil was part of the project team even before the LR project had formally started in Brazil.

During the 2005 – 2007 period, ICLEI Brazil worked directly with the first Model Community, Betim. In that period, the following was achieved:

Network

• Established an initial strong and diverse Renewables Network in Brazil with the municipalities of Betim (MG), Porto Alegre (RS), Salvador (BA), São Paulo (SP), Belo Horizonte (MG) and Volta Redonda (RJ) and other project members in Europe and India.

Reference Center

- The reference center became operational in June 2006. Originally it was staffed with one person and beginning in January 2007 an additional staff person was allocated to the center in order to meet all of the demands;
- After 6 months of being operational Betim leadership signaled the importance of renewable energy in the city by moving the reference center to a larger and more public location;
- Activities for setting up the center have included setting up an advisory committee, developing an operational plan, and establishing a communication infrastructure within and outside the Local Renewables Network.

Capacity Building

• The organization of an international seminar in Betim that brought together more than 300 participants from the private, public and 3rd sector;

- The organization of trainings and information sessions in Betim's Reference Center on Renewable Energies and in other locations in the city such as the town fair;
- Participation of Betim staff in events in other cities and states and countries such as the technical visits to Petropólis (RJ), Freiburg (Germany) and Nagpur (India).

Policy and Project Work

- A multiple stakeholder approach to develop a solar energy policy was initiated and a bill was written;
- On 14 February 2007, the Mayor of Betim signed an internal regulation mandating that all vehicles purchased or contracted by the City are to be multi-flex unless there are reasons against it. (At the time such a policy was of great significance since multi-flex vehicles allow users to fill up with ethanol, gas or petrol.).
- As a result of the multi-flex vehicle policy, when new fuel contracts were being negotiated, Betim mandated that the City fleet would only use ethanol.
- During this phase, Betim began their most famous project to date, in partnership with the energy provider, CEMIG. The City began the installation of solar thermal panels in 1363 low-income houses, which provided considerable savings (*this project is discussed in section 8.1*).

Between 2007 and 2008 Betim continued with its renewable energy activities under CRER with limited support from ICLEI Brazil since the pilot project that funded ICLEI's participation came to an end in June 2007. During this period, ICLEI Brazil continued to be involved via the Center's stakeholder group. Once funding was secured from GTZ to jumpstart the project in Betim, ICLEI Brazil began to work more intensely again with the first Brazilian Model Community.

See also the Brazil country report.

3 Activities of Betim as a model community in brief

With the support of ICLEI and the GTZ, an Impact Chain was developed to help guide the activities of the model community. Based on this impact chain, Betim developed their work plan and activities based on the four indicators of success listed in the chart on the next page.

The indicators were determined by the proposal that was agreed to at the beginning of the project between ICLEI and the GTZ. At least on a monthly basis the City's Renewable Energy and Energy Efficiency Reference Center (REEERC or Centro de Referência em Energias Renováveis e Eficiencia Energética – CRER in Portuguese; in this report the Reference Center will be referred to as "CRER") staff and ICLEI representatives took stock of progress by updating the Impact Chain, determining which activities were finalized and developing next steps. This chart was displayed in the CRER and proved to be an inspirational visual tool as well as a guide to keep staff focused. It allowed project participants to visualize when planning or action was needed.

The chart below depicts CRER Betim's activities after it was last updated. Since this is a dynamic tool, changes in the activity section are continuous.

LR Network - Betim Impact Chain						
Indiantara						
Indicators						
At least four model communities (two in India and two in Brazil) have developed and approved politically, in a participatory multi-stakeholder process, a local energy strategy which gives a prominent role to energy efficiency and the generation and use of renewable energies.	At least two model communities in Brazil and two in India have established a competence centre for energy efficiency and renewable energies, and each has at least one qualified member of staff.	The proposals of each competence centre are adopted and implemented by at least two private (or local government) companies in each model community.	The model communities have been integrated into an international network of local authorities. Specifically, this means that the network has access to significant outcomes and experience via internet portals, and members of the network have personal working contacts to the other members, i.e. experience and findings are exchanged, and members know their network contacts on specific issues personally.			
	Line of	Mort				
	Line of	VVO ľK				
1. RE and EE Policies	2. CRER - Reference Center of Renewable Energy and Energy Efficiency	3. Renewable Energy and Energy Efficiency Projects	4. Strengthening of the international LR Network			
			Betim, Porto Alegre & ICLEI Brasil			
Solar Thermal Energy Policy	Workshops on How to Build Low-Cost Solar Water Heaters	Class on Energy Efficiency for Municipality Employees	Capacity Building on Networks (why and how) for cities			
Inclusion of text on Solar Water Heaters in the Municipal Building Code, and other legislation currently being reviewed	Round of debates and lectures on "Project Renew"	Collection and reuse of cooking oil	Convening Communities Model to share information on the installation of solar water heaters in the houses under the Program "My Home, My Life"			
Construction of low-income housing including solar water heaters through PAC, "My Home, My Life"	Environment Week - June 2010	Follow up on indicators / research Project Energia do Bem (Good Energy)	Exchange between São Paulo and Model Communities on legislation for Solar Water Heaters			
	Presenting CRER to the Municipality	Construction of biodigestors for generation of biogas to be used locally				
	Capacity Building on RE for arquitects	Installation of photovoltaic panels in the city parks				
	Seminar and Technology Exhibition on Renewable Energy and Energy Efficiency March 2012	Replicating the installation of solar thermal panels in low income communities - Parque do Cedro, in partnership with CEMIG				
	Lecture for Construction Companies under PAC on Solar panels, Heat Recovers, stoves					

Local Renewables project, Betim City Completion Report, June 2010

4 Citywide energy assessment / City energy report: Understanding Betim's energy usage patternspast, present and future

In order to know where best to invest time and resources, it is important to understand the needs of a city and where opportunities lie. Knowing the importance of having trustworthy information to feed into the Model Community's strategy and work plan, a consultant was hired by ICLEI to conduct a study on challenges and opportunities associated with renewable energy and energy efficiency in Betim. This study was so helpful in discovering relevant information and resources that both Betim and Porto Alegre have determined that they will update the study at least every two years.

Following are the steps that were taken to develop the "Study on Challenges and Opportunities in Renewable Energy and Energy Efficiency in Betim":

- development of an outline of the study which was approved both by ICLEI and Betim;
- broad research on RE and EE in Brazil and the world (its importance, what is available, basic definitions, existing laws and regulations) was done in order to convince readers of its importance;
- local research on state and municipal laws, master plans and others involved with RE and EE;
- development of a questionnaire and list of interviewees that was approved by ICLEI and Betim; and
- interviews with relevant stakeholders from all sectors.

Beyond identifying challenges and opportunities, the study also recommended further actions in accordance with the information that was researched. Recommendations in the following areas were given:

- education and outreach;
- financial incentives;
- policy development;
- political and structural aspects; and
- technology.

Since the beginning of the project, staff and political leadership have been working toward an update of their GHG inventory which is another important tool in identifying the city's energy needs and challenges. A GHG Inventory was developed in Betim by the city and ICLEI staff in 2003 with data from 2000 as a baseline year under the auspices of ICLEI's Cities for Climate Protection (CCP) Campaign. However, appropriate knowledge transfer was not completed by those who were involved and it has not been updated since. Thus, currently (in 2010) the city is researching how to best develop a new inventory in a manner that its results will not be lost and that appropriate permanent staff are trained to update it as part of their routine.

5 Policy development and target setting: Committing to energy reduction and setting reduction targets citywide

(Indicator 1)

In Betim the focus on policy development has been threefold, focusing on:

- solar thermal energy policy;
- policies on municipal building codes; and
- Minha Casa Minha Vida (My Home My Life) solar energy policy.

Local Renewables Project Indicator 1:

Formulation of an 'Energy Strategy' for Betim

Under the LR project, the first indicator of success involves the development and political approval, in a participatory multi-stakeholder process, of a local energy strategy which gives a prominent role to energy efficiency and the generation and use of renewable energy.

Although there are some difficulties in developing a full fledged policy since this is only done on the federal level, the Environmental Secretariat of Betim via CRER and its leadership is pushing for the inclusion of sustainable energy policies in the municipal regulatory instruments that are currently being reviewed. These instruments include building codes, the Land Use and Occupation Law, Land Division Law, Classification Road Plan, Postures Code and the Master Plan. This review will be an opportunity for Betim to not only formulate an energy strategy but also strengthen it by the inclusion of the issue in the other laws and plans. Thus far the process has been internal, only involving the Secretariat of Planning and will soon be open to other Secretariats.

Given this situation, CRER-Betim focused on a more specific strategy on solar thermal energy by developing a bill that mandates the installation of piping for solar water heaters in all new buildings. This is also being included in the building code currently under review. In addition, CRER's participation in the Master Plan Executive Commission has secured that all urban projects of great impact are being mandated to be solar thermal energy ready.



Picture 5: Solar panels in a housing estate in Betim

5.1 Betim's policies within the Brazilian context

One might ask why not develop policy that would cover both solar thermal energy (for the purposes of heating water) and photovoltaic (for the purposes of generating electricity). The answer is that Brazilian local governments have no authority to define their energy sources when it comes to the electricity grid. This decision is made at the federal level and may be only slightly influenced by local leaders, although there is a new, very recent movement to challenge this.

Betim focused its policy work in areas where they have direct influence.

We provide a broad overview of the current issues Brazil is facing in regards to energy that will become more and more relevant with the passing of time and merits the attention of the REEERC.

Brazil's Law n^o 12.187 approved in December 2009 created the National Policy on Climate Change (PNMC), which establishes voluntary goals for reduction in GHG emissions by 36,1% to 38,9% in relation to emissions projected for 2020. As a basis for the PNMC, the 2008 National Plan on Climate Change presents studies and national instruments to mitigate emissions across all sectors, including energy. It states that even though 45,8% of Brazil's energy is renewable, emissions from this sector can be cut through the substitution of carbon sources (usually used for heating showers during peak hours) for clean energy.

RE and EE face challenges: Although Brazil is the 5th biggest emitter of GHG in the world, this is due to Brazil's deforestation practices and not energy consumption as is mostly the case for the other top emitters. In fact, Brazil's energy production is considered to be relatively clean since its main source of electric energy is derived from hydro-power. However, there have been a number of studies declassifying hydro-power as a clean energy source since high amounts of methane and carbon dioxide are produced as a result of the flooding of reservoirs. In addition, hydro plants have been villianized by many since they force local communities to migrate, causing social and economic hardships to those who have been displaced.

The National Policy on Climate Change also foresees a Strategic Plan on Energy Efficiency aiming to reduce national energy consumption by 10% until 2030 (approximately 106 TWh (tera watt hours) through energy efficiency projects. Among these actions are incentives to use solar water heaters (SWH). It is foreseen that the installation of SWH will decrease the necessity for new hydroelectric plants. It is estimated that a **national SWH program** combined with other actions can reduce energy consumption during peak hours by 1,200 MW and represent a total cut of 2,500 GWh/year by 2015, which results in an annual reduction of 460,000 tCO2e.

Another issue to be pointed out is that Brazil's **energy consumption is drastically increasing** due to its economic growth and it is expected that hydro energy will no longer be able to meet increasing demands. In 2001 Brazil suffered a country-wide crisis when lack of rain led to low water levels in reservoirs which in turn resulted in a black-out. Since then the federal government has invested in several programs to diversify the country's energy sources, including wind energy and energy efficiency measures.

This decision on the federal level was of extreme importance to Betim which is a large consumer of electricity due to its large industrial sector. According to the chart below, Betim's annual consumption of energy per one thousand inhabitants is nearly double that of the country's consumption.





Another important reason to **focus on solar heaters** is that heating water is a huge consumer of energy. Approximately 6% of national electricity consumption is traced back to water heating that is in its majority used for showers since consumption of heated water in bathroom and kitchen sinks are not the norm. Since most take showers at the same time of the day, electric showerheads are responsible for 18% of electricity consumption during peak hours. This means that additional resources are solely invested in order to supply electricity for showers during these time slots. Usually the more polluting and expensive thermoelectric plants that run on oil, gas or coal are used at this time. On some level, or at least propagated by the electric showerhead industry, this equipment is being sold as a point of national pride since it is a homegrown invention that is used in about 73% of all Brazilian households.

Currently 12 million electric shower equipments are purchased annually in Brazil where as solar heaters only reach 300 thousand per year. Given these data, the motives to promote alternatives to electric water heaters are strong and if successful, such a policy would achieve great energy savings and a drastic reduction in GHG emissions.

5.2 Adoption of a solar thermal energy policy

Over the last years Betim has become as well known for its use and promotion of solar thermal power in public housing as it has for being an important industrial center. With the support of the state energy provider CEMIG, 1,356 solar thermal panels have been installed in Betim since 2005. Once the positive results and gains of such technology was made known, Betim has received visitors from all over the country and other nations to learn more about their experience.

One of these visitors was the Governor of the state who visited Betim with a delegation of municipal leaders from Minas Gerais to learn how their experience could be replicated elsewhere. It is safe to say that his decision made public in 2010 to install 15 thousand solar thermal panels in Minas Gerais was influenced by what he saw in Betim. This state policy was reported on in the April 2010 edition of the German periodical *Sun and Wind Energy*. Thus far the state has installed over 2,500 solar panels in over six cities.

Despite all of this notoriety, Betim has not yet approved a municipal law on the use of solar energy as other cities in Brazil have. Over 100 cities in Brazil have approved such policies. However it is important to note that only about 6 of these have actually implemented this law.

In short, the new policy under preparation in Betim forces the construction sector to install the piping needed for solar heaters into the structure of buildings. One of the most cited examples of such legislation is from the City of São Paulo in Brazil. São Paulo's legislation came into effect in 2007 and was based on Barcelona's solar energy law. In São Paulo's

case, the Environmental Secretariat established that all new buildings in the city containing four bathrooms or more must be solar-energy ready. This means that homeowners will not have to tear down walls to install the needed piping, an intrusive renovation considered to be one of the biggest drawbacks in the installation process. If the piping is made available by the construction company, future owners will only need to make an investment of about 2,500 BRL (€ 1,140) to purchase the solar panel and cover the installment costs. São Paulo defined the criteria of four bathrooms in order for the law to specifically be applicable to high-middle class families which have the means to pay for the equipment. Also, it is argued that if the higher classes use solar energy, other classes will follow suit, seeing it as a fashionable purchase.

The importance of approving such a policy would help to guarantee that Betim's initiative thus far would not be an isolated success story that may be forgotten over time, not deemed important by future administrations or considered mainly to be a social welfare practice geared towards low-income families. During the process detailed below, Betim determined that all new buildings in the city must be built solar energy ready, regardless of how many bathrooms. City officials believe that due to the city's positive experience thus far with solar energy and the popularity that sustainability is enjoying, a broader focus on all classes is not too ambitious. Such a policy would affect a larger part of its citizens in households of all income groups, commerce, industry, public administration and the third sector.

To help to make the case for such a policy, CRER staff conducted a research project (**survey**) to better understand the benefits as well as improvements needed in regards to the use of solar power for the purpose of heating water. The research project will be related later in more detail but it is worth noting here that the average consumption of electricity for a household of 4 persons was of 98 KW/month. After the installation of the solar panels consumption fell to 74 KW/month, representing a reduction of 24 KW per month. In financial terms, the bill which totaled 79 BRL (about \in 35) a month was reduced to 33 BRL (about \in 14) a month, resulting in monthly savings of 45 BRL (about \in 20) per family. Such a savings makes an enormous difference for these families that on average earn less than 1,000 BRL per month. With such positive results it is understandable why the research project also determined that practically all of those who were interviewed (98 percent) reported satisfaction with their solar heaters.



For more information on this survey, please see ICLEI case study # 112.

Picture 5.2: A resident shows the difference in her energy bill, before and after the installation of the solar water heater.

Once it was decided that the development of a solar thermal energy policy was a priority, the following steps were taken, starting in 2009:

- CRER staff first met with representatives of *Cidades Solares*, an initiative in Brazil that
 has supported cities to develop and approve policies that promote solar energy. *Cidades
 Solares* was involved in this movement since 2005 when it started its work with the City
 of São Paulo.
- Having understood the history of the movement and difficulties that they would face, city
 officials studied several solar thermal policies that had been approved in Brazil and
 elsewhere in order to develop their own bill. Their consultation included cities such as
 São Paulo, Porto Alegre and Belo Horizonte (all Local Renewable Network Cities).
- The bill was developed by staff at the Secretariat of Environment as well as staff from the Secretariats of Public Works and Planning.
- Once a first version of the bill was drafted, CRER staff circulated the bill within the Secretariats of Environment, Public Works and Planning for review.
- The bill was sent to the Vice Mayor in order to gain his support as a political ally. A
 response is still to be given. This is an important step since the Vice Mayor has a
 sustainable conscious and such a measure will need strong allies. For example a similar
 piece of legislation which had been introduced by a Council Member in June 2009 was
 vetoed by the Mayor's Office as unconstitutional.

It is understood that the course that this bill will run may be long and once it reaches the end of the process, it may not even be approved. For this reason, CRER is also working along other lines in order to build a legal framework that promotes solar thermal energy via building codes and Master Plan Executive Commission.

5.3 Building code

The strategy developed and adopted by CRER staff and technocrats from the Planning Secretariat to guarantee the use of solar thermal power by its citizens included the addition of such a policy in the building code that is currently being revised. Currently the building code along with the Land Use and Occupation Law, Land Division Law, Classification Road Plan, Postures Code and the Master Plan are being revised in the municipality. Since these are overall planning and regulating instruments, they will not be pigeonholed as other laws may be. Whereas the solar thermal energy law may be disregarded on its own and be forgotten. Introducing it in the building code guarantees that it will be discussed and implemented. The deadline for the approval of these policies is the end of 2010.

5.4 Master Plan Executive Commission (Comissão Executiva do Plano Diretor – CEPD)

The Master Plan Executive Commission (*Comissão Executiva do Plano Diretor – CEPD*) may be generally defined as one of the tools that guarantee the democratic management of the Master Plan. More specifically, CEPD is a technical committee which was created by a municipal law in 2007. It is comprised of members of the city's executive power, representatives from at least the areas of urban planning, economic development, environment, housing, government, treasury and legal departments. CRER's manager, an architect by training, is a member of this commission.

The CEPD is, in practice, an extremely important mechanism for Betim's sustainable development since it is enabled to technically deliberate and analyze the transformations of the urban environment.

Beyond this, Decree n° 27.173/09 and Law n° 4.984/10 have given the CEPD power to determine the development of significant ventures such as Minha Casa Minha Vida – a

federal government housing program that is investing billions of euros in the coming years (see section 8).

As mentioned above, the Master Plan, building code and other regulating instruments are currently being revised. In this timeframe the CEPD is serving as the principal deciding body on issues not yet included by law. Another reason why this body has gained considerable power is that the building code for instance has not been revised for decades, making it outdated and irrelevant in a world that has changed drastically with technological improvements and in a city that has dramatically transformed itself into an industrial center instead of the rural crossroads that it was before the 1970s.

Following is the approval process for urban projects is described in order to best explain the important role it plays in general and specifically in regards to solar thermal energy.

5.4.1 The approval process for urban projects

Before beginning any building project, the responsible party needs to consult City Hall to receive clearance.

If the public administration considers the project to be one that will cause considerable impact on the urban structure in accordance to a pre-established set of guidelines, the project will be handed over to the CEPD to analyze.

The CEPD then considers a variety of impacts on the surrounding areas in regards to: traffic increase, need of public transportation lines, removal of vegetation, urban landscape, waterproofing, urban dredging, solid waste management, wastewater, public networks of health, education, sport and leisure, job and revenue creation, tax creation, and real estate appreciation.

After the analysis, a report requesting the implementation of measures considered to be required for the existence of the project is prepared and given to the responsible party.

Once the measures have been implemented, the project may be sent for approval. The Division of Approvals may only approve the project if it meets all of the report's requests.

So, although the Commission's requests have not been implemented into law thus far, it is able to establish conditions that must be obliged. When needed, the Commission also acts as an educator and instigator.

5.4.2 Results of having a CRER staff member on the CEPD

The participation of a CRER staff member on the Commission (since 2009) has brought to the surface the issue of solar thermal energy where it was not routinely considered before. Now for every project that passes through the Commission, its members evaluate the need to request:

- 1. inclusion of rain water collectors,
- 2. solar thermal energy ready constructions, and
- 3. water meters for every individual unit.

In order to measure the impact that the Commission is having on the use of solar energy in the municipality, CRER staff monitored its results. This was done in order to determine if the Commission is in fact a mechanism that is promoting the use of solar energy. CRER staff found that between March 2009 and April 2010, 61 urban projects were analyzed by the Commission. The results of the study which were published in the "Evaluation Report of the CEPD's Mandate on EE and RE Measures for Businesses" as detailed below conclude that not enough information is available at this time to determine whether or not the CEPD is an effective mechanism to promote the use of solar energy.





CRER staff focused more time on the nine projects that were approved in order to find out more. Through a personal visit it was discovered that out of the nine only one had concluded construction. In this case the sustainability measure (in this case, rain water collectors) had been implemented. In the other eight cases, construction had either not begun or were in an early phase where the verification of the measures could not be done. It is therefore concluded that more time is needed, but we have now a glimpse that the CEPD's actions are effective for the implementation of sustainability policies.

6 Action planning: Designing a path to achieve reduction targets

6.1 MoU as a basis for cooperation

Political commitment of the city's leadership has been vital to the activities of Betim as a model community.

The inception was marked by signing an initial Memorandum of Understanding (MoU) with ICLEI Brazil in April 2006 which built the basis for the first phase of the project.

For the second phase of the project which began in 2008 with GTZ support, a renewing MoU was signed publicly in April 2009 during ICLEI's *Minha Casa Minha Vida* event in Brasilia, marking the newly elected city government's renewed and strengthened commitment to continue the project. The document was signed by the Mayor and the Secretary of the Environmental Secretariat. The document defines political and technical liaisons responsible for the execution of the work plan. In Betim's case the Secretary of the Environmental Secretariat and the manager of the CRER were selected.

This public signing did not only demonstrate the City's commitment to continue to implement the Local Renewables project. It was a clear expression of the new City Government to continue the previous government's policy on renewable energy. Such a continuation is often times not respected due to party politics. The signing symbolized that renewables was able to rise above party lines in Betim.

In so far this continuation is not only a success of the project but also a signal to many more cities in Brazil that promoting RE and EE is key for a modern policy and should not be subjected to differences between political parties.

The 2009 MoU defines the following as the main steps to be implemented:

- Involving and mobilizing stakeholders in the process as well as being the driving force in gearing information sharing and partnerships among them;
- Developing and implementing local policies and projects for renewable energy and energy efficiency;
- Establishing a renewable energy and energy efficiency reference center as a place to learn, showcase practical applications, and to provide technical expertise; and
- Implementing training and outreach activities.

One of the first steps that was taken at the beginning of the project was to establish an annual work plan that was developed by ICLEI and Betim. The work plan was systematically updated and received recommendations from GTZ representatives as well as CRER's Advisory Group. The work plan outlined the activities listed in the Impact Chain chart (see *chapter 3*). Other than the activities on policies explained in detail in chapter 5, the work plan also took into account activities being implemented in the areas of projects, outreach and network development.



Picture 6.1 Images of the first pages of the MoUs

Listed below are some of these activities and their results:

6.2 Solar thermal energy survey

The joint initiative by Betim, Cemig (Minas Gerais Electricity Company) and Cohab (Minas Gerais Housing Department) resulted in the installation of 1,356 solar heaters in 4 housing estates for low income families in the municipality in the 2004-2007 period.

In 2009, the CRER-Betim team carried out a survey at these housing estates with the following objectives:

- compare energy consumption before and after the installation of the solar heaters;
- evaluate the level of satisfaction among solar heaters users; and
- evaluate the condition of solar heaters.

In order to carry out the survey, CRER's team developed a multiple choice questionnaire which was brought to residents of the four housing estates in a door-to-door fashion and completed by CRER staff and the mobilization team of theenvironmental education unit of Betim's Environment Secretariat. In total, 54% of the residents (733 units) of the four housing estates (Dicalino Cabral, Celso Pedrosa, Itacolomi, and Vargem das Flores) were interviewed by the CRER and mobilization team between the months of July and August 2009.

Prior to the installation of the solar heaters, the energy consumption of a 3-4-people family was 98 kWh/month. After the installation of the solar panels consumption fell to 74 kW/month, representing a reduction of 24 kW per month. In financial terms, the electricity bill which totaled 79 BRL (about \in 35) a month was reduced to 33 BRL (about \in 14) a month, resulting in monthly savings of 45 BRL (about \in 20) per family.

The CRER-Betim survey was important in understanding the effects of the use of solar heaters in these housing units. The survey showed that:

- The solar heaters reduced power consumption by around 25% in most cases, and houses with a solar heater maintained an average consumption of 74 kWh/month;
- When families consume less than 90 kWh/month, they are exempt from paying a 30% tax, namely the circulation of goods and services ICMS), allowing their financial

savings to be even greater since they not only reduce their bill by consuming less but also by paying less taxes.

- In general terms, the electricity bills were reduced by 57%; With this savings on the electricity bill, the use of solar heaters enables a considerable increase in household disposable income;
- 94% of those surveyed stated that there is enough hot water for the whole family throughout the day;
- Of those surveyed, 98% approve of the solar heaters; and
- Of those surveyed, 96% would install a solar heater in another house.

In addition to the information on the heaters, the survey also showed that:

- Despite the considerable reduction in energy consumption after the installation of the solar heaters, many people do not know the best ways to use electrical appliances, i.e. they do not have a sustainable consumption standard, which would further reduce the consumption and expenses on electricity;
- The use of incandescent light bulbs, which use more electricity than fluorescent bulbs, is still high at these housing estates. For example, at the Itacolomi Housing Estate, 79% of those interviewed used incandescent light bulbs; and
- A more efficient monitoring of the properties is necessary to follow up on the use of solar heaters.

Another positive aspect of the survey was that, based on the analysis of its results, CRER put forward some action proposals, and has been working closely with partners to enable the implementation of the following initiatives:

- Maintain the solar heaters policy for housing estates for low income families in partnership with Cemig;
- Create legal instruments that mandate the use of solar heaters in all new buildings; and
- Mandate the use of solar heaters in all homes of the federal government's *Minha Casa, Minha* Vida (My Home, My Life) program in Betim.

CRER is currently working with Cemig to resolve the problems with the heaters highlighted by the residents during the survey, such as leaks, blockages, faulty parts, etc.

See ICLEI case study 112 for more information on the solar heater project in Betim, as well as ICLEI case study 89 for more information on solar heaters in the Itacolomi housing estate in Betim.

6.3 **Project RENOVAR (RENEW)**

An initiative of CRER Betim, in partnership with the Pontificia Catholic University of Minas Gerais (PUC-MG). RENOVAR is a debate series on renewable energy and energy efficiency issues which aims to enhance public debate with experts. 200 participants took part in the debate series in 2008.

6.4 Workshops on Low Cost Solar Water Heaters – LCSH (Oficinas de Aquecedores de Baixo Custo – ASBC)

Since 2008 CRER-Betim staff have been offering a course that focuses on training low income families to build a low cost solar thermal heater. These courses have occurred mostly in Betim but staff have been invited to offer the trainings in other cities as well.

The 4-hour course included a theoretical-practical workshop, with an explanatory PowerPoint presentation on how to build the heater and presentation of a prototype.

To measure the impact of this course, CRER-Betim carried out research via telephone calls with the participants. The study took place between 10 August and 27 October 2009 and interviewed the course participants in the period from March to November 2008. In that period, 440 people signed up for the course, from which 283 attended in 17 different groups. However, only 153 were interviewed due to the difficulties in reaching the participants by telephone. Among the 153 participants interviewed, 94% (144 individuals) did not install the solar water heater and only 5.9% (9 individuals) installed it or just assembled it to install it at a later time (see table below).

Period	Mar-Nov 2008
Participants	283 (17 groups)
Interviewed	153
Installations Completed	9
Percentage	5.9%

Table 6.4 Low Cost Solar Heater (LCSH) Course

The research revealed that the main reasons restraining participants from installing the LCSH are: low family income; lack of time; the house was under construction/renovation; the interviewee opted for another kind of solar thermal heater; and the lack of knowledge in that field.

The main ideas to solve this low percentage of LCSH construction and installation proposed by the participants of the course were:

- To charge a fee, so every participant would receive an explanatory and illustrative booklet to facilitate the manufacturing of the LCSH (the courses were free and no materials were distributed);
- To focus on the installation process of the LCSH during the course; and
- To show videos showing the manufacturing and installation process to ensure better comprehension of participants.

To overcome the identified problems, CRER decided to offer practical workshops, adopting as a strategy to focus on two specific types of target audiences: self organized groups within low income communities and professionals working with installation of hydraulic systems. For the first group, the community itself purchases the necessary equipment and seeks CRER in order to host a workshop and build a solar heater with full guidance and support from CRER throughout the process.

The plan was implemented in September 2009, when a workshop for 5 people from local communities was given. A very active community member volunteered her home and purchased the equipment that cost about 200 BRL (\in 90). Within 9 days, they built and installed the solar heater themselves. In order to promote the use of solar thermal energy, the community member installed a tap outside her home where visitors can feel for themselves water that is heated by the sun. Two other workshops were organized in 2009, training a total of 35 participants.



Picture 6.4: Dona Leontina received a certificate after the course on low-cost solar water heater construction.

6.5 Internal Commission on Energy Management (Comissão Interna de Gestão Energética – CIGE)

The Internal Commissions on Energy Management (*Comissão Interna de Gestão Energética* – *CIGE*) are created to implement and monitor energy savings plans within the public administration. Usually one commission is set up per building and is led by a president, preferably an engineer that works in the building. It is also important that the CIGE is made up of maintenance staff that play a large role in the commission's success. The new City Hall in Betim that had been inaugurated at the end of 2008 was only fully occupied in March 2010. Thus CRER found it best to wait for the building to be fully operational before creating its CIGE. Betim has taken the first step in establishing a CIGE for the new city administrative headquarters (City Hall). In May 2010 CRER organized a training that was taught by CEMIG staff.

This initiative was inspired by Porto Alegre's success with CIGEs. In September 2009 Betim staff participated in Porto Alegre's first event on renewable energy and energy efficiency. One of the presenters was the president of one of the city's CIGEs in the health sector. The president presented the survey that they conducted on their electricity consumption in all of the buildings under the responsibility of the Health Secretariat since 2005. With the results of this study the Commission proposed several projects that aimed to improve energy efficiency and consequently, reduce costs. The Vargas Maternity Hospital is an interesting example of success. The measures included the replacement of 4 elevators, substitution of all air conditioners, replacement of all lamp bulbs, reactors and luminaries, as well as installation of presence sensors and light sensors in the stairs, corridors and toilets. With these measures, in approximately 12 months, there was a 50% reduction in the hospital's electricity consumption.

7 Betim Renewable Energy and Energy Efficiency Resource Center (REEERC): A key actor during project implementation

(Indicator 2)

Local Renewables Project Indicator 2: The Reference Center in Betim

Under the project, the second indicator of success involves the establishment of a reference center for energy efficiency and renewable energies, with at least one qualified member of staff.

In Betim, this indicator was fulfilled beyond expectations. Understanding the importance of renewable energy and energy efficiency, political leadership decided in 2009 to staff the Center with 3 full-time staff people and one part-time intern. The multidisciplinary staff is able to offer a variety of assistance, as their formal training is in different fields such as education and engineering. The mix has allowed CRER to organize outreach activities as well as develop courses on how to build a low-cost solar energy water panel. They have also developed research projects together such as the one on solar thermal panels.

Initially the Center had been physically placed in an internal office within the Secretariat. Again, signalling the importance that the leadership has given to the project, it was decided to move the Center to a more prominent space where City Hall visitors could easily see it as they walk by. Since the CRER is located in a room in the center of the new City Hall, nextdoor to the Local Agenda 21 office and a public training space.

7.1 Resource Center: Concept, set up, partners, funding and activities

One of the selection criteria for Model Communities is the commitment of the local government to allocate its own resources, including staff, office equipment and office/ exhibition space. This allows the cities to build internal capacity that will remain when the more active participation of ICLEI comes to an end.

Betim, as one of the Model Communities, has allocated staff capacity to the project, mainly through the Reference Center (CRER - Betim). Throughout the project, the Center's staff were involved in the promotion of RE and EE, policy preparation, and the implementation of projects. The CRER was established under the structure of the Environmental Secretariat and its team report directly to the head of the Secretariat. Both the CRER team and the Secretary worked closely together with ICLEI staff, responsible for the implementation of the project along with project funders.



Picture 7.1: The team at CRER – Betim, on the left the Secretary of the Environment, Geraldo Antunes da Conceição.

CRER has been designed as a hub for information and the promotion of ER and EE technologies in order to inspire other cities. Since its inception, the Renewable Energy Reference Center has served as an important tool to raise the local and regional population's awareness about how local actions related to RE and EE may be a great step to reversing the global tendencies of climate change. In addition CRER put to test its theoretical arguments in concrete actions towards sustainable energy in Betim and Brazil as a whole by providing information to city dwellers and visitors about how to optimize the energy already being consumed in their daily activities and to install a system whose main sources are clean and renewable energy.

Responsibilities and activities of the Betim Resource Center:

- To provide information to all those interested in knowing about RE and EE
 - by acting as a display and exhibition space for information and models on RE and EE; and
 - by creating a comprehensive resource base of information on renewable energy and energy efficiency (database, library, etc.).
- To facilitate exchange and collaboration between different stakeholders and to develop and maintain a network of all the actors for effective information sharing, technology transfer and fund mobilization,
 - organize workshops and seminars;
 - organize meetings; and
 - organize study visits.
- To act as "anchor" for the local stakeholder group;
- To reach out to different target audiences, such as
 - municipal corporations/departments;
 - local utilities, local business;
 - developers of large-scale construction projects;
 - architects, city planners;
 - city residents and resident welfare associations; and
 - school children.
- To prepare the city energy report (see chapter 4) and to provide annual updates to the city energy report;
- To draft proposals for project activities to implement the action plan and annual activity plans (see box on Indicator 3);

- To oversee and organize implementation of proposed activities: including pilot demonstration projects and awareness programs (see chapter 8); and
- To monitor the performance and impacts of implemented activities such as pilot demonstration projects.

In Betim, the establishment of the Reference Center has been extremely beneficial to the local authority, and has helped to direct their vision in RE and EE. This is valid for the first phase (2005-2007) and even more for the second phase (2008-2010) in which CRER was kept under the incoming government.

Over the course of the project, CRER has become a type of focal point for information within the city administration. The political leaders proclaimed recently that if CRER did not exist, the issues of renewable energy as well as energy efficiency and consequently climate change would not be considered. Therefore, the continuation of the Center is a great legacy of the Local Renewables project.

For more information on the CRER in Betim, please see ICLEI case study 105.

7.2 Partnerships and stakeholder involvement for local activities

Due to the fact that it was the first center to be established by the Local Renewables project in Brazil, reaching its objectives was a great challenge. However, the partners involved in the project used diverse strategies to assure that the Center would be successful in achieving its goals and objectives. Among these strategies was the creation of a stakeholder group (SG) (*Grupo Consultivo - GC*).

7.2.1 The Importance of the stakeholder group

Without the stakeholder group's participation, the implementation of actions and the running of CRER would be compromised. For bodies like CRER, joint action is fundamental since it is possible to steer actions for the development of sustainable energy public policies through the interaction of multiple stakeholders.

The involvement of multiple stakeholders enables the analysis of deficiencies and the potential of initiatives. It is, therefore, possible to envision options that will result in more effective actions.

SG's collaborative model allows for organization, acknowledgement and strengthening of actions. The potential for action is also enhanced, given the SG's greater scope, which encompasses diverse segments of society.

Another benefit of the multi-disciplinary role played by SG, within which there are different levels of knowledge, is the possibility of joint learning.

SG's dynamics incorporate interested parties in the process and create a formal channel for their participation. Therefore, it serves as a forum for interaction, negotiation, debating of issues and fosters the search for solutions.

The cross-sector set up presents an important contribution for the creation of better conditions for a cooperative logic and to give a voice to civil society as well as to engineers and specialists who work in related fields. The result is the improvement of access to information and greater inter-sector integration.

CRER's stakeholder group is responsible for:

- overseeing the execution of activities carried out by the Center, with the possibility of evaluating them and indicating priorities for action;
- promoting and disseminating CRER's activities and information of interest related to the theme of sustainable energies;

- submitting proposals for action and activities to be carried out jointly with CRER;
- taking steps to establish contact with relevant institutions in order to form collaborations; and
- notifying CRER about their actions that are related to the theme of renewable energies.

The objectives of having the SG's participation in CRER are:

- to involve key stakeholders in the debate on sustainable energy;
- to facilitate the integration of sustainable energy as a government policy, thus ensuring its implementation; and
- to provide useful information and advice on sustainable energy.

The stakeholder group is composed of members from different segments of society, chosen according to their relevance and their ability to provide substantial support for the development of the project, namely:

- Technical or political representatives from secretariats, government bodies, departments, superintendants and local and state government agencies;
- Representatives from the municipality's council;
- Representatives from the supplier of electricity to the municipality;
- Representatives from the private sector, trade unions and professional associations;
- Representatives from the third sector
- Representatives from teaching and research institutions, as well as technology centers.

The composition of the group reflects strategic considerations. In the case of local authorities, it is important that bodies responsible for the following services are represented in the stakeholder group:

- water and sewage;
- administration;
- housing;
- urban waste collection;
- environment;
- public works;
- planning;
- transportation; and
- other services that are deemed relevant locally.

Stakeholders in Betim

Betim Secretariat of Environment ICLEI Betim Secretariat of Communication Betim Secretariat of Economic Development Betim Department of Housing Betim Secretariat of Public Works Betim Secretariat of Finances and Management Betim Public Transportation Company Puc Minas (University) **Betim Council** Contagem City Environmental Secretariat Sanitation and Water Company CEMIG (State electricity provider) FIEMG - Federation of Industries and Businesses of Minas Gerais Petrobrás Belo Horizont Environmental Secretariat CREA MG - Council of Engineers, Architects and Agronomists of Minas Gerais Projeto Gaia (NGO)OngTrem (NGO)

8 Activities to implement the action plan in Betim

(Indicator 3)

Local Renewables Project Indicator 3:

Proposals of Betim Reference Center being implemented

Under the project, the third indicator of success involves the proposals of the Reference Center being adopted and implemented by at least two private (or local government) companies in the model community.

In Betim, CRER worked on many fronts. One of which is related to the survey of the housing units that received solar thermal panels from Cemig. The survey discovered a few technical problems such as leaks and Cemig is looking into solutions. Also related to the survey, Cemig is now consulting with CRER on developing a sustainable energy program for housing units that will receive the panels. This will be done jointly with the Housing Secretariat that is represented in CRER's multiple stakeholder committee.

In addition, also under development is a campaign that will focus on energy efficiency methods to be employed to further reduce energy bills.

8.1 The strategic approach: Minha Casa Minha Vida

Minha Casa Minha Vida (My Home My Life) is a federal government housing finance program with the overall objective of providing low-income families with housing while fueling the economy. According to 2008 figures, the habitation union, SECOVI estimates that there is a national housing deficit of 5.6 million. The program was launched in March 2009 amidst the housing crisis that affected the world's most powerful economies. The government foresees an investment of R\$ 34 billion (about \leq 15,600 billion) that will go towards the construction of one million homes for families that earn no more than R\$ 4,650 (about \leq 2,130). The program has not reached its initial goal mainly for internal reasons since there were considerable delays in determining regulations. The goal of building 400 units by 2009 was not accomplished. Up until 1 March 2010 only 331 units had been approved.

CRER staff along with the Secretariat of Environment saw this program as a golden opportunity to change national construction standards to include sustainable aspects such as solar thermal energy and rain water collectors. Betim was not the only one to see opportunity in Minha Casa Minha Vida (MCMV). From the beginning the Brazilian Minister of Environment worked for the inclusion of sustainable criteria in the one million houses that were to be constructed. ICLEI also supported its cities by organizing a series of events in Brasília, the country's capital, in April 2009 so that they could lobby for the inclusion of sustainable construction criteria. Among them, Betim representatives spoke about their impressive results related to solar thermal energy. ICLEI and its cities, specifically the Local Renewable Model Communities, continuously worked with the federal government and the financing institution Caixa Economica Federal, pushing for a decision and emphasizing the benefits of solar energy.

Minha Casa Minha Vida is exceptionally relevant for Betim since it has been said that the federal government has agreed to build 5 thousand houses in the municipality. This number, considered to be high, has been calculated based on several considerations. The first of which is that Betim's annual population growth of 3.5% has resulted in several infrastructure issues including lack of proper housing for the new residents who come from all over the state and region seeking better quality of life and work in industries. Another factor for its growth was the establishment of the first university in the city in the 1990s that drew in students and academics. This growth is actually lower than it has been in prior years –

reaching about 7% where as the capital's growth is estimated at 0,9%. Migration trends have therefore made Betim the fifth largest city in the state of Minas Gerais. Betim will also greatly benefit from Minha Casa Minha Vida since its neighbour, the state capital of Belo Horizonte has no more vacant land to be used for building. Since 97% of the capital's land is already being used, cities in the metropolitan region of Belo Horizonte are participating more widely in Minha Casa Minha Vida, which is not necessarily the case for other metropolises.

Although more details on the Reference Center's operations are in chapter 7, it is worth mentioning here that the involvement of multiple stakeholders in the city's renewable energy work has been one of the most important factors for success. Involving others has enriched the process and brought together resources allowing more to be done. We mention this here since the Center's advisory group was very much involved in Betim's activities surrounding Minha Casa Minha Vida. In one of the earlier meetings when city staff presented their proposal to develop a solar thermal energy policy, the stakeholder group agreed on the importance of also linking their work to push for the inclusion of solar thermal panels in the Minha Casa Mina Vida houses, knowing that the city would be greatly impacted by the program.

As a result, several activities were initiated:

8.1.1 Research on how MCMV works

In order to best understand what could be done, CRER staff researched how Minha Casa Minha Vida was being dealt with in Betim. The first step was to consult the federal government as well as the Department of Public Works which was the main point of contact with citizens who were registering to participate in MCMV. It was discovered that participants could fall into two different categories depending on their income level. The first group was comprised of families that earn between one and three salaries per month. Currently, one salary in Brazil is equivalent to R 510 (\in 235) – the least a person could earn when legally employed but the 2009 minimum was R 465. For these families, the federal government is responsible for the purchase of the home. For families that earn between four and 10 salaries, they are able to participate in the program but are responsible for the mortgage payments.

8.1.2 Legal Instruments

During the research phase, it was also discovered that the municipality had drawn up a decree to regulate Minha Casa Minha Vida in Betim. The document follows procedure by establishing certain regulations such as how families will be chosen, selection criteria, documentation required, land use, etc.

During a meeting with the head of the Public Works Department in September 2009, it was suggested that the decree be amended to include that all of the MCMV buildings should have solar thermal energy. At this time it was still not clear if the federal government would establish that all of the homes should have solar energy since they had not yet published a long awaited internal regulation on the issue. The Local Renewables project cities and ICLEI lobbied the appropriate federal institutions, and it was decided that Betim would take an ambitious step and require all of the MCMV buildings to have solar energy installed. The measure was included as Article 126 but was removed before it was approved.

Not willing to give up, CRER staff included the article's language in the solar energy law that is currently being studied by the Vice Mayor (see section 5.2). Also, all of the MCMV projects must be approved by the Master plan Executive Commission. This Commission has thus far defined that all of these buildings must have solar thermal energy and rain water collectors (see section 5.4). In this manner, the MCMV buildings will follow suit to the other social housing projects in Betim that proudly use solar thermal power. Thus far the Commission has required that 15 MCMV projects totaling over 5 thousand units should have solar thermal energy. None of these projects have begun yet due to the approval process.

CRER is monitoring these construction projects to ensure that this decision will be implemented.

Betim was not the only city contemplating such bold action. Porto Alegre, the other Model Community in Brazil also took action in late 2009 and was more successful. For more information please see the Porto Alegre completion report.

8.1.3 Minha Casa Minha Vida Outreach Events

Led by the Regional Council of Engineers, Architects and Agronomists (CREA) of the State of Minas Gerais, staff from Betim comprising of those from the Reference Center and the Department of Public Works organized an event on 30 November 2009 geared specifically for representatives of construction companies that would be building for Minha Casa Minha Vida. The event's objectives were to:

- inform the building sector that the city was developing guidelines for the inclusion of solar heaters for the program in the city via decree;
- inform those present about the Reference Center's work in developing an overall solar heater policy for all new buildings;
- argue the benefits of solar thermal energy based on their positive experience, and;
- provide a public space where the construction sector could have their questions answered and begin to prepare for the changes ahead instead of springing up on them in the future.

The only drawback of the event was that the main target audience was not present. Even though there was a good number of participants, only one of about 13 construction companies involved in Minha Casa Minha Vida were present. In the organization phase it was understood that CREA knew which companies were building MCMV houses in Betim and would invite them, and this turned out to be a misunderstanding. Due to this, a second event was planned. This time the main partners met to determine the best outreach strategy in order to guarantee a larger number of participants. As a result, during the second event 7 of the 13 companies participated in the event held on 12 December 2009.

The importance of such activities must not be underestimated. Over and over again, it is witnessed that public policies that are developed without the involvement of those whom it will affect are less effective or more problematic to be implemented. Even if developed with good intentions, if stakeholders are not consulted, it is likely that the policy will suffer resistance and resentment for lack of consultation. Also, in a country where a plethora of laws are approved but not enforced, many are rightfully weary of lawmakers who merely develop legislation for personal means and photo opportunities. In addition, such events allow the public sector to better understand the needs of those it will affect in order to draw up more effective legal instruments.

The exchange process enriches the end result. Although it is expected that certain conflicts will arise among the different parties, it is best to find solutions as early as possible and not wait for the final phase.

8.1.4 Further Developments

On 31 May 2010, Caixa Economica Federal, the financing agency for Minha Casa Minha Vida published its terms of reference for solar energy for MCMV housing for families earning three or less salaries. The document states that solar heaters can be installed in MCMV homes in Brazil's south, southeast and central west regions without any additional cost to the construction company since it would now be added on to the total construction costs to be paid by the federal government. However it does set limits to how much more the inclusion of solar panels can cost.

Although debatable, the north and northeast regions were not included since it was determined that people in these regions do not need heated water for bathing due to the high temperatures year round. The government also states that according to studies it was established that the market would not be ready to supply a greater number of solar panels. Since then 13 thousand requests for homes with solar heaters have been processed and it is foreseen that up to 40 thousand units with solar heaters will be built in the three regions cited above by the end of 2010.

In addition, Minha Casa Minha Vida II was launched in the second quarter of 2009. It is expected that 2 million homes – all of which with solar energy- will be built in the second phase which will begin in 2011. The equipment that will be installed is being popularly called the 'flex shower' since it could use solar energy when there has been enough solar radiation to heat water as well as electricity for those not so sunny days. According to the Electric Research Company (Empresa de Pesquisa Elétrica) and the Ministry of Mines and Energy, the installation of the flex showers in the 2 million homes will provide a paramount reduction in GEE savings– equivalent to removing the total electricity consumption of Belo Horizonte (population 2.5 million), avoiding the emissions of polluting gases in the volume emitted by all of the automobiles in Brasilia which total 220 million tons of emissions per year.

Traditional solar heaters used in Brazil and elsewhere such as the US are connected to boilers that heat large amounts of water when the sun has not been strong enough. The flex showers are more efficient, only heating what is necessary when used. The flex showers cost about R\$ 1,700 (\in 780) per unit. In addition, 266 low-income families will also receive the equipment and a new line of credit for the middle class to acquire the flex shower will be made available. It is estimated that this policy will generate 85 thousand direct and indirect jobs, especially in the construction sector.

9 Cooperation and partnerships: Building local, national and global relationships

(Indicator 4)

Local Renewables Project Indicator 4:

Integration of Betim into an international network of local authorities

Under the project, the fourth indicator of success involves the integration of the model community into an international network of local authorities.

In Betim, this indicator was fulfilled by several activities that took place during the project. The city's leadership and technocrats participated in several events and training workshops where other cities from the Local Renewables project were present and the exchange of experiences was extremely rich, influencing the city in areas such as climate change. Betim was able to learn about how the other Reference Centers in India operate and as a result adopted some of their monitoring measures. Betim not only visited other cities but was visited by others that came to learn.

Being an ICLEI member, naturally Betim participates in ICLEI's global network where city representatives were also exposed to what is happening on a global level.

9.1 Seminars

Since 2006, Betim has organized three international seminars and workshops on renewable energy and energy efficiency.

The latest of the three featured a technology fair will be featured in this section. The event named "The International Journey on Renewable Energy, Energy Efficiency and Local Government in Betim: Technological Innovation for a New Economy" took place from 17 - 19 March 2010.

In total, 450 people attended the activities. With the objective of promoting the implementation of renewable energy and energy efficiency projects within cities and disseminate technologies and successful initiatives, the seminar presented four main activities, namely, "The Third International Seminar on Renewable Energy, Energy Efficiency and Local Government", the technology fair, a series of technical visits and a series of workshops. Participants of the technical visits were taken to see either the solar heater installations in Betim or to Metalsider – a company that is beginning to co-generate energy. One of the workshops was a closed session for Local Renewables Network Cities focused on next steps. A second group met to address the potential of generating biogas from waste in Brazilian cities and the third brought together local business people to discuss opportunities in the renewable energy field. This third meeting was co-organized by the Federation of Industries and Businesses from Miinas Gerais (FIEMG), CEMIG – the state energy company, ICLEI and CRER-Betim.

An interesting note in regards to the business group – a second meeting organized by CRER has already taken place with a high turnout. The main issue on their agenda was to work with the Development Bank of Minas Gerais (present at both meetings) to create a line of credit for development of new clean technologies. The seminar was equally an opportunity to develop activities of other projects in which Betim is involved. The "Promoting Local Biogas Use for Sustainable Development in Brazil" workshop financed by REEEP allowed representatives from Betim to exchange views and experiences on waste and wastewater management and biogas recovery in landfills and wastewater treatment plants.



Picture 9.1: The International Journey seminar in Betim

9.2 Global cooperation and partnerships

Currently over ten European, Indian and Latin American cities are a part of the international Local Renewables Network Communities. The first Model Community in Latin America is Betim. Other than Betim, other Brazilian Communities in the Network are Belo Horizonte (MG), Porto Alegre (RS), Salvador (BA), São Paulo (SP) and Volta Redonda (RJ). Betim has a predominant role in the Local Renewables Network in Brazil due to its position as a Model Community which is a City that has formally agreed to commit itself to promote and use renewable energy and energy efficiency through the project indicators.

The city of Betim has been an active participant of the Local Renewable Network project. High level city officials have attended project meetings, capacity-building programs and technical visits in Brazil and abroad. For instance, in the very early stages – November 2006, the former Secretary for the Environment who spearheaded the project in Betim took part in the kick-off conference for the Local Renewables project in Nagpur, India. This was an extremely strategic move in establishing relations between the work that was being done in Brazil with British funding and work being done in India and Europe with GTZ funding. In foresight the connection between the sister-projects was extremely important in strengthening the Brazilian Cities and motivating them to do more within the international network.

Another example of interaction between cities took place when several representatives took part in events in Freiburg, Germany, (also a Local Renewables project partner city) and visited the local soccer stadium that is powered by photovoltaic energy.

Betim is equally very open to strengthening its relations with other local governments and international organizations abroad in order to continue to learn and develop new renewable energy and energy efficiency policies. Although some attempts have been made, ICLEI and Betim have not been as successful as hoped in this endeavour. For example, in 2010 ICLEI's efforts to match Betim with European cities such as Almada, Portugal and Helsingborg, Sweden were not successful due to financial and scheduling reasons.

It is interesting to mention here that Betim was chosen in 2010 to participate in the "Promoting Local Biogas Use for Sustainable Development in Brazil" project which is being implemented by ICLEI-Brazil with financial support from the Renewable Energy and Energy Efficiency Partnership (REEEP). The main goal of this project is to improve urban sanitation and increase clean energy generation through methane recovery technology. One of the main reasons why Betim was selected was its previous work on renewable energy issues.

List of some events where Betim participated:

- March 2010: "The 1st International Journey on Renewable Energy, Energy Efficiency and Local Government in Betim: Technological Innovation for a New Economy" took place from 17 19 March 2010.
- **December 2009:** 15th Conference of Parties to the United Nations Framework Convention on Climate Change, Copenhagen, Denmark, 7-18 December 2009
- **September 2009:** Seminar "Energy Efficiency and Renewable Energy in Brazilian Cities", Porto Alegre, RS, 23 24 September 2009. energy and energy efficiency
- June 2009: ICLEI World Congress 2009: Connecting Leaders, Advancing Local Action for Sustainability, Edmonton, Canada, 14-18 June 2009
- April 2009: ICLEI-LACS International Mission on Energy Efficiency and Sustainable Construction, Freiburg, Germany, 27-29 April 2009
- 2007, 2008: Round of Debates "RENOVAR", Betim, Brasil,
- June 2007: II International Seminar on Renewable Energy and Local Authority, Betim, Brasil, 27 29 June 2007
- November 2006: International LR project conference in Nagpur, India
- June 2006: First International Seminar on Renewable Energy and Local Authority, Betim, Brasil, 28-29 June 2006

One very relevant complication is the language barrier that Brazilian cities face when trying to communicate with other Network cities. Since in most cases, English is used as the working language and interpretation/translation is not always offered, Brazilian cities are left out of the loop. Being that often other barriers such as differences in culture and jet leg present challenges, it becomes even more tiring to try to communicate in a language that is not familiar to you. This has presented budgetary challenges for ICLEI that tries to overcome these issues by hiring interpreters.

The problem does not end with person-to-person engagements. As stated at the beginning, one of the Local Renewable goals is to promote the use of renewable energy and energy efficiency. This is done not only at speaking engagements but also in written form. Thus the project in Brazil has taken on a financial burden of not only translating relevant information into Portuguese for lusophones but also committing to provide information to others in other languages, most times in English. Since information needs to be translated, most times Brazilian work plans schedule time for translation and additional editing which add costs since either staff are doing these activities or it is contracted.

Given this difficulty, unfortunately there has been little communication between Brazilian cities and the other Network cities outside the country. Although common interests have been identified across the Atlantic and Indian Oceans, a lack of resources has not allowed a deeper connection. There have been several virtual and in person meetings over the years that have been brokered by ICLEI with interpretation support. We have identified that Betim could make very good use of technologies and expertise in waste management and recycling plants that are being used in Europe. Through considerable efforts, ICLEI pressed for a specific exchange to take place on this issue but was not successful.

Model Communities in Brazil have also learned about what is taking place in the reference centers in India and have implemented some of their best practices and were thoroughly inspired by their Indian counterparts. Many more of these exchanges could take place with the objective of inspiring each other to go beyond their current achievements.

This is particularly correct for India and Brazil, both BRIC countries with growing economies that suffer from brutal inequality among classes, share similar climates and can set a new benchmark for sustainability for developing countries.

It is also worth mentioning that the inclusion of South African cities is exciting and very much welcomed since Brazil also shares many similarities with the African Nation, even more so now that both will have the recent experience of hosting the World Cup.

9.3 State and national level cooperation and partnerships

At the state-level, Betim has a very strong partnership with the Minas Gerais State Electric Company (CEMIG). This partnership has been long-lasting, allowing Betim to implement effective solar energy policies in the municipality. Since 2005, 1,363 solar heaters were installed in low income communities of the city under the framework of this partnership. In addition ICLEI has a good relationship with the State of Minas Gerais.

Many representatives from several sectors of the state administration have been at events in Betim such as the international seminars and Renovar debates as well as Network's activities such as technical visits abroad to Freiburg, Germany in April 2009

Minas Gerais' capital Belo Horizonte is known to be Brazil's Solar Capital since it is estimated that it contains more solar thermal panels than any other city in the country. Minas Gerais is eager to keep this title and develop further by experimenting with photovoltaic energy in large demonstration projects such as the *Minerão* soccer stadium and is working closely with the German government via GTZ to make this happen in time for the World Cup 2014 that will take place in Brazil. As mentioned before, the Governor has been to Betim with a delegation of local leaders and was surely influenced by their experience which led to the creation of a state program that will install 15 thousand solar panels in the state. Although the state was represented in the Center's Advisory Group earlier on, there is no current representation but the CRER staff are looking at changing this situation.

Over the years Betim has hosted several events, serving as a hub for the Network in Brazil. It has influenced other cities as near as Belo Horizonte to develop their own solar energy initiative and as far as Alto da Floresta, a city in the northern state of Mato Grosso to train citizens on how to build their own solar panel. Many cities, other than the Network members have to Betim to learn more about their notorious solar energy social housing program and the Center has served as the main point of contact to not only guide visitors but also to attract them to Betim. Contagem, its next-door member has developed a partnership with ICLEI and Betim, allowing the city to participate in events and meetings in Betim that focus on renewable energy and more specifically biogas issues as well as other sustainability measures. It is clear that Betim is setting the mark for other cities that also want to engage themselves in renewable energy.

As the first Model Community, Betim has been a pillar for its younger counterpart, **Porto Alegre** when it became the Country's second Model Community. The cities have exchanged information on how to set up the reference center and other issues including how to best reach target audiences and monitor their activities. Several in person meetings have taken place, mostly with the guidance of ICLEI staff.

Betim has also been highly influenced by the other Brazilian Local Renewables Network cities. For example, Betim has replicated São Paulo's solar energy policy that was first announced in Betim by the Secretary of Environment of São Paulo during their 2nd International Seminar on RE and EE in June 2007.

They have been closely in touch with São Paulo's staff who have gladly shared information and lessons learned. Also, Belo Horizonte and Betim have exchanged information on this policy since both were developing their city legislation at the same time. Through project documentation and personal contacts, other types of exchanges have also taken place. For instance, Betim and other cities have learned about Volta Redonda's successful experience in implementing a vegetable oil recycling program through a case study that was written on this initiative. See ICLEI case study 106 for more details.

Betim, Porto Alegre and Belo Horizonte have worked on similar initiatives in the past few years. For example, Belo Horizonte is currently developing a vegetable oil recycling program using a regulatory instrument whereas Porto Alegre and Betim are consulting local businesses on how to develop solutions to the issue while adding value such as job creation and capacity building programs. Although these cities were not solely influenced by Volta Redonda's experience the exchange among them gave them confidence, ideas and lessons learned as they moved forward.



Picture 9.3: Network members met in Porto Alegre, 2009.

An important aspect of the project has been a friendly competition among project cities. ICLEI's ability to bring to the discussion what other local governments are doing instigates the cities to push forward instead of just celebrating their current victories. For example, Belo Horizonte officially launched its GHG emissions inventory in December 2009 and the Secretary of Environment discussed the process and results at COP 15 in Copenhagen with many including other Secretaries of Environment present from Brazilian cities. As a result, many of these cities, including Betim and Porto Alegre met with ICLEI about how to go about developing their own emissions inventories.

Network cities have met with ICLEI to discuss how to better communicate among them. So far, interaction between the cities is made mostly through ICLEI when the organization sees an opportunity to share experiences. Some initiatives have been implemented such as a city-only list-serve and person-to-person exchanges but there is still much to improve. An idea yet to be implemented is a routine meeting (even if by telephone for budgetary reasons and to reduce emissions) between at least the Model Communities of Betim and Porto Alegre. Such meetings would provide an open space for staff members to learn about what each other is doing, identify opportunities and discuss challenges. All have also agreed that there is much expertise among them that could benefit each other and that at least the Model Communities should invest in bringing Local Renewables project city staff to present specific issues in their respective debate series.

10 Impacts and legacies of the project in Betim

Betim as a Model Community in the Local Renewables projects has project legacies on a local, national and global level. The most relevant are listed below.

10.1 Local impacts

- Better understanding of opportunities and challenges: The first study on existing opportunities and challenges to be overcome locally, regionally and nationally enabled the city to easily identify 'low-hanging' fruits that were ready to be reaped and make them aware of challenges and present recommendations on how to deal with them. The value of this study has been that both Brazilian Model Communities have decided to update it, at least once every two years. Subsequent updating will allow them to gauge impacts of the various interventions. The preparation of the study has enabled Betim to set priorities for actions.
- Monitoring of results: One of the most important impacts, if not the most important, is breaking the culture of not monitoring results and basing future action on assumptions. Monitoring may be said to not be a part of Brazilian culture, especially in local governments that work with stretched resources. However, although there was resistance in the beginning CRER staff began to monitor their actions. This was specifically difficult in the early phases since proper monitoring must be planned for before actions are implemented rather than at the beginning of the monitoring phase. But when CRER staff began to see the importance of information obtained in monitoring, either to help them in designing future action or to lobby for support from leadership and external parties, they began to adopt it in their work plan.

For example, for many years the public in general doubted the positive impacts of solar thermal energy projects since it was common to see some of them being sold at street corners. The research conducted in each of the communities revealed that in the beginning some families sold the solar panels since they had not been told of its benefits. It was then understood that the neither the city nor CEMIG had developed a sustainable energy campaign in this community. This information has allowed CRER to argue for funds and resources to conduct this type of campaign before homeowners receive the panels.

- Continuation as a Model Community: Betim was the first city selected to participate in the Local Renewables project. The selection process involved a call for cities to participate and eight cities presented proposals. Such a selection process adds value to the title on a national level and it would be seen in a positive light if a city would continue the projects it began as a Model Community. The main impact of this is the further strengthening of the city's commitment to RE-EE policies and projects.
- The Betim Resource Center has evolved into a competence center for RE and EE within the city government. CRER is one of the most visible impacts of the Local Renewables project in Betim. The Center has been supported and encouraged in its activities since project inception, and its role and importance within the city has grown over the years. The Center and its staff are now involved in various energy related matters and proposals within the city such as the master plan executive commission and approval of architectural projects, providing ideas and advice as well as establishing policy, not restricted to only activities under the Local Renewables project. The awareness programs undertaken by the Reference Center have had widespread impacts throughout the city.
- Increase in local business in RE and EE: Although it is too early to prove, it is safe to
 assume that CRER's work with the private sector, begun at the international seminar in

March 2010, will change the face of businesses in the region, influencing them to adopt more sustainable practices as well as products and services.

• Scaling up: The project has expanded Betim's experience of the installation of solar thermal energy in social housing into a city-wide policy. The national and international recognition has influenced Betim to go further. Betim is now looking beyond the inclusion of solar energy in social housing projects. For example, CRER's policy work will force all future buildings that will be constructed in the City to be solar-energy ready.

Another more recent activity that will be scaled up is in the field of energy efficiency. First CRER is setting up an Internal Commissions on Energy Management (CIGE) in the City Hall. When measurable successes have been reached, the initiative will then be spread to other buildings such as schools and city hospitals.

10.2 State level and national impacts

• Local governments are confirmed as relevant actors: National and state level officials were consistently involved in the project activities in Betim through inclusion in the stakeholder group, events, projects and others. This allowed Betim and CRER in particular to be advised by state and national expertise such as CEMIG – the energy provider, while also serving as a role model for implementation of the various measures. For example, the Governor's visit to Betim clearly proved the benefits and gains of solar thermal energy and as a consequence the State Government announced a program to install over 15 thousand solar energy panels.



Picture 10.2: Governor of Minas Gerais visits solar thermal power unit.

- On a national level, several ministries (for example, Ministries of Mines, Energy and Environment) are made aware of the key roles of local governments through meetings, project reports and joint sessions. This is particularly true due to ICLEI's work with cities on the Local Roadmap Project that worked with cities across the world to influence national governments' decision and actions in regards to emission reduction goals.
- Model communities in Brazil inspire the energy discussion and showcase local action: The effect that the model communities have had in spreading the message of local renewables around the country is apparent. In the case of Betim, it has especially been at the forefront of such discussions in Brazil, beginning with their first international RE and EE event in June 2006.

10.3 Global impacts

- **RE and EE initiatives in Brazil are shared with global community:** ICLEI has helped to coordinate events and sessions highlighting local renewables at various international platforms. Betim has been represented at a number of these occasions and has had the opportunity to share their experiences, progress and impacts. Cities from around the world have been able to gain from Betim's information sharing.
- **Potential expansion of the Local Renewables network:** Other cities in Brazil and Uruguay have expressed interest in pursuing a similar Local Renewables initiative.

10.4 Betim's legacy: Inspiration for the design of new and additional future projects

Given the success of the Local Renewables project in Brazil and the opportunity to build on existing efforts, success, commitments and involved parties, ICLEI has been sought after for several other project ideas by its member cities.

10.4.1 Expansion of the Network

Since the project began in 2005 ICLEI has been asked to expand the Network to other cities in Brazil and other countries in the region. Although the proposal to become bigger was tempting, we thought it wise to first establish a strong base, working within limits in order to grow in a more structured manner in the future. The decision to choose the second Model Community from within the cities that participated in the Network was done along this frame of mind. Now that we have worked with these cities for the past five years, learning from our success stories as well as from our mistakes, it is time to expand the Network.

Strategic framework: In Brazil, this is especially important since **Minha Casa, Minha Vida** is providing a national framework to justify the use of renewable energy. ICLEI has built a strong network of partners from all sectors including banks, research institutions and federal government institutions to further expand. Expanding the Network within Brazil is needed at this point. Currently Betim in the metropolitan region of the state capital is influencing cities in the region. Proof of this is that Minas Gerais is the state that has the largest numbers of ICLEI members that actively participate in the Center's work in one way or another and have themselves been influenced by Betim to use renewables. Porto Alegre is also making progress. The younger of the Brazilian Model Communities, it has already made its name in the city council that has looked for the Center to support the creation of a metropolitan region committee on climate change. Cities in the state of Rio Grande do Sul, the most southern in the country, are also becoming more involved. Recently the city of Santa Maria became an ICLEI member and is now researching how it can develop renewable energy policies and projects.

Other regions in Brazil: Progress and excitement about renewables is being spread in the south and southeast of the country via Porto Alegre and Betim. It is now the time to do the same in other regions. We believe that there is momentum now because through its work on climate change with states, ICLEI has developed a working relationship with the city of Manaus in the state of Amazonas which took a leading role in organizing a movement of cities from the Amazonian region to participate in COP 15. Manaus, whose energy matrix is made up of diesel and oil to produce electricity, has shown interest in participating in the Network as a Model Community.

Using the World Cup: Other cities such as Rio de Janeiro have also shown interest. This momentum is also being created by Brazilian cities' race to be showcased as sustainable cities by the World Cup in 2014 and other mega events such as Rio+20, the Olympics in Rio in 2016 and others. Many of these cities' environmental departments do not have experience or information on renewable energy. Now with two solid cases of success, ICLEI

is ready to expand the Network to further inspire others to act. In addition to expanding the Network under the spirit of the World Cup, ICLEI also sees a very viable opportunity to bring sustainability to the forefront of the host cities' agendas using the sporting event as a catalyst. The Brazilian Government has determined several priorities for the global event which includes waste management, energy efficiency, and water management. ICLEI is developing a proposal to establish sister-city partnerships between Brazilian hosts and German as well as South African cities that hosted the event in 2006 and 2010.

10.4.2 Spreading to the region

In regards to Latin America, ICLEI also sees opportunities for successful Model Communities in further countries. Spreading the Local Renewables Network to the region can make good use of the work that has already been laid by ICLEI in other projects. Specifically speaking about Montevideo and Buenos Aires, these cities are currently participating in an ICLEI project that promotes the development of sustainable construction policies. Both have been working on solar energy. Cities in Uruguay for example have to regulate the solar energy law created by the federal government in 2009. Montevideo has developed a renewable energy group that is working on the regulation as well as other construction policies that involve energy efficiency measures. The city has also been experimenting with wind energy as a result of a partnership with an energy provider. Unlike Brazil, the use of alternative sources of energy is in dire need since the country imports all of its energy, meaning that consumers pay a high price. Since many only react when they are financially affected, Uruguayan cities and citizens are very open to renewables.

Another important factor about working with Montevideo is that, as a national capital city where a third of the country's population lives, it acts as a strong influence over other cities. We have seen this through the sustainable construction project, as two other cities in the metropolitan region also developed their greenhouse gas emissions inventory as Montevideo was completing its study. Welcoming Montevideo into the Network would also be interesting since it could easily exchange experiences with nearby Porto Alegre. Both cities have a history of working together in the Mercosul economic block in regards to issues that affect the southern cone of the continent. It will also be of great importance to have a Spanish-speaking city in the Network, which will create the need to publish information in Spanish which can be better disseminated to other Latin American countries.

10.4.3 Research and project development on cooling issues

Questioning the need for cooling and starting a debate on alternative technologies: Traditionally, artificial cooling has not been used in Brazilian residences. Mostly, air conditioners are used in office buildings that have been built on modern-looking buildings that unfortunately are not sustainable in tropical climates. But more and more we are becoming aware of an increase in the use of artificial cooling systems due to higher temperatures. Air conditioners have also become more popular since their prices have dropped. ICLEI sees here the need to develop a research project on artificial cooling. The results of such a study would point to usage tendencies and its risks which would allow the development of recommendations and future projects on sustainable construction and natural cooling options.

10.4.4 Supporting cities in GHG emission inventories

These inventories are often the first step for setting the right priorities – as again proven in LR project. A nationwide project to capacitate and support local governments in doing these inventories therefore would be a key step to accelerate the most efficient activities.

The preceding section is also included in the Brazil Country Report.

10.5 Betim's further plans

The City also has several plans in the pipeline that will further promote the cause of local renewables in Betim.

Establishment of the Center in the official governmental structure: With the goal of providing a guarantee of the continuation of the Reference Center's work, the political leadership is currently proposing that the Center be included in the official governmental structure which is now under review. Although the Center's existence is not being challenged, this measure will ensure that it will not be called into question in the future. This also provides other benefits such as clarity for CRER staff and others on the importance of the Center and its purpose.

Resources for the Center: Once the Center is officially in the governmental structure it will also be allocated an appropriate budget which will greatly expand its outreach. Currently CRER has depended on the Secretary's ad hoc allocation from other budgets. In addition, Betim is in discussion with ICLEI about setting up another MoU which will focus on keeping Betim as an active member of the international network.

GHG Emissions Inventory: Another priority for Betim will be the development of their emissions inventory. Betim is also in touch with ICLEI about this issue. The involvement of these cities in ICLEI's Local Roadmap project has created interest in cities to take their baseline inventories seriously especially now that many cities are doing it.

Setting reduction goals: Once Betim has its GHG inventory, it will be able to establish reduction methods not only in emissions but set a sub goal of energy reduction via policy. This will further build internal capacity within Betim's technical body and allow it to participate more actively in national and international debates on the issue, which in turn allows local governments a stronger voice and influence.

Policy work: Betim continues to work on the solar energy policies mentioned earlier in order to guarantee that the city goes further in the work that has already been so successful. This action is also important beyond the city's borders since it is in line with the national government's energy efficiency plan to reduce emissions as presented at the United Nations Conference of the Parties in Denmark (COP 15) in December 2009.

Other projects: In addition, Betim will continue to work on activities present on the Impacts Chart that includes the set up of the Internal Commission on Energy Management (CIGE), further negotiations on the development of a city-wide recycling program of used vegetable oil, a training program for architects and engineers on how to project solar thermal panels in architectural projects (there have been many poorly developed projects which do not allow water to heat properly, giving solar energy a bad name; such a training program will be vital if Betim is successful in passing its solar thermal policies since a greater demand for a work force with such abilities will be more in demand), monitoring activities, offer technical help and lobby for the inclusion of photovoltaic panels in a city park as well as setting up a biodigestor system that supplies gas as demonstration projects.

11 Lessons learned and recommendations

These are the lessons learned over the course of the project, and recommendations which can be made based on the experiences in Betim. This information is based on extensive literary research and surveys of key stakeholders in Brazil.

11.1 Educational aspects

Lessons learned

- There are not enough awareness raising activities on the importance of renewable energy and energy efficiency in every segment of society.
- There is not enough information on economic and financial benefits of renewable energy and energy efficiency actions.
- Since, in general, architects and engineers were not formally trained in higher education programs about sustainable building, renewable energy and energy efficiency, they don't naturally incorporate them into their building plans.

Recommendations for the work of CRER in Betim

- CRER should consider promoting educational, training and sustainable energy consumption programs in a cross-sector manner with its Renovar debate series and focus more resources on internet based tools such as the Center's website and blogs.
- CRER should explore a partnership with the Federation of Industries and Businesses of Minas Geraias (FIEMG) which has shown interest in the Center's low-cost solar panel workshops.
- CRER should work alongside the Housing Department and CEMIG (the Minas Gerais state energy company) in the cases where solar thermal panels are being installed in public housing units. CRER's role would be to provide tenants with appropriate information on energy efficiency and renewable energy before they move into their new homes.
- In regard to display models that could serve as effective educational tools, it is recommended that CRER searches for viable partners. One of these may be CEMIG which has offered to contact suppliers for the donation of equipment. One challenge that the Center faces is lack of space in its location. A solution may be to showcase this technology in another location. For example, the Environmental Secretary informed ICLEI that a city building is being constructed in one of the city's parks. This could be an ideal location.
- Best practices should be explored through the project's international network and disseminate this information to appropriate target audiences.
- A more long-term recommendation would be for the Center itself to become a demonstration project, featuring RE and EE technology. This may be achieved through the work that the Internal Commission on Energy Management will conduct at City Hall or in a separate location specifically for CRER.

11.2 Financial and economic aspects

Lessons learned

- According to the interviews conducted, many interviewees considered the needed investment in solar energy (thermal or photovoltaic) to be high.
- It was also discovered that there are very few options for lines of credit for renewable energy technology and EE projects.
- An added challenge is that construction companies follow an established rationale in selling buildings that will render them the most immediate and highest profit. The sector shows resistance in selling buildings with solar thermal energy since the added investment will lower their profit margin which they will not be able to make up in the long term by paying lower energy bills since the future owner and not the company will gain from the lower consumption.

Recommendations

- Betim houses several small scale solar thermal panel manufacturers. It is recommended that CRER invest time in better understanding how these companies operate to determine how to help them grow. Such growth would not only foster local industry but also reduce costs associated with production and logistics.
- CRER has concrete numbers that prove the financial and economic gains of solar thermal energy. This information should be disseminated in easy to understand language for a variety of target audiences.

11.3 Legal aspects

Lessons learned

- Betim's municipal legislation (*See chapter 5*) is extremely outdated and does not contemplate renewable energy, energy efficiency and sustainable construction aspects.
- The "culture" of solar heaters is already present in Betim but has not yet been regulated.

Recommendations

- CRER staff are already involved in updating the building code to include that all new buildings should have solar thermal energy. However they should not miss this golden opportunity to include other RE and EE aspects not only in the building code but the other five regulating mechanisms being reviewed. It is recommended that via the Environment and the Planning Secretariat (CRER has easy access to the person who is leading the updating of this laws and who happens to participate in the Center's Advisory Group), CRER lobbies for the inclusion of more sustainable public lighting with new technologies such as LED and other EE applications.
- The creation of incentives for the private sector to invest in green technology may also be contemplated based on State Decree 45.229/09 which enables opportunities for businesses to reduce their GHG emissions through RE/EE.
- It is also recommended that CRER study the possibility of including RE and EE aspects in the environmental licensing that is led by the Environmental Secretariat, where CRER is housed.

11.4 Political and structural aspects

Lessons learned

- Interviewees from the public administration acknowledge a lack of communication among the different sectors. This disconnection makes it difficult to share relevant information.
- There is a lack of internal guidelines for the promotion of EE in public buildings and a municipal energy policy.
- The existence of CRER is not fully known by all in the City.

Recommendations

- It is recommended that CRER study the feasibility of an energy efficiency law for Betim's public buildings. The experience of Buenos Aires should be explored as an example.
- The interviewees reached a consensus about the importance of enabling/creating a municipal department responsible for developing a local energy policy. CRER could lead this discussion within its advisory group that is composed of the key municipal sectors. It would be interesting to link this with the City's strategy on GHG emissions, also opening discussion on the importance of conducting GHG inventories.
- Unknown to project implementers, in 2008 an Internal Commission of Energy Conservation (similar to the CIGE that is being led by CRER) was created by the Municipal Association of Public Workers of Betim). It is believed that the Commission was rendered inactive. In the spirit of learning from others, it is strongly recommended that CRER contacts those involved to understand better what happened – their difficulties, who was involved, why it is inactive and if there are any documents, tips and other information that could be useful for the new Commission.
- CRER could better promote itself now that most of the city's secretariats and departments are in one building. It is recommended that CRER establishes a calendar of activities geared to public servants and in partnership with the education secretariat and the environmental education department creates a series of activities focusing on RE and EE. CRER should also be aware of events and other opportunities in Betim where it could participate and promote RE and EE.
- It was also discovered that CRER would highly benefit by seeking partnerships with the Transportation Secretariat and the Water and Sanitation Company of Minas Gerais (COPASA). In short, these institutions are interested in establishing sustainable initiatives in regards to alternative fuels which is connected to Betim's workplan.

For more information please see the Brazil country report.

11.5 Technological aspects

Lessons learned

- Most RE technology is imported and expensive.
- There is lack of knowledge about new technology that is already available.

Recommendations

• Technologies in RE and EE need to be further promoted. Betim took a step in this direction when it not only organized the technology fair at its international event in March 2010 but also with the business workshop that took place. This work should continue.

- Also it is important to help home markets. The Pontificia Catolica University of Rio Grande do Sul located in Porto Alegre has developed a project that produces photovoltaic panels. This technology was tested in Germany and the results were very positive. PUC is now developing a business plan for the development of industrial scale manufacturing. Although the University is in another state, it is recommended that Betim explore ways to promote this initiative and others since Brazilian industries will contribute to making these technologies more available to all others.
- It is recommended that CRER seek FIEMG and other Advisory Group members to explore opportunities to install bio digesters in the city.

12 Documents, events and publications

The following documents are available from the ICLEI LACS Secretariat. Contact:<u>rede.elo@iclei.org</u>

Documents

- Evaluation Report of the CEPD's Mandate on EE and RE Measures for Businesses
- Study on Challenges and Opportunities in Renewable Energy and Energy Efficiency in Betim (Portuguese)
- Wind and Energy article on State solar energy efforts
- CRER Report on Solar energy (Portuguese)
- CRER Report on the Master Plan Executive Commission (Portuguese)
- Solar Energy Bill (Portuguese)
- Sun and Wind Energy (April 2010 edition)
- Memoranda of Understanding (included in binder at ICLEI ITC)

Events

- I International Seminar on Renewable Energy and Local Authority, Betim, Brasil, 28-29 June 2006
- II International Seminar on Renewable Energy and Local Authority, Betim, Brasil, 27 29 June 2007
- Round of Debates "RENOVAR", Betim, Brasil, 2007, 2008.
- ICLEI-LACS International Mission on Energy Efficiency and Sustainable Construction, Freiburg, Germany 27 to 29 April 2009
- ICLEI World Congress 2009: Connecting Leaders, Advancing Local Action for Sustainability, Edmonton, Canada, 14-18 June 2009
- Seminar "Energy Efficiency and Renewable Energy in Brazilian Cities", Porto Alegre, RS, 23 24 September 2009
- 15th Conference of Parties to the United Nations Framework Convention on Climate Change, Copenhagen, Denmark, 7-18 December 2009
- I International Journey on Renewable Energy, Energy Efficiency and Local Government in Betim: Technological Innovation for a New Economy", 17 – 19 March 2010

Case studies

- ICLEI case study 105: Betim's Renewable Energy and Energy Efficiency Reference Center
- ICLEI case study 89: Renewable energy in low-income housing in Betim
- ICLEI case study 112: Solar heaters in low income housing estates: Energy and financial savings in Betim
- ICLEI case study 113: Stakeholder involvement groups for Local Renewables in Betim and Porto Alegre

The Local Renewables Model Communities Network

The Local Renewables Model Communities Network (or Local Renewables project) is a key component of ICLEI's Local Renewables Initiative. This international project connects leading cities in order to cooperate in sharing their expertise and experience in the fields of renewable energy (RE) and energy efficiency (EE).

Special support for participating model communities in India and Brazil was possible due to generous funding from the German Federal Ministry for Economic Cooperation and Development (BMZ) through the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH. Model communities within the Local Renewables project are supported to develop exemplary practices in the field of sustainable energy, with the goal to also inform and encourage other local governments to follow their example.

Project activities with model communities include:

- compiling energy status, energy audit and carbon emissions profiles;
- researching urban renewable energy potential;
- developing local policies for RE and EE and adopting these policies in the municipal council;
- establishing and operating RE and EE Resource Centers as places to learn, to showcase practical RE and EE applications and to provide technical expertise; and
- involving stakeholders throughout the process.

Within the Local Renewables project three types of cities were connected:

(a) Model Communities: Cities or towns that have declared their intention of becoming model communities and have made a formal commitment to local renewable energy strategies.

(b) Resource Cities: Cities or towns that are ready to share their expertise and experience with other cities in the Network and beyond. Resource communities have highly developed renewable energy and energy efficiency strategies, with effective actions implemented.

(c) Satellite Cities: Cities or towns that have an interest in learning with the Network and contribute when possible.

The Local Reneables project has enabled cooperation between cities in Brazil, India, Europe and South Africa.



Local Renewables project, Betim City Completion Report, July 2010