**Intelligent alternatives of energy use**

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Energy use alternatives are generally considered from the supply standpoint: energy sources are hydroelectric, fossil fuels, nuclear, wind, sun, geothermal or even methods that use sea movements. The planetary effort to reduce climate impacts and economize petroleum are leading to widespread investments to alter the supply profile by diversifying sources and prioritizing renewable, clean energy sources. There is also a complementary effort to encourage consumer awareness in relation to rational fuel use.

It is interesting to recall the great global oil crises in 1973 and 1979, when prices rose sharply leading to studies on behavioural changes of North Americans due to the high cost of energy. Some of these studies resulted in factories learning to save energy, home-owners using insulating material to fight the cold or heat and cars that were no longer merely considered from the luxury perspective, but for their energy effectiveness. The excellent short-term results exposed the former culture of energy wastage. Consequently, energy sustainability demands efforts that are related to energy supply as much as rational use of energy.

In Brazil, a similar case occurred after the blackout at the start of the last decade, leading to emergency measures prompted by a nationwide public awareness campaign that promised reduced energy bills for consumers that consumed less and applied fines to those that exceeded consumption limits. In all, there was a significant reduction in energy use without people having to deprive themselves of certain comforts. The public simply realized that they were wasting energy in almost all usage forms, and that they could greatly reduce energy consumption without sacrifice or suffering by merely adhering to intelligent resource use.

The Brazilian population of around 200 million inhabitants has a very unequal consumption level. As inequality is reduced and the poor start to consume energy, national consumption should expand significantly. As an order of magnitude, around 50 million people comprise the “fourth world” while another large portion of the population will effectively start consuming and, in many cases, reach the consumption levels of the wealthier classes. Subsequently, consumption will expand in general, demanding more energy for direct use of domestic appliances as well as industry and agriculture.

Intelligent composition – more efficient and less polluting- of the energy matrix on the consumer side is therefore essential. Brazil is evidently not alone in this process. Overall enrichment of the planet that directly impacts energy consumption of both individuals and companies that supply them cannot and should not be avoided. We are 7 billion inhabitants on this planet, being that the poorest two thirds of the population consume less than 10% of produced goods and services. Generalization of the spendthrift consumer of the USA model, which represents 4% of the world population and 25% of greenhouse gas emissions, is simply not feasible. This observation is important because Brazil will participate, with the rest of the world, in a broad effort to change the consumer profile. The central axis does not consist of deprivation or sacrifice, but of organization and intelligent use.

Energy is practically linked to all human activities, which means that this is a civilizational challenge that seeks to prompt cultural change. We are still in the race to consume more as this increases GDP and generates more jobs, which erroneously reduces the main cause of anguish that is the incapacity to maintain a family. Considering that there are 7 billion people on this planet, and 70 million more every year, this vision is suicide because the planet is simply not large enough, as we are increasingly realizing. In this spaceship, we must all act like crew members and not like passengers – without overlooking those who act like first class passengers in comfortable, well-served places, generating a trail of costs that affect us all.

A simple illustration provided by a United Nations report summarizes the rising debate. In North Korea, in light of the climate-related challenges and the global financial crisis of 2008, they have decided to launch a programme of 36 billion dollars to modernize urban public transport. Repercussions were varied, as boosting public transport leads to more efficient urban mobility in terms of time spent by travellers, and reduced pollution. The programme created 960 thousand jobs, which improved the social situation; jobs generated salaries and demand resulting in overall improvements and reducing the effect of the financial crisis. Moreover, the investment allowed companies access to advanced technology and the country reached a good position in scientific-technological advancement, which is considered strategic. Naturally, energy consumption in public transport was drastically reduced, so there was no sacrifice, only intelligent articulation.

The evolution from “consume more” to “consume better” is natural, as is the transformation from the desire for quantity to the desire for quality. Prior to this evolution, an assembly plant merely targeted the sale of cars, while today, the car industry is also interested in social aspects due to the pressure of the culminating easy oil era, climate change, depletion of resources and, above all, the revolt of two thirds of the world population that know they are being kept out of the system. The World Bank addressed these issues with caution when it referred to the 4 billion people that “have no access to the benefits of globalization”. As Ignacy Sachs correctly stated, we are condemned to reinvent.

Brazil has become urbanized: around 85% of the population lives in cities and about a third lives in great metropolises. Even in medium-sized cities, the traffic problem is becoming critical. A study of the Rede Nossa Sao Paulo shows that 2 hours and 43 minutes are lost every day in the city due to traffic, during which people do not rest, work or spend this time with their families. They get up earlier to arrive on time, leading to the disappearance of family life. They move at an average speed of 14 kilometres per hour, in first and second gears, with immense fuel consumption, shifting 2 tonnes of equipment per person of 70 kilos. The bus lanes, however, allow the transportation of 23 thousand people per hour, while in the car lane beside them, only 3 thousand people are transported in the same period. Fuel consumption per person/kilometre is much higher. The metro system, which is incomparably more efficient due to the clean energy, allows the population to save an incredible amount of time.

In the metropolises, thousands of new cars are registered very day. Not triggered by need, but by advertising massacre and, above all, because there is no alternative collective public transport system. In reality, all families of the poor suburbs also have cars, so the car is not the problem as everyone needs a car to shop, for weekends and family trips. The problem is that in a city of 11 million inhabitants, as in the case of Sao Paulo, 6.5 million people travel daily at the same time, going and coming; every day, on the same routes, to work or to take their kids to school. If this massive and simultaneous shift of people were transferred to the dense metro network and the bus and streetcar lanes, the roads would be free for more diversified uses.

An econometric study conducted in Lisbon showed that a greater number of cars entering the city slows the buses down, forcing people to prefer their cars instead of the slow-paced buses. Integrated development planning of the public transport system of the city is vital in order to change the energy matrix that wastes petrol, pollutes the city and generates systemic productivity losses. The individual person cannot solve the situation because he or she needs to get to work, preferring the individual solution that is the car even if the budget forces him or her to sacrifice essential needs.

Interestingly, waste is not calculated with traffic jams, but with higher GDP caused by increased car sales, more mechanic workshops, hospital admittances, and motorcycles that fill the remaining space on the roads. Young people on motorbikes die every day in a silent tragedy that no longer provokes revolt. Enterprises and assemblers finance political campaigns of city administrators, leading to more cars, tunnels and viaducts and, in the case of Sao Paulo, the shamefully limited 60 kilometres of metro lines.

Evidently, the huge waste of energy is the result of wrong choices in the urban transport matrix. The road option, however, is equally tragic. Brazil transports almost two thirds of its cargo on trucks that use diesel fuel, tires and asphalt with an absurd tonne/kilometre cost. In a country of large distances like Brazil, the system generates excessive costs to all producers in the direct form of shipping and indirectly through tax and tolls for roadway maintenance. If we observe Brazil as a whole, almost all financial centres have ports, from Manaus to Porto Alegre, with the exception of Belo Horizonte and region. The much-needed national transport system should prioritize sea transport that is incomparably cheaper and could interconnect our Atlantic economy to the rail network in the interior, while trucks are used for short distance and fractioned cargo transportation. These measures would lead to fuel economy and, consequently, a reduction of the transport/component in all productive regions resulting in external economy and increasing systemic productivity.

Another very significant change in the energy consumer profile is in the prosaic electric shower. In electric shower devices of 2500W – when compared to cold light bulbs that have a consumption level of around 15W – the shower becomes a powerful domestic energy consumer. In addition to the consumption volume itself, showers are often taken at the same time which makes matters worse. The fact that electrical energy, and therefore electricity, is not storable means that the overload in the grid is very high. To prevent the grid from collapsing, power generators need even larger investments. In various countries, energy supply companies finance the installation of solar panels in homes, as it is cheaper to invest in domestic equipment to balance the consumption level than to invest in greater generation capacity.

In fact, while production of electricity with photovoltaic cells reaches the commercial arena, albeit the difficulties, solar water heating has been fully dominated in technical terms, in addition to being cheap and reliable. In terms of domestic expenditure, cost reduction is significant and investments, even if individual, are recovered in a short period. The roof of a house is an immense space in an urbanized area, with the sole utility of draining water, considering that in various regions roofs are being used to heat water and capture rain water for a number of uses that do not require drinkability. Many houses even have waterproof concrete slabs instead of tile roofs that are ideal for growing a garden that absorbs water and favours the planting of flowerbeds and small vegetable gardens, thus stabilizing the temperature of the house and reducing the use of air conditioning. A terrace between these gardens is also very agreeable.

Water is an essential element of the consumption profile and presents widespread energetic impact. In general, instead of understanding the natural dynamics of this element for better usage, people tend to impose the law of men. Natural springs, valleys and the entire natural drainage system are covered with asphalt to favour cars, while the rest is channelled to accelerate drainage, followed by duct deepening because water accumulation is quicker and large pools that require huge amounts of concrete and high energy density. This flood of excesses also leads to “bulky contracts” for the construction companies. Evidently, one day, these works will be dismantled and the rivers and streams will be clean again, full of fish, with lots of green areas and space for walking, which will humanize the city as today, in reality, they only serve to push sewage. To understand and adapt to nature can be much cheaper in financial and energy-related terms.

In the case of drinking water, numerous studies indicate that assuring clean water in the tap of every residence creates a simple and cheap supply system. According to Lester Brown, in his wonderful *Plano B 4.0*, selling water in bottles in the supermarket generates energy costs that are around a thousand times higher than selling water in the tap. This excessive expenditure involves the production of plastic bottles, their transportation and handling, availability in supermarkets, energy used to fetch the bottles, which is often by car, time spent on purchasing and transporting water, discarding and final transporting the bottles to landfills and, finally, all the plastics discarded for packing in various stages, including rubbish bags. IDEC studies show that, in general, there is no difference in terms of faecal coliforms between tap water and most bottled waters available in stores. But it seems more fashionable to buy water. In fact, a good filter (that does exist) that cools water correctly makes water cheaper and generates significant family economy in relation to soft drink consumption. A glass of cold, clean water is still a simple option that makes us feel good.

It is interesting to think about the house, our home, and its energy balance. Today, there are electricity metres that provide details about how much we use the air conditioner, heaters, electric tap, refrigerator, and various stand-by points – that red light that allows us to turn devices on. Systems that enable us to turn off lights and the fan when there is no one in the room comprise an excellent savings factor. Sometimes, however, people find it difficult to solve these problems individually. Stand-by consumes 4W, which is quite a lot given the growing number of domestic appliances. The requirement of regulatory authorities that stand-by should not exceed 1W forces companies to advance their technologies to achieve greater energy efficiency and comply with the requirement of installing catalytic convertors in cars to enhance performance. Technologies should free us from costs and make life easier, not harder.

Changes undoubtedly demand articulated action of public powers, companies and the general public. People will continue to drive to work insofar as there is no adequate transport, they will continue using electric showers insofar as there is no generalized offer of solar heating systems and appropriate maintenance, and they will continue to buy water in the supermarket – middle class and upwards – insofar as better quality water is not provided as a public service. The modest cooking gas will continue to be transported and sold in small cylinders that circulate around the city, with astounding energy inefficiency, insofar as local governments do not generalize access to street gas, including the use of gas from sanitary landfills.

Energy efficiency of domestic appliances has greatly improved after the passing of the law that forced stores to display energy use levels on a refrigerator, for example. This process led to public awareness through adequate information systems and pressure on companies by the consumer and regulatory authorities. Energy consumption efficiency is getting organized and should consequently be administrated. It is a public policy, not simply a government policy.

Free access to broad band internet is another very important factor in rational energy use. In cities like Pirai, in the State of Rio de Janeiro, generalization of access allows citizens to solve their problems on the internet, while bits travel quicker and cheaper than a car or bus, without wasting the time needed to solve a problem personally. This involves tension between companies that charge tolls on the circulation of information and knowledge, and public needs. A good example is the reconstruction of New Orleans after Hurricane Katrina; “the incentive was to construct a wireless broadband network to provide a free public internet service, which would also allow the necessary communication with government and emergency services. The company Bell South threatened to sue the city if the municipal network of New Orleans continued to be managed by the city. As a result, the network was acquired by an overseas company” [[1]](#footnote-1)

The generalization of wireless broadband internet access constitutes an important factor of rational energy use and systemic efficiency of all productive processes. As the world economy evolves quickly to the economy of knowledge, free circulation of information becomes essential. The street also has incomparably higher costs to the cost of broadband, which navigates on electromagnetic waves with little infrastructure, but no one would dare charge tolls for people to walk the streets. The fact that the streets are free does not prevent the installation of stores and a variety of activities that are remunerated. Delays in the creation of free public wireless infrastructure force millions of people to make useless trips and companies to accumulate unnecessary stock. Courier services to collect a signature illustrate just how private interests outweigh the interests of the general public, or delayed understanding of technology that generates high costs for everyone. The resulting inefficiency generates energy costs, and the energy balance should be considered in all its dimensions, including time wasted and climate change.

The construction industry comprises another mature area for profound revision of its own parameters. The so-called “green constructions” or “sustainable architecture”, involve this type of adopted raw material without spilling concrete, economy of supplies transportation, to avoid waste, and use of local material. In Costa Rica, they have adopted bamboo for very solid constructions, generalized use of glass to enable more natural light, double panels in frames to stabilize room temperature, natural ventilation systems to reduce the need for air conditioning and so forth. Deeply embedded stilts and tubes comprise forms of using geothermal energy to save on artificial heating systems. There is a universal awakening – although still disperse and relatively slow – that progresses to a vision that quality can be as or more important than quantity, and that construction of glitzy buildings that flaunt useless luxury can be less impressive than simple, more intelligent buildings. This slow but somehow deep cultural change allows us to perceive the new technological opportunities as environmental tragedies impel and encourage us to quicken the pace.

Environmental threats prompt the discussion of consumerist obsession of which we are the authors and victims. A surreal and spendthrift consumption model that is typical of the middle and higher classes of the USA has emerged together with an artificial perception of success centred in the capacity to flaunt a house with a garage for four cars, air conditioning in each room, car models that have to be switched every year, clothes that have to be discarded although they are good and beautiful, breasts that must be filled to resemble something they are not, expensive designer clothes that are purchased not for their utility, but for the status conferred by the brand, although they are *Made in China* or from shady clothes store districts. The modern, successful citizen throws away an average of one kilo of products per day. He or she buys fruit – out of season – that is transported across thousands of kilometres to decorate a lovely grape dish to impress the guests.

We are the authors of a farce, but we are also the victims. Children spend hours in front of the television, which is why large marketing companies create advertisements that are targeted at raising children that later become large-scale, avid consumers. The advertising effort today costs around one trillion dollars per year, whether we like it or not, whether we watch the advertisements or not. It represents the industry of economic behaviour that people do not like to acknowledge because it is considered a weakness of the spirit to buy something under the influence of advertising. The human being is easily influenced, which is a weakness but also an important quality. Commercial harassment is mostly responsible for this monstrous distortion of people that do not know where to place the useless items they purchase, while one billion people on the planet do not have enough to eat. The social and the environmental aspects are like a hand and glove; one is articulated to the other.

Packaging becomes an interesting mirror of the reigning consumer. A pair of socks bought in a shopping centre forces the buyer to parade with a huge plastic or paper bag, making the consumer a walking billboard of the store and the designer label. In Toronto, Canada, stores are obliged to charge a modest amount for plastic bags, ten cents to the dollar, which drastically reduced the waste, namely because the salesperson is forced to ask if the person wants a bag to then charge it. On average, a middle-class person wastes half a kilo of packaging a day. The energy waste involved is huge, from the energy cost of packaging to transportation and final destination of solid waste. Various companies that deliver a cooker, for example, are forced to remove and reuse the packaging, which also forces manufacturers to design packaging that can be re-used. There is room for intelligent life.

The basic line of thinking that guides the energy problem from the usage standpoint is the circularity of productive cycles. Instead of the traditional lineal system in which we extract natural recourses, transform them into products that we consume and discard, generating voids on one side and contamination on the other, we should advance toward a circular process in which products are developed in such a way that they can be recycled or reused, eventually generating a neutral environmental balance in nature and minimizing environmental impact in general. Many companies today already assemble computers so that various components can be easily disassembled and reused in other products. Consequently, productive planning is not limited to the cycle of production and sales – and flaunting earned money – but seeks to organize sustainability of a set of successive productive cycles.

An important axis of the energy matrix change emerges from the recent technological transformations of transport methods, with the generalization of electric cars, motorcycles and bicycles. It is important to remember that most technologies already exist. Society has only recently put pressure on clean electric systems that force companies to boost reconversion to electric or hybrid vehicles. The weak point is still the battery, which has a slower moving technology. The horizon, however, shows the clear possibility of people generating electricity from photovoltaic cells on their roofs to charge their vehicles or replace the battery according to their needs. The horizon also shows a silent city without the hysterical noise of the accelerated motorcycle. Subsequently, petroleum will be used for nobler tasks than starting an engine and air-conditioning of stationary cars in the large avenues of the metropolises.

A less visible dimension of rational energy use in cities is linked to urban organization itself. Extreme income inequality is reflected in the organizational territorial deformation of the city. The location of companies and jobs has generated great interest in living space leading to a raise in land and rent prices. The working population was therefore forced to seek spaces that they could afford, generating a deep spatial division between workplace and living space, especially in the metropolitan areas, with dormitory-cities that oblige people to commute for hours to get to work or solve the simplest problems like paying tax in city hall or even going to the cinema on the weekend. On the side of the wealthy, distant condos have multiplied consisting of fenced and isolated luxury that also require long trips for any daily task. The result is thousands of people travelling constantly and, above all, a lot of time wasted.

Emerging urban reorganization is the self-sufficient neighbourhood. Modern technologies fully enable the local availability of public services, at walking distance, without commuting or prejudice to the coherence of the system that can be articulated online in the entire city. By overcoming the narrow visions of separate “residential areas” and “commercial areas”, we have acknowledged that every location should have public and private services that facilitate the lives of its residents. The idea of schools that require tiring car trips is absurd, as children should be able to walk or ride a bike to school. Leisure needs to be decentralized to avoid the ridiculous scene of having to take the car out of the garage, put the bike on the rack, drive to the park, take the bike off the rack, and then redo the entire process to drive back home.

This rational territorial organization, from a standpoint of the self-sufficient neighbourhood in a series of basic activities of our daily lives, has evident positive effects on energy saving and time saving, on the revival of living alongside other people, on the collaborative pleasure of a neighbour watching over another person´s child in the park or playground, that is, on the return of civilized life that we call economy of well-being.

A phenomenon that has quickly expanded is the reduction of transportation of the products we consume. Many cities seek to implement the so-called “green belt” of fruit and vegetable farmers, allowing the city to provide fresh products that do not require transportation over large distances. Cities like Imperatriz do Maranhao, for example, acquire almost all their produce from the south-eastern region of the country, which is transported in trucks, when most of these products could be purchased in the region and additionally generate jobs and income. In England, today, supermarkets must display the origin of products and therefore, somehow, indicate the “kilometres” the products have covered. In Belo Horizonte, the city hall changed the product acquisition system for school meals; instead of buying products from large intermediaries, they have signed agreements with small producers located around the city and consequently reduced the energy cost, improved school meals and optimized agrochemical control.

The points exposed in this array of energy alternatives show that the production of clean energy is simply not enough. We must also organize consumption in an intelligent manner. Families can implement many positive actions, such as recycling, using food waste for composting, rearranging installations to replace the electrical shower, and so on. Many measures, however, require organization of public services. In order for people to leave the car at home, there must be public transport, and recycling requires a consistent collection system. Companies and the media, especially the advertising system, must focus on promoting balanced and responsible consumption by retrieving the informative capacity instead of reiterating artificial visions of consumerist success.

In other terms, this implies cultural change. Every act of purchasing and using a product should lead to thought in two dimensions: if it is good for us (undoubtedly), and if it is good for the entirety of social dynamics. To pour the oil we use to fry potatoes in the sink may be simpler for the housewife, but it leads to high costs for everyone. It is a lot cheaper to pour the oil in a container, while it is concentrated, than to clean the rivers. We must all do our part because we are all crew members. Considering that energy is somehow the blood that supplies human activity, we are all responsible: solutions are in the articulated effort of all individuals. It is not sacrifice. It is common sense.

1. “The [reconstruction of New Orleans](http://en.wikipedia.org/wiki/Reconstruction_of_New_Orleans) was the impetus to build a metro-scale wireless broadband network to provide free public Internet service, and it also provided needed communications for government and emergency services. [Bell South](http://en.wikipedia.org/wiki/Bell_South) threatened the city with legal action if the New Orleans municipal network were continued to be run by the city. Consequently, the network was bought by an outside company.” Visit: (<http://en.wikipedia.org/wiki/Municipal_broadband> ). [↑](#footnote-ref-1)