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Regulatory Behavior Law and Prosumers

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***Abstract*—** *This paper aims to present the methods that can be used by the Public Administration to encourage the use of renewable energy sources by the market and by civil society, in order to implement the guidelines of the 2030 Agenda. The specific objective is to reach energy self-consumers. electricity - prosumers - through public policies that enable behavioral change. To this end, behavioral economics has influenced the development of public policies capable of encouraging consumers and the market to use renewable energy sources. The scope of the research is the use of new technologies applied to the production of renewable energies, with an emphasis on photovoltaic energies and the position of prosumers in this context. The methodology used is bibliographic research, use of data from official sources, in addition to the analysis of current public policies in Brazil on the subject.*

I. INTRODUCTION

One of the main historical reports of the environmental impacts generated by the use of fossil fuels was the big smoke in England. It occurred in December 1952, when a fog, originated from the great burning of fossil fuels in the period of the Industrial Revolution, generated intense atmospheric pollution and covered the city of London.

Subsequently, several movements began in order to raise awareness among the world population about sustainability issues. This culminated in the current Agenda 2030, which presents the 17 Sustainable Development Goals[1] - SDGs - to be followed by the member states that are part of the UN.

In the list of SDGs, the seventh objective[2] that specifically deals with renewable energies stands out, with an

[1] The Sustainable Development Goals are a collection of 17 global goals, established by the United Nations General Assembly, in order to eradicate poverty and promote dignified life for all, within the limits of the planet. These are clear objectives and targets for all countries to adopt according to their own priorities and to act in the spirit of a global partnership that guides the choices needed to improve people's lives, now and in the future.

indication of the need to guarantee universal, reliable, modern and affordable access to energy services.

This paper intends to address the use of the Behavioral Economy in order to stimulate the adhesion by the prosumers to sustainable energy generation methods, and for this to be made possible, the need to update the existing policies in accordance with market needs and respecting environmental issues. Such updates will be proposed through nudges of social and economic behavior necessary to achieve the objectives of Agenda 2030.

II. RENEWABLE ENERGIES AND NEW TECHNOLOGIES

Power generation has been a common theme since the advent of the Industrial Revolution. Appearing in England, it takes care of a moment that assumes a determining dimension in the economic competitiveness of countries and in the quality of life of its citizens (SILVA & CARMO, 2017).

As a starting point, the Industrial Revolution saw the need to increase production and, consequently, increase the use of fossil fuels. It was a milestone for the beginning of environmental awareness, since England was affected by a major environmental impact in 1952, known as big smoke (BBC, 2002).

With the Industrial Revolution of the 18th century, factories began to demand more natural resources to produce consumer goods and produce a significant increase in the burning of fossil fuel and coal (Paz, Boch, Ortega, & Campos, 2015).

Despite the positive aspects resulting from socioeconomic development, many negative environmental impacts marked the Industrial Revolution. As a result, several international movements and treaties have emerged that sought to protect the environment, including, for example, the Stockholm Convention[3], Kyoto Protocol[4], Agenda 21[5], Rio +20[6] and the Agenda 2030[7].

These initiatives in favor of the environment demonstrate the worldwide concern for sustainable development, brought about by the Bruntland Report in 1987.

At the Brazilian level, it is important to point out that the ecologically balanced environment is a constitutional guarantee provided for in art.225 of the 1988 Constitution. This is an economic principle, the impact of which affects all areas (VASCONCELOS, 2020).

2.1- New technologies applied to the production of renewable energies

The progressive protection of the environment depends on the change of mentality and attitude towards the generation of energy, with primacy for its renewable sources.

Renewable energies, as the expression suggests, are the result of natural resources that are renewed, that is, that are inexhaustible, such as hydro, tidal, geothermal, solar, wind and biomass energy (Portal Solar, 2015).

According to Portal Solar (2015), hydropower uses water in motion to generate electrical energy, where the water pressure, which flows over the blades of a turbine, rotates on an axis and drives an electric generator, converting the movement in electric energy (Portal Solar, 2015).

Ocean energy, in turn, offers several forms of energy generation, with emphasis on wave energy, which is generated by capturing the movement of waves. The second way refers to tidal energy, which in turn involves the trapping of water during high tide and uses the flow during the period when the tide is going down to generate electricity. The third form is known as ocean thermal energy, which uses temperature differences between deep waters and the surface, in order to extract energy from the heat flow (Portal Solar, 2015).

Geothermal energy uses heat inside the earth by means of steam or hot water that can be used by energy generators to produce sustainable electrical energy.

On the other hand, solar energy is one of the most promising alternatives when it comes to renewable energy,

[2] SDG 07 - affordable and clean energy. Available at https://brasil.un.org/pt-br/sdgs/7

[3] The Stockholm Convention, in addition to raising the status of the environment to the level of human rights, highlighted the need for protection and interaction between the artificial and natural environment, in order to guarantee a better quality of life.

[4] The Kyoto Protocol was implemented in 2005, establishing mandatory targets for a total of 55 countries, in order to reduce the emission of polluting gases.

[5] Agenda 21 took place in 1992, its main objective was to present proposals focused on sustainable development, which was recognized worldwide as a necessity.

[6] Rio +20 was basically a renewal of the political commitment to sustainable development, with two main themes, green economy in the context of sustainable development and the institutional structure for sustainable development.

[7] At the meeting that culminated in the Agenda 2030, all UN countries defined new sustainable development goals as part of a new sustainable development agenda that must be implemented by 2030.

since it is inexhaustible and can be used as a source of heat or as a source of light. This energy method is responsible for the origin of practically all other energy sources on the planet, since it contributes to the evaporation of water, originating the water cycle, allowing the damming and the consequent generation of energy through hydroelectric plants. Solar radiation also induces atmospheric circulation on a large scale, producing winds, providing opportunities for the generation of wind energy (PINHO & GALDINO, 2014).

According to the Special Report on Renewable Energy Sources and Climate Change Mitigation published by the IPCC (Intergovernmental Panel on Climate Change), it separated the production of direct solar energy into five blocks, namely: 1) passive solar, where bioclimatic architecture is inserted , 2) active solar, which includes solar heating and cooling, 3) solar photovoltaic, for the production of electrical energy, 4) generation of electrical energy from solar thermal concentrators for high temperatures and 5) process inspired by photosynthesis through from which, in a reactor powered by carbon dioxide (CO2), water and metal or metal oxide, exposed to solar radiation, hydrogen, oxygen and carbon monoxide are produced. In this case, hydrogen would be the solar fuel to feed fuel cells, no longer produced from natural gas, but from breaking the water molecule through sunlight (PINHO & GALDINO, 2014).

As for wind energy, its generation results from wind turbines that convert the wind force into torque, propelling the electric generator to generate electricity.

Finally, there is biomass, which is used to burn organic materials such as agricultural and forest residues or even urban or industrial residues in cogeneration. (VASCONCELOS, P.E.A., 2019b, p. 75-79).

In this research, the outlined scope is the analysis of the prosumer in the generation of photovoltaic energy, since it has a low environmental impact and can be applied in the urban environment with ease.

2.2. The Brazilian reality and the adoption of photovoltaic plates

Brazil occupies the first position in the world ranking of renewable energy generation, holding 46% of the country's energy production through this method, far ahead of the world average, which is 14.2%, and of OECD countries (Organization for Cooperation and Economic Development). The latter - OECD - have only an average of 10.8%, as shown in the table 1, based on data from the Brazilian Energy Review (Ministerio de Minas e Energias, 2020)

Table 1: Internal Energy Supply in Brazil and in the World (% and toe)

Fonte	Brasil		OCDE		Others		World	
	1973	2019	1973	2019	1973	2019	1973	2019
Petroleum Derivates	45,6	34,4	52,6	35,3	29,9	25,4	46,1	31,5
Natural Gas	0,4	12,2	18,9	28,1	12,9	20,9	16	22,8
Mineral Coal	3,2	5,3	22,6	15,7	31,1	35,3	24,6	26,3
Uranium	0	1,4	1,3	9,6	0,2	2,3	0,9	5
Hydro	6,1	12,4	2,1	2,3	1,2	2,5	1,8	2,5
Other Non-Renewables	0	0,6	0	0,4	0	0,1	0	0,3
Other Renewables	44,8	33,8	2,5	8,5	24,7	13,5	10,6	11,6
Solid Biomass	44,3	24,1	2,4	4,6	24,7	11,7	10,5	8,9
Liquid Biomass	0,5	7,8	0	1,03	0	0,18	0	0,65
Wind	0	1,64	0	1,42	0	0,53	0	0,87
Solar	0	0,195	0	0,82	0	0,59	0	0,65
Geothermal	0	0	0,16	0,62	0	0,52	0,1	0,54
Total (%)	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Of wich renewable	50,8	46,1	4,6	10,8	26	16	12,5	14,2
Total - Mtep	**82,2**	**294**	**3.741**	**5.418**	**2.105**	**8.223**	**6.109**	**14.358**
% world	1,3	2	61,2	37,7	34,5	57,3		

Due to the good climatic conditions and because it has several natural resources, Brazil has the possibility to implement any of the means of renewable energies, enabling the diversification of its energy matrix.

It is possible to identify the increase in investments in the country for the implementation of renewable energies, as shown in Tables 2 and 3. The increase, mainly, in the use of wind energy, which had an increase of 15.5%, and energy solar, which had an increase of 92.2% in generation compared to the previous year, as well as a reduction in energy generation through the burning of oil by 25.5% (Ministerio de Minas e Energias, 2020).

Table 2: Internal Energy Supply

Specification	mil toe			Structure %	
	2018	2019	19/18 %	2018	2019
Non-Renewable	**157.972**	**158.395**	**0,3**	**54,5**	**53,9**
Petroleum and Derivates	99.627	101.051	1,4	34,4	34,4
Natural Gas	35.905	35.909	0	12,4	12,2
Mineral Coal and Derivates	16.418	15.480	-5,7	5,7	5,3
Uranium (U308) and Derivates	4.174	4.174	0	1,4	1,4
Other Non-Renewable (a)	1.848	1.780	-3,7	0,6	0,6
RENEWABLE	**131.898**	**135.642**	**2,8**	**45,5**	**46,1**
Hydraulics and Eletricity	36.460	36.364	-0,3	12,6	12,4
Firewood and Charcoal	25.511	25.725	0,8	8,8	8,7
Derivates of Sugar Cane	50.090	52.841	5,5	17,3	18
Other Renewables (b)	19.837	20.712	4,4	6,8	7
Total	**289.870**	**294.036**	**1,4**	**100**	**100**
dos quais fosseis	153.798	154.221	0,3	53,1	52,4

(a) Blast furnace, melt shop and sulfur gas; (b) bleach, biodiesel, wind, solar, rice husk, biogas, wood waste, charcoal gas and elephant grass.

Source: Resenha Energética Brasileira (2020)

Table 3: Internal Electricity Supply (IES)

Specification	GWh			Structure %	
	2018	2019	19/18 %	2018	2019
Hydraulic	388.971	397.877	2,3	61,1	61,1
Sugarcane Bagasse	35.435	36.827	3,9	5,6	5,7
Wind	48.475	55.986	15,5	7,6	8,6
Solar	3.461	6.655	92,2	0,54	1,02
Other Renewables (a)	18.947	18.094	-4,5	3	2,8
Oil	9.293	6.926	-25,5	1,5	1,1
Natural Gas	54.622	60.448	10,7	8,6	9,3
Coal	14.204	15.327	7,9	2,2	2,4
Nuclear	15.674	16.129	2,9	2,5	2,5
Other Non-Renewables (b)	12.314	12.060	-2,1	1,9	1,9
Import	34.979	24.957	-28,7	5,5	3,8
Total (c)	**636.375**	**651.285**	**2,3**	**100**	**100**
of which renewable	530.269	540.395	1,9	83,3	83

a) bleach, biodiesel, wind, solar, rice husk, biogas, wood waste, charcoal gas and elephant grass; (b) Blast furnace, melt shop and sulfur gas; (c) Includes captive self-producer, which does not use the basic network.

Source: Resenha Energética Brasileira (2020)

In view of the current world scenario in 2020, Brazil occupies a privileged position in terms of energy generation through renewable means, offering opportunities to stand out in a future global energy revolution.

It is important to mention, albeit succinctly, the paper Matriz Energética Brasileira (TOLMASQUIM, GUERREIRO, & GORINI, 2007), which, despite its elaboration in 2007, reflects the Brazilian energy reality until 2030. In this work, the authors point out that energy consumption will grow at rates higher than the last few decades and that the expansion of energy supply may exceed twice the current capacity.

It is noteworthy that concerns about the environment will also grow and economies that more efficiently implement the binomial energy resources of low cost and low environmental impact will obtain important advantages compared to countries that adopt non-renewable methods of energy. This is an issue that is likely to reveal an important challenge for Brazil, but also an opportunity to stand out on the international stage (TOLMASQUIM, GUERREIRO, & GORINI, 2007).

On the one hand, the challenge stems from economic and social development, which will demand a significant amount of energy and, with this, a high degree of security and energy sustainability. On the other hand, the opportunity opens up for Brazil, which has special conditions for renewable energy resources and technology to transform its natural wealth into energy and, thus, add value to its wealth production (TOLMASQUIM, GUERREIRO, & GORINI, 2007).

In the meantime, it is up to Brazil to adopt the necessary means to increase the diversification of its energy matrix in order to stand out, increasingly, in the international scenario as a pioneer in the use of renewable means of energy generation.

In this context, solar energy from the sun and captured by photovoltaic plates stands out, transforming it into energy, which has been the predominant medium used by countries in the field of renewable energies, due to the minimal environmental impact and the possibility of its use by any citizen in their residence or in the buildings where they reside. It is possible to notice the growth in the use of solar energy in recent years, with the reduction of the respective generation costs, in comparison to other methods of energy generation (SILVA & CARMO, 2017).

It should be noted that, despite the 92% increase in Brazil. solar energy is the one that offers less energy in Brazil, contributing only 6,655 GWh, compared, for example, to wind energy, which contributes 55,986 GWh, and hydro, which generates 397,877 GWh, according to data presented in Table 3.

Brazil, in turn, has high levels of solar radiation, since it is located in an intertropical region and in a latitudinal range, with solar radiation higher than that seen in most parts of the world and, therefore, higher potential than European countries, in the form presented in the Brazilian Solar Energy Atlas, which states that in the least sunny region of the country it is possible to generate more energy than the sunniest place in Germany (PEREIRA et al, 2017)

From the averages presented by Atlas (2017), it is possible to see that the northeast is the region that has the greatest potential for generating solar energy, with generation potential of 5.39 to 5.59 KWh / m2 in the annual average, using based on the average horizontal global solar radiation over a period of one year, since this is the standard used worldwide as an identification base for the energy potential. It was also identified that this area has the lowest annual irradiation variation, as well as demonstrating that there is uniformity in irradiation in Brazil, which allows the implementation of solar energy generation projects in any area of the country (PEREIRA & et al, 2017).

Having established these premises, it remains to discuss what are the incentives that Brazil has adopted to expand the generation of solar energy.

Brazil has at least three important projects to encourage renewable energy, namely: 1) Normative Resolution 482/2012 of the National Electric Energy Agency - ANEEL; 2) green IPTU[8]; and 3) exemption from ICMS

[8] IPTU is a Brazilian tax on the property, called Urban Property Tax

for solar energy equipment and components in the state of São Paulo. (VASCONCELOS P.E.A, 2019a)

ANEEL Normative Resolution 482/2012 provides for the electric energy compensation system, allowing the interested party, who generates clean and sustainable energy, to exchange energy with the local distribution network. According to article 6, sole paragraph, of the aforementioned Resolution "will be granted as a free loan to the distributor, with the consumer unit now having a credit for the amount of active energy to be consumed for a period of 60 (sixty) months"[9]. That is to say: the consumer will not be entitled to any compensation in cash, but only in credit to be used with the distributor.

The green IPTU[10], in turn, refers to the discount on the aforementioned municipal tax in the case of buildings that use sustainable solutions, whether in new or renovated buildings. However, as it is a municipal tax, it is up to the municipalities to institute laws with the provision of said tax benefit, with different discount rates and specific requirements for its implementation.

Regarding the exemption from ICMS, its effectiveness is based on Article 1, III, of Decree 63.095 / 2017 of the State of São Paulo.

In summary, it is possible to perceive that Brazil, although it is the winner among the countries in the quantitative aspect of energy generation, has enormous challenges in the technological aspect, since the largest quantity of renewable energy generation in the country comes from hydroelectric plants that have impacts environmental and social issues in the region where they are located (MORAN, LOPEZ, MOORE, MULLER, & HYNDMAN, 2018).

It should also be noted that Brazil is the most promising country in terms of energy generation through the use of photovoltaic plates, with the potential to supply all the country's demand.

[9] ANEEL Normative Resolution 482/2012: "Art. 6th. The consumers responsible for the consumer unit may join the electric energy compensation system: I - with microgeneration or distributed mini-generation; II - member of an enterprise of multiple consumer units; III - characterized as shared generation; IV - characterized as remote self-consumption. "

[10] "Green" taxes are aimed at reducing carbon emissions in the atmosphere, with the aim of trying to curb global warming and can also help to reduce deforestation - by allocating part of the collection to funds for this purpose. This type of tax aims to tax those who contaminate the environment, in order to reduce the degradation of nature and curb climate change

III. NEED TO IMPLEMENT RENEWABLE ENERGIES TO IMPLEMENT THE 2030 AGENDA

The 2030 Agenda, signed in 2015, highlights in its preamble several objectives, such as, for example, eradicating poverty, promoting prosperity and well-being for all, protecting the environment and tackling climate change, with the presentation of 17 objectives and 169 goals to be achieved by 2030 (United Nations, 2015).

Here the objectives of Agenda 2030 will be highlighted, which have a close connection with the generation of clean energy, namely: a) SDG 7: deals with clean and accessible energies for the population; b) SDG 11: highlights the importance of sustainable cities and communities; and c) SDG 13: need for action against global climate change (United Nations, 2015).

SDG No. 07 indicates the need to ensure reliable, sustainable, modern and affordable access to energy for all by 2030. It also stresses that countries must substantially increase the share of renewable energy in the global energy matrix, as well as strengthening international cooperation, with the aim of facilitating access to clean energy research and technologies. (United Nations, 2015) (VASCONCELOS P. E., 2020c, p. 133)

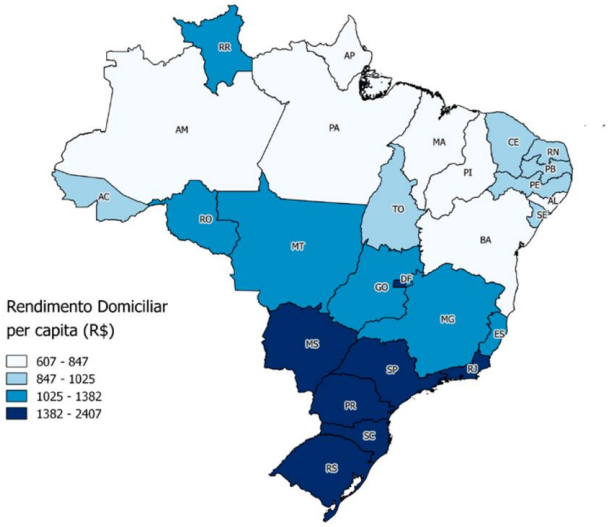
At this point, it is important to highlight that Agenda 2030 not only foresees the importance of implementing renewable energy, but also highlights that these energy sources are accessible to the population. Renewable energies can be supplied by the Government itself or by its concessionaires, as well as they can be exploited by individuals, individuals and legal entities, based on state incentives. In the latter case, the Government must encourage, through "regulatory pushes" (nudge), the use of sustainable energy in homes and commercial establishments.

As highlighted in the previous chapter, Brazil has several laws that aim to facilitate the acquisition of photovoltaic plates by the population, in order to make them self-producers or prosumers.

However, the rules in force do not prove capable of guaranteeing the democratization of the use of photovoltaic plates that currently have high prices in relation to the Brazilian socioeconomic reality. According to data from IBGE (Instituto Brasileiro de Geografia e Estatística, 2019), the per capita household income of the States range from R$ 607 to R$ 847 to R$ 1382 to R$ 2,407 (Figure 01), which makes implementation practically impossible of an autonomous photovoltaic system, even in the states with the highest per capita income in the country, since the average cost reaches

approximately R$ 20,000.00, including the value of the material used and labor (Portal Solar, 2020).

Cartograma 1 - Rendimento mensal domiciliar *per capita* das pessoas residentes em domicílios particulares, segundo as Unidades da Federação - Brasil - 2018



SDG 11 provides that cities and human settlements must become inclusive, safe, resilient and sustainable. In the list of goals, SDG 11 provides for the reduction of the negative environmental impact per capita of cities, including paying attention to air quality, waste management, among others (United Nations, 2015).

It is important to highlight that the adoption of photovoltaic plates in buildings or houses is closely linked to the reduction of negative environmental impact. By not using non-renewable energy supplied by concessionaires, there will be less emission of polluting gases into the atmosphere. Likewise, the use of photovoltaic plates would bring benefits in relation to the energy generated by hydroelectric plants, as there would be no need to build new plants that naturally generate a high environmental impact in the area of operation.

Finally, SDG 13 indicates the need to adopt measures to combat climate change and its impacts, highlighting, in its second goal, the need to integrate climate change measures into national policies, strategies and plans (United Nations, 2015).

Incidentally, one of the main factors for climate change is the burning of fossil fuels, with the emission of greenhouse gases - GHG - into the atmosphere, generated by various means, including cars, industries or power plants that use energy generation methods through non-renewable sources.

Thus, it is inferred that the replacement of these factors by alternative energy methods would contribute to the fight against climate change.

The implementation of renewable energy sources and environmental sustainability depend on the efficient performance of the Government that can use the strategies presented by the Behavioral Economics studies to encourage the use of these energy sources, as will be demonstrated in the next chapter.

IV. REGULATORY LAW AND BEHAVIORAL ECONOMICS

In this topic, the forms of state regulation and the tools that have been intensified in recent years from the studies of Behavioral Economics and Economic Analysis of Law will be addressed.

As for Behavioral Economics, Thaler and Sunstein's (2008) theory of nudges will be presented, which represent small state "push" inducing social and economic behavior desired by the Public Power, which would act as an "architect of choices".

In the end, it is intended to demonstrate the importance of the Public Power in inducing behaviors necessary for environmental sustainability and the fulfillment of the objectives set out in Agenda 2030.

4.1. Concept and fundamentals of state regulation

State regulation represents a form of indirect State intervention in the economy that aims to discipline the exercise of economic activity through the establishment of legal rules, inspection, sanctions and conflict resolution.

At this point, Oliveira (2015) highlights that the term "regulation" is polysemic, admitting three different meanings, namely: a) broad sense: This sense provides that regulation is any form of state intervention, corresponding to the generic concept of intervention in the economy; b) intermediate sense: provides that state regulation is equivalent to conditioning, coordinating and disciplining private activity, excluding, therefore, the direct action of the State in the economy; and c) restricted sense: regulation would be only the conditioning of economic activity by law or normative act. In the present work, the term regulation will be used in its intermediate sense.

The regulatory role of the Brazilian State is based on art. 174 of the Brazilian Constitution[11], which provides that the State must act as a supervisory agent, regulator, encourager and planner of economic activity. Due to the principle of free initiative and the provisions of art. 173 of

[11] "Art. 174. As a normative agent and regulator of economic activity, the State will exercise, in accordance with the law, the functions of inspection, incentive and planning, which is decisive for the public sector and indicative for the private sector. "

the Brazilian Constitution, the State can only exercise economic activity directly in cases of national security imperative or of relevant collective interest[12].

Regulation represents an indirect intervention by the State in the economic order that is not to be confused with the State's business activities (direct intervention). It is not, however, a simple adoption of a passive stance of police power or state ordering, but rather an active stance in the imposition of behaviors on the markets to be regulated (OLIVEIRA, 2015, p. 138)

It should also be noted that the regulation of the economic order can be carried out in four ways: a) state regulation: exercised by the Direct Public Administration or by entities of the Indirect Administration, usually through special autarchies (regulatory agencies); b) non-state public regulation: carried out by private initiative entities through state delegation or recognition of the legal order; c) self-regulation: implemented by private entities that concentrate the role of regulators and regulated, since they regulate the market in which they are inserted; d) deregulation: when there is no institutionalized regulation, public or private (OLIVEIRA, 2015, p. 138).

Regarding the fundamentals of state regulation, Oliveira (2015) mentions the two schools that seek to explain the reasons for regulatory intervention in the economic order: a) School of Public Interest: provides that regulation must be intensified and justified by the need to satisfy the public interest or the common good; and b) Chicago School: maintains that the regulation of ensuring the proper functioning of the market, correcting its flaws, among them: monopoly, externalities, collective goods and information asymmetries.

However, the author still highlights the two views, considered in isolation, are insufficient to justify regulation in the contemporary State, especially in the Brazilian context. The "strong" intervention of the State in the economic order, due to the asymmetry of information between the Public Power and the market, can generate the so-called government failures, causing the following problems: state paternalism (reduction in the autonomy of individuals), theory of capture (satisfaction of regulated interests to the detriment of consumers) and regulatory asphyxiation (unfeasibility of exercising economic activities due to the excess of state restrictions). On the other hand, "light" state intervention in the economy does not consider the distribution of wealth, which contributes to the maintenance or increase of social and economic inequalities between individuals, thus making sustainable and egalitarian development unfeasible (OLIVEIRA, 2015).

In fact, the historical process is pendulous, and the profile of state regulation has always varied according to the reality of each country, with moments of greater economic freedom and others of greater state intervention in the economic order, especially, in this last case, in a period crisis, as happened with the 1929 crisis in the United States and in the moment after the two World Wars in Europe (OLIVEIRA, 2015, p. 140).

It turns out that the traditional debate centered on the intensity of state regulation has, to some extent, lost its role in coexisting with the debate on regulatory quality - Better Regulation - through the institutionalization of mechanisms capable of ensuring greater legitimacy, efficiency and control of regulatory policy (WEATHERILL, 2007, p. 1-17).

In this scenario, Baldwin (2010) highlights the guidelines of the Organization for Economic Cooperation and Development (OECD) for the implementation of better regulation: a) serving clearly identified political objectives and being able to achieve them; b) have a solid legal and empirical basis; c) produce benefits that justify costs considering the distribution of effects across society and taking into account economic, environmental and social effects; d) minimize costs and market distortions; promote innovation through market incentives and goal-based approaches; e) be simple and practical for users; f) be consistent with other regulations and policies; and g) be compatible, as far as possible, with competition, trade and the principles of investment facilitation at domestic and international levels.

Thus, highlights Baldwin (2010), that within the discussion that involves better regulation, the application of smart regulation, or smart regulation, should be valued, which aims to implement a mix of control methods that do not focus only on state agencies, but also by other regulatory actors such as associations, corporations, pressure groups and even individuals themselves. Intelligent regulation argues that whenever possible, low intervention methods should be used.

4.2. Regulation and behavioral economics: nudges

According to Richard Thaler (2008), Behavioral Economics, which can be used in the formulation of public policies, intends to include the human factor in economic models, replacing the fictitious beings used in traditional economic models, defined as "Econs", which they are flawed and affect several deviations when they disregard the reasons that drive the performance of ordinary people.

[12] Art. 173. Except for the cases provided for in this Constitution, the direct exploitation of economic activity by the State will only be allowed when necessary to the imperatives of national security or to the relevant collective interest, as defined by law.

According to the author, the central premise of economic theory is that people would always seek to optimize their choices, that is, of all the goods and services offered, one would opt for the best within their possibilities. There is a presumption that the beliefs that motivate "Econs" choices are impartial, based on what economists call "rational expectations" (THALER, Misbehaving, 2019, p. 19)

Thaler (2019) points out three criticisms of traditional economic models: a) the problems of optimizing the choices common people face are often too difficult to be rationally and ideally solved; b) the beliefs from which people make their choices are still biased, with several biases that have been documented by psychologists; and c) there are many factors that the optimization model leaves out.

The premises of the Behavioral Economy must be taken into account by the Public Power when regulating the economic order.

In this sense, Richard H. Thaler and Cass Sunstein (2008, p. 3) suggest that the State should function as a kind of "architect of choices" that organizes the context in which people decide in order to guide the decision, without replacing the choices of individuals.

According to the aforementioned authors, the push regulation can be inserted in the so-called "libertarian paternalism". On the one hand, paternalism is characterized by the state's induction of choices and, on the other hand, the libertarian character is found in the very choice that will be made by the individual (THALER; SUNSTEIN, 2008, p. 4-6).

According to neuroscientists and psychologists, there are two systems of thinking in people: automatic system (fast and instinctive) and reflexive system (deliberative and conscious). Due to the scarcity of time and information asymmetry, it is impossible to demand that all individuals' choices are reflective and take into account all variables in the decision-making context.

Regulatory pushes are intended to facilitate the automatic choices people make on a daily basis.

In a study on the subject in the 70s, Israelis Amos Tversky and Daniel Kahneman, identified three heuristics or "golden rules" about the way of thinking (THALER; SUNSTEIN, 2008, p. 23-31): a) anchoring: people usually think and decide based on data and information that they have previously or that are placed in the questions (eg, people normally make larger donations when, in the question, higher value options are placed); b) availability: people usually analyze the risks involved in their choices based on experienced examples (eg someone who experienced an earthquake usually overestimates the risk of its occurrence) or disclosed by the press (for example, when immediately after the occurrence of a terrorist attack, frightened people will overestimate the risks of a new attack occurring); and c) representativeness: thoughts and choices based on stereotypes (eg, the high number of cancer cases in a given neighborhood can lead to the false idea that there is a national epidemic).

In this context, the State should architect the choices of individuals through the presentation of information and possible alternatives, especially in cases where there is a time lapse between the costs and benefits of the decision (ex: promoting the diet to ensure better health in the future), decisions on infrequent or non-feedback issues and situations involving information asymmetry or lack of time to evaluate the options involved.

In its role as an architect of choices, the Public Authority takes into account the psychological principle of stimulus-response compatibility, exposed to Thaler and Sunstein as follows: "the signal you receive (stimulus) must be consistent with the desired action. When there are inconsistencies, there is a drop in performance, and as a result, people are wrong" (THALER & SUNSTEIN, 2008, p. 98).

Thaler and Sunstein (2008) present several basic principles of choice architecture, highlighting, in this study, the standard option principles (the path of least resistance) and feedback. The first principle highlights that people accept the option that requires the least effort or the path of least resistance. The second principle, on the other hand, reveals that feedback is the best way to help improve the performance of human beings, highlighting that an important type of feedback is the warning that there is a problem or that the problem is about to happen.

Furthermore, Thaler and Sunstein (2008) highlight the herd behavior that suggests that most people learn from others, regardless of the correctness of ideas. Social influences could be grouped into two basic categories: a) the first involves information, that is, if many people do or think something, their actions and thoughts convey information about what would be more convenient to do or think; and b) the second involves social pressure that refers to the importance that people attach to their image before others.

Regulation by pushing (OLIVEIRA, 2015, p. 197) or nudge represents an important instrument of satisfaction of the public interest, with the state induction of socially desirable behaviors, without withdrawing the decision of individuals. In relation to the environment, regulatory pushes can contribute intensively to increasing the use of renewable energy and the effectiveness of environmental sustainability, as will be highlighted in the next topic.

4.3. Behavioral regulatory law and environmental sustainability

Based on the premises previously established, it is intended to demonstrate how behavioral regulation can contribute to the realization of the objectives of Agenda 2030.

The environment, as taught by Jose Afonso da Silva (2002), is a system that provides balance for life in all its prisms, being formed by the conjunction of factors arising from nature, culture or even artificial factors that guide this trajectory of life.

The promotion of the defense of the environment represents an important challenge, due to the prevailing vision in the different countries towards the maximization of economic advantages, in what was called by Cardoso and Neto (2019) "economicocentrism", which recognizes a subsidiary role of nature that it would be a supplier of goods that can be turned into economic wealth or money. In this scenario, the environment would be seen as an instrument for generating profit and not as a need for humanity to survive.

Notwithstanding this reductionist view, it is necessary to strengthen the need for an ecologically balanced environment, which is a good of humanity inserted in the catalog of human rights by the United Nations, through the Stockholm Declaration. As a result, the environment requires global protection, since the risks go beyond state borders, and it is up to the states and the population to protect it.

Cardoso and Feitosa (2019) add that, in addition to the normative structure of Environmental Law, which covers constitutional norms and infraconstitutional legislation, there are other types of rules for the protection of rights, called soft law and originated within the scope of International Law. These rules, also used in economic regulation and public services, make rational choices in terms of cost and benefit feasible, presenting themselves in a more flexible way, with the relativization of legal commands.

However, the current scenario reveals that the standards under review were not sufficient for the effectiveness of sustainable measures by the general population, which is why the instruments provided by the Behavioral Economy and nudge regulation can induce members of society to do better choices on environmental issues

At this point, the research carried out by Evans et al. (2017) whose scope is the application of nudges to environmental issues, in what can be called green nudge.

In summary, the authors claim that environmental issues have certain characteristics that differentiate them from other political-legal areas, which demonstrates the inefficiency of traditional regulatory models for preventing environmental damage. Environmental protection is a public good that must be protected by reducing social inequality, with social inclusion through economic and political participation (EVANS, et.al, 2017, op.cit Croson and Treich, 2014 p.336)

For this reason, green nudges expand the reach of public policies to deal with environmental issues and must be incorporated into the state regulation toolkit.

In order to exemplify nudges aimed at encouraging the reduction of energy consumption, Thaler and Sunstein (2008) mention a study on the power of social norms, carried out in San Marco, California, where all houses received information on the amount of energy consumed in previous weeks and information about the average energy consumption of the houses in the neighborhood. In the following weeks, it was found that those who were above average reduced their consumption and spending on energy, but those who were below average increased their consumption.

This latest discovery is called by Thaler and Sunstein (2008) as the “boomerang effect” and reveals a warning: if the intention is to guide people to present socially desirable behaviors, do not let them know that they are already behaving better than the norm. The way found to solve or minimize the problem, was to add visual feedback through happy or sad emoticons.

It is possible to imagine some green nudges that can be used in the field of state regulation, such as, for example, the permission to sell photovoltaic energy to the electric company, the exemption of interest on installments and the realization of advertisements encouraging the adoption of this model in together with environmental awareness.

As green nudge applied to the use of green energy, Pichert and Katsikopoulos (2007), bring up the following hypothesis: “Standard, it affects the choice for energy. Currently, the standard is polluting energy, so people use it because it is the standard. In this case, if the standard were clean energy, then people would use it”.

For the hypothesis presented, Pichert and Katsikopoulos (2007) present two experiments, where it was possible to analyze the hypothesis where clean energies are the standard for use.

The first experiment was carried out in a small town called Shönau in Germany. The authors present initially, that such a city is not considered an environmental center, since the green party, had only 5% of votes of the population, in the period presented by the author. In the 1980s, an initiative by the citizens of the area was founded,

as a reaction to the Chernobyl disaster, aiming to rise up against nuclear energy.

In view of this scenario, proposals resulted in the adoption of sustainable means of energy generation and for that, the city created its own energy company, which buys energy generated through renewable sources and promotes the generation of solar energy (PICHERT & KATSIKOPOULOS, 2007).

The second scenario portrays the case of a German company, a supplier of electrical services that diversified its services, offering three new tariffs where previously there was only one. These tariffs were divided into a green tariff (used as a standard) an economic tariff (8% cheaper than the standard tariff but using polluting methods for power generation) and the premium green tariff (23% more expensive than the standard tariff but enables a greater share of electricity generated in new installations).

Because green energy is used as a standard, it would be up to consumers who wanted to change the tariff to one of the other two presented, to contact the company, requesting the exchange. In this scenario, 94% of consumers maintained the standard tariff method, as this is the "easiest" choice, being this one of the fundamentals of the choice architecture.

With the concomitant reading of both cases presented, it is possible to perceive that the fact of implementing a method of sustainable energy generation as a standard will make a large part of the population maintain it, this being a tested nudge that can be applied in other countries

V. CONCLUSION

The present study demonstrated the Brazilian challenge related to the low adherence to the energy generation system through solar energy through photovoltaic plates.

The adoption of this system would be enough to generate enough energy to sustain the entire country, in addition to the potential for sales to other countries, since the solar radiation index in Brazil is high when compared to other countries.

However, the current reality reveals that the installation of autonomous energy generation systems, through photovoltaic plates in homes and commercial establishments, involves high investments if we consider the per capita income of Brazilians.

The issue is not only economic, but also the necessary awareness of the population in general about the need to use renewable energies for the effectiveness of environmental sustainability. Along with the necessary tax incentives, it is necessary that the Public Power uses instruments of regulation by pushing in the environmental area (green nudges), creating incentives for democratization and universalization of the generation of renewable energies, notably through photovoltaic plates in condominiums, in homes, in commercial establishments, industry and public buildings.

Through the presented study, it is demonstrated that the application of Behavioral Economics in environmental matters is not only correlated, but also essential for the implementation of the relevant rules. As a demonstration, experiments were carried out in Germany, which prove the efficiency in the use of green nudges in the electrical area. It is something essential to the Public Power in its decision making, in order to ensure that the Goals for Sustainable Development are fully fulfilled.

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