ICLEI Local Governments for Sustainability

IRENA International Renewable Energy Agency

CITY IN FOCUS

SAO PAULO, BRAZIL

Local Government Regulation Ordinances and Laws to Promote Renewable Energy

SUMMARY

A regulation can be understood as a measure for influencing actors by means of formulated rules and directives, passed by legislation and having the force of law. Conventionally, regulation has been used as a tool to restrict certain undesirable actions. More recently, regulation is being used to promote desirable actions or to influence a desirable outcome without the narrowly prescriptive details of how the action should be implemented. When used in this manner, regulation can stimulate innovation and encourage a transition to renewable energy (RE) solutions. The *Solar Ordinance* of Sao Paulo, for instance, requires new residential, commercial and industrial buildings to install solar water heating systems (SWH) to cover at least 40% of the energy used for heating water. It is part of the municipal building code and is in-line with the national energy framework. The *Solar Ordinance* has stimulated market demand for an innovative RE technology and resulted in significant net savings among a wide array of stakeholders and a reduction in the production costs of SWH. By 2015, it will allow for a reduction of around 35,000 tonnes carbon dioxide equivalent (tCO_2e) from the city's residential sector and 200 gigawatt hours (GWh) in electricity consumption. It is currently been replicated in cities across Brazil.

Figure 1: Sao Paulo, view from the peak of Jaragua

INTRODUCTION

REGULATION TO STIMULATE INNOVATION

Regulation is a law, rule, or other order prescribed by authority towards meeting a certain end. It can be understood as a measure for influencing actors by means of formulated rules and directives, and is enforced with penalties and fines. The specificities of a regulation can vary greatly according to the nature of its objective. It is also dependent on the legal jurisdictional abilities and conditions of the respective authority, for example, a local government's legal responsibilities and abilities are defined by various national/federal and/or sub-national laws. In essence, a regulation is an act or statute made by the executive branch of government, which has the force of a law and is typically more administrative in nature. On the other hand, a policy is more likely to be made by individuals or organisations (but can also be made by governments) and helps achieve goals and carry out plans (*e.g.* a rule in a factory that prohibits smoking inside the premises to avoid fire or any mishap). In many cases, there is an overlap between the two.

The different kinds of local public policies to carry out regulations are often part of a legislative act. For a local government to implement a new regulation or policy tool, it may on occasion require changes to laws of higher tiers. Primary examples of local government regulations are land-use regulations and building codes.

Conventionally, regulation has been used as a policy tool to restrict certain undesirable actions. More recently, regulation is being used to dictate a certain action without detailing how the action should be implemented or to promote more desirable actions. This allows actors (developers, businesses, households, etc.) to be more innovative with their response. In this sense, regulation can stimulate innovation and facilitate a transition to RE solutions. RE related examples of local government regulation include:

CITY IN FOCUS: Sao Paulo, Brazil Population 11.3 million (2011)

- Regulations on planning and zoning can encourage the systematic integration of RE generation into local land-use, while considering a variety of other requirements (*e.g.* distance to residential areas, wildlife protection reserves, etc.). The development of such land-use plans can be important for informing future city development strategies on what to develop where (*e.g.* planning for and zoning of large RE plants, public transportation and electric vehicle infrastructure).

- Building codes and permits can incorporate RE requirements into building regulations. Examples from the building sector include mandates on the use of SWH, solar photovoltaic (PV) installations, etc. Another example is a building regulation that stipulates a certain energy share of a new building is sourced from RE. This enables an innovative response, where energy efficiency (EE) and RE are promoted by means of being the most cost-effective way of meeting the regulation.

- Renewable portfolio standards (RPS) or renewables obligation or quotas set by a local government can establish a mandatory goal for RE (*i.e.* increased production from RE) that electricity producers must reach. This leaves the market to find the most suitable way to reach the target. In these cases, the more cost-effective RE technologies are typically promoted.

- Other innovative regulations include mandating blending of biofuels with gasoline and/or diesel fuel sold within city limits, or introducing mandatory carbon cap-and-trade schemes.

Figure 2: More then 90% of Sao Paulo's electriicty is from Hydropower (spillway of Jupia plant, 1551.2 MW)

CONTEXT

SECURING ENERGY AND REDUCING GREENHOUSE GAS (GHG) EMISSIONS

Amongst the 50 richest cities of the world, the city of Sao Paulo has by far the smallest per capita GHG footprint. The average Paulistano resident is responsible for 1.47 tCO_2e. With more than 90% of electricity sourced from hydropower plants and a service-oriented economy, Sao Paulo depends upon low-carbon electricity. With rapid urbanisation, the demand for electricity has been growing steadily. The supply of electricity however has not. With decreasing availability of sites for hydropower, energy security has become an urgent issue. The public has also become more concerned about sustainability and local air quality, making RE an increasingly appealing option.

DESCRIPTION OF ACTIVITIES SAO PAULO SOLAR LAW

In Sao Paulo, water heating is estimated to account for about 40% of the city's electricity consumption. This includes both domestic use (where inefficient electric showers are still the most common way for heating water) and commercial use (*e.g.* swimming pools). Any initiative to reduce the city's electricity demand should target these particular energy uses. In response, the *ordinance nº14.459*, of July 3, 2007 (*lei solar/the solar law*) was approved by the municipality of Sao Paulo to lower electricity demand for water heating.

The ordinance is part of the municipal building code. The law requires new residential, commercial and industrial buildings to install SWH systems (sistemas de aquecimento solar) to cover at least 40% of the energy used for heating water. Non-compliance with the regulation can lead to the withdrawal of the building permit or the occupancy permit (the so called "habite-se").

The regulation only applies to new buildings with four or more bathrooms and buildings (new or existing) that have large additional hot water needs (*e.g.* swimming pools). Small residential buildings are only required to have the infrastructure to enable potential future installation. The number of bathrooms is the main criteria to assess what is considered to be a large building and allows the public to more easily understand to which buildings the regulation applies. New industrial buildings are also required to install SWH, if the specific activity requires heated water, *e.g.* where changing rooms are available for its employees.

Under optimal conditions, the SWH system could meet up to 70% of the hot water demand in a building. However, the regulation requires at least 40% of a building's hot water demand through SWH, thereby providing a realistic target for buildings in unsuitable local conditions for solar heating.

Figure 3: Solar water heaters in Sao Paulo (Mogi das Cruzes)

THE IMPLEMENTATION PROCESS - DRIVERS AND ENABLING CONDITIONS

One of the key contributors toward the implementation of this ordinance was the national campaign for solar thermal technology *Cidades Solares* (*Solar Cities*) initiated by the Brazilian Association of the Solar Thermal Industry DASOL ABRAVA (Departamento Nacional de Aquecimento Solar da Associação Brasileira de Refrigeração, Ar Condicionado, Ventilação e Aqueciment – National Department of Solar Heating of the Brazilian Association of Refrigeration, Air Conditioned, Ventilation and Heating Services) and the international network Vitae Civilis (Civil Life). The campaign, launched in 2005, aimed to promote solar thermal technology by lobbying their inclusion in local solar building codes. Training sessions were organised for engineers, architects and representatives of local governments. While nationally oriented, the campaign mainly focused on selected local governments (prefecturas). The expectation was that success in selected regions would diffuse across the country.

As a part of the campaign, Vitae Civilis presented the achievements of *Barcelona's Solar Ordinance* (see box on Barcelona) to the Committee for Climate Change and Eco-economy of Sao Paulo's Secretariat of Green Spaces and the Environment (Secretaria do Verde e do Meio Ambiente - SVMA). Following a positive reaction by the Secretaria, a *Solar Ordinance law* was drafted with the collaboration of DASOL/ABRAVA and Vitae Civilis. In 2006, the draft ordinance was presented to the public, the Committee for Climate Change and Eco-economy, and the municipal council (Câmara dos Vereadores). During the drafting of the legislation, the ordinance was continuously improved through public consultations. The ordinance was finally submitted for approval to the municipal council, which has legislative power in Sao Paulo (*Projeto de Lei nº 313/06, do Vereador Russomanno – PP*). After two public sessions the ordinance was approved on 3 July 2007, as *law nº 14.459*. The legislative ordinance became effective six months later and is known as the *Solar Ordinance or the Solar Law* (*Lei Solar*).

PBE- INMETRO labelling programme

The PBE (Programa Brasileiro de Etiquetagem) labelling programme was initiated to improve the quality of SWH in Brazil. In order to receive the label, SWH products are analysed by an accredited agency. The agency evaluates and grades the performance of SWH from A (best score) to E (worst score). The aim of the label is to provide an incentive to producers to achieve better performance and enhance the competition for quality products. PBE is considered to be an important component for the development of the solar energy industry in the country as it increases the trust of consumers in a relatively new product.

COSTS AND FINANCING

The *Solar Ordinance* did not involve any direct cost for the municipality of Sao Paulo. It did not require creating any new body to oversee compliance with the law or to apply sanctions. It only established a new requirement for obtaining an occupancy permit. The requirements of the law can be easily understood by the target population. The regulation has led to significant net savings, due to the lower costs in production, transmission and distribution of electric energy.

RESULTS

CO_2 EMISSION AND ELECTRICITY SAVINGS

In 2007, The Brazilian Association of Solar Equipment Producers (DASOL ABRAVA) prepared an impact assessment of the *Sao Paulo solar law*. According to this study, if an average Sao Paulo twenty-story building with 80 apartments (each with an average occupancy of four people) adopted a SWH system to cover 40% of the annual energy demand for hot water, 22 tCO_2e would be avoided annually. This would equate to saving 8,400 m^2 of land from flooding in the production of hydropower.

The same study estimated that in the first year of the law, 40,000 m^2 of SWH could be installed in the whole of Sao Paulo. This would save more than 14,000 MWh. It is estimated that by 2015, the city will have more than 580,000 m^2 of SWH collectors. According to the projections, this would avoid in 2015 around 35,000 tCO_2e from the city's residential sector and 200 GWh electricity consumption.

Currently, the law only applies to a limited number of buildings in Sao Paulo, and a limited share of each building's hot water energy demand (40%). However, the 40% could increase to 70% when operating in optimal conditions. In the long run, the regulation could apply to 80% of buildings, as most buildings will have to be renovated over the forthcoming decades.

Environmental concerns, increasing electricity prices and energy scarcity have driven the use of SWH beyond the legal minimum requirements of the *solar law.* This reflects a significant shift in public perception and the opportunities presented by an affordable RE technology. The law has already been replicated in cities across Brazil.

ECONOMIC RESULTS

Setting up solar energy systems to substitute, at least partially, the demand for energy has important economic implications. The law stimulates market demand for SWH. Through greater demand, the production costs for SWH can be reduced. For the residents, the introduction of SWH provides a substitute for electricity and a source for financial savings. The repayment period for the initial SWH investment costs has been estimated to be 24 months to 36 months and leaves a substantial financial saving for the remaining operational life span of about 20 years.

For the local government, the results imply lower costs in keeping up with electricity demand. The installation of SWH in the city of Sao Paulo significantly reduces the consumption of electricity. According to DASOL ABRAVA, the resulting financial savings from avoided expenditures could be more than USD 400 million between 2007 and 2015.

LESSONS LEARNT FOR REPLICATION

PRESCRIBING REALISTIC AND DESIRABLE INNOVATION

While regulation can set ambitious RE targets for various energy-related needs, targets need to take into consideration compliance by the regulated consumer. Compliance depends on the technical feasibility, affordability and desirability of the action the regulation prescribes. Where regulation has more compliance by citizens and businesses, less effort is required for control and enforcement. The role of the regulation is then to overcome the hesitation of those actors who resist adopting innovation and possibly economically desirable actions. A firm, consistent, transparent and proportional application of a regulation, which was designed in an inclusive participatory process, can enhance awareness, understanding and subsequently compliance of a regulation.

SPECIFIC TO THE LOCAL CONDITIONS

The *Solar Ordinance* is highly specific. It only covers one type of RE source (solar) and one energy use (water heating) and neglects other RE sources (*e.g.* wind). In Brazil, building codes fall within the local government jurisdiction. The municipal regulations cannot conflict with legislation from a higher tier of government (*i.e.* state or national level). The *solar law* was successful because it stayed in line with the national energy framework. It required a simple addition (or substitution) of a SWH to an existing electric water heating system. It does not involve any change in the production or distribution of electricity. This would have had more complicated administrative and political implications. The production of electricity, for example, is regulated at all levels of government. In addition, exceptions to the regulation may be required. Buildings were exempt from the *Solar Ordinance* that could not technically achieve the requirements (*e.g.* shading by another building).

CERTIFICATION OF PROMOTED TECHNOLOGIES AND MAKING EXCEPTIONS

The success of the regulation depends on the certification of SWHs, to avoid the flooding of the market by cheap, low quality products. Certification can include minimum quality and performance standards as well as ratings for consumers to be better informed and producers to adhere to minimal standards.

Figure 4: Solar water heaters in Sao Paulo (Mira Estrele)

Renewable energy in public transport, Portland (OR), US (population 0.7 million)

Portland is a unique case of a local government approving regulations on the share of RE in the transportation sector. In 2006, the municipality adopted the first local renewable fuels standard in the US, which mandates 5% biodiesel and 10% ethanol blending with all diesel and gasoline fuels sold within the city limits.

Source: REN21, ISEP and ICLEI (2011), Global Status Report on Local Renewable Energy Policies

Leadership in building ordinances, Barcelona, Spain (population 1.6 million)

Barcelona was the first European city to establish a *Solar Thermal Ordinance* (STO). The ordinance makes it obligatory to use solar energy for the supply of 60% of running hot water in all new buildings and renovated buildings above a certain size threshold (typically all commercial buildings, and residential buildings of 16 or more households). The regulation, which is part of the Barcelona Energy Plan, was adopted by the municipality in 2000 and was amended in 2006. The Barcelona Energy Agency acts as a centralised co-ordinator, which monitors and assesses the development of the ordinance. Between 2000 and 2011, the city increased the surface of solar thermal collectors from 1.1m² per 1,000 inhabitants to 59m². Training courses for professionals, a solar thermal guide and other managing tools have been put into place to support the implementation process. Fines of up to EUR 60,000 are charged in case of violation. The early example of Barcelona's ordinance has been adapted around the world.

Source: ProSTO (accessed Nov 2012), Barcelona Solar Ordinance; www.solarordinances.eu/
ICLEI (accessed Nov 2012), LGAction: Brief case study on local climate and energy actions #14, Barcelona, Spain, A new energy model to tackle climate change, www.iclei-europe.org/

Wind power land-use planning, Wellington, New Zealand (population 0.2 million)

The local government enabled the construction of a major 143 MW wind farm, completed in 2009, by developing specific land-use planning requirements, including gaining the support of the community through a consultation process, and arranging traffic management, amongst other measures. In the process, Wellington local government adopted a strategy to promote wind power within its territorial boundaries.

Source: REN21, ISEP and ICLEI (2011), Global Status Report on Local Renewable Energy Policies

The Merton Rule, London Borough of Merton, UK (population 0.2 million)

The *Merton Rule* is a planning policy, developed in 2003 by Merton Council, UK. The rule requires the use of RE to reduce annual CO_2 emissions in the built-up environment. The requirements and the share of RE to be used change according to different conditions (*e.g.* commercial buildings over 1,000m^2 square meters to generate at least 10% of their energy needs using on-site RE equipment). The rule encourages the use of RE and energy efficiency measures. The impact of this rule was so impressive that it was taken as a model in numerous other cities of the UK and around the world.

Source: Merton Council (accessed Nov 2012), The Merton Rule, http://www.merton.gov.uk/

Further readings:

See additional relevant case studies at www.iclei.org/casestudies, for example:
107 - Turning pollution into profit: the Bandeirantes Landfill Gas to Energy Project - Sao Paulo, Brazil

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