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Extra long Argentinian lockdown: Revising the energy regime

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ABSTRACT

With the first confirmed cases of COVID-19 in March 2020, a long and strict lockdown was implemented in Argentina, as a means of avoiding health services collapse. Measures were taken early in order to strengthen the health system before the potential spread of the virus. Mandatory isolation measures impacted on the energy system: they modified energy demand and production patterns, and caused reasons for uncertainty among investors and project stakeholders. Nevertheless, profound changes caused by the pandemic, pave the way for the adoption of sustainable solutions with the potential to improve people's quality of life. This paper aims to explore the effects of the COVID-19 lockdown on the Argentinian energy sector and on the course of the transition. By means of secondary sources, such as public reports and national statistics, and semi-structured interviews, changes in the energy sector are analysed as well as local-scale alternatives for the post-pandemic. Community-led energy initiatives and the possibility of implementing sustainable practices, could contribute to reducing uncertainty and valorizing local resources and capabilities.

1. Introduction

Energy is a *sine qua non* condition for most human activities. Everyday actions such as working, producing goods and services, cooking, heating and even practising leisure activities would be unthinkable without it. Since the beginning of the 21st century, Argentina has promoted an energy transition in order to reduce its dependence on hydrocarbons and move to a less centralized generation system. The energy transition does not only involve technological innovations or changes in the type of energy resource used, it also requires adapting production processes and forms of consumption. Thus, the transition implies changes at social, cultural, economic and political levels. In other words, it is a transformation that alters the systemic characteristics of a society [1–4].

In the Argentinian energy transition, efficiency measures and the incorporation of non-conventional renewable energies facilitate achieving universal energy access. Although the majority of the population (98%) has electricity [5], a large part of dispersed rural communities lack access to electricity and natural gas distribution networks. The national State has enacted laws to promote renewables (Law 26,190/2006 and Law 27,191/2015) [6], and has assumed international commitments, the most recent of which is the Paris Agreement (2015). Within this framework, Argentina has implemented programs and public policies, such as public tenders for large-scale generation projects, with guaranteed purchase of the generated energy. As a result, 3 GW of renewable energy have been installed, which represent 7.5% of the total installed capacity in the country [7].

The health, economic and social crisis caused by the outbreak of COVID-19 (the disease caused by Severe Acute Respiratory Syndrome Coronavirus 2, SARS-COV-2) has modified the global and national energy landscape, and with it, the course of the energy transition. Following the declaration of a pandemic, confirmed on 11 March by the World Health Organization, Argentina began its Preventive and Mandatory Social Isolation on March 20, 2020

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(Decree 297/20). After 150 days (on 16 August), the extra long Argentinian lockdown became the longest in the world. It has gone through different stages, depending on the level of restrictions, and the decisions of each provincial and local government. The rigor of the measures meant that it was also one of the strictest, including criminal prosecution for non-compliance. With the slogan "stay at home", the level of activity and circulation decreased, leaving large part of the population confined to their homes. This had a turmoil effect on the economy. Most of the activities were necessarily suspended or reduced, with a consequent drop in production. Governments tried to put in place measures to soften the negative effects on economies, and to contain the threat to public health at the same time. This had repercussions on the energy sector: direct symptoms (related to changes in energy demand and production) and collateral damage (associated with disturbances in prices and financing possibilities that reduce activity in the energy sector).

This article aims to review the direct and indirect effects of the long lockdown imposed in Argentina, in response to the COVID-19 pandemic, on the energy sector, and to examine sustainable alternatives. To that end, secondary national and international documentary sources, such as reports from specialized energy organizations, press articles and research and sector statistics, are analysed. The text is structured in three sections. Section 1 presents a diagnosis of the energy symptoms caused by the lockdown in Argentina, accounting for the changes in energy demand and production. Section 2 explores collateral damage, among which are the brakes on projects and investments, derived from the drop in hydrocarbon prices and the difficulty in accessing financing. Section 3 analyzes sustainable alternatives that are valorized in the world, arising from efficient practices and local and collective forms of energy production and management. Pre-existing experiences with the potential to be replicated in the post-pandemic are identified in Argentina.

2. Materials and methods

The paper is based on a multi-scale territorial theoretical perspective. The socially appropriated space is visualized as a totality where strategies, decisions and actions of actors intervening at different temporal and spatial scales are displayed and materialized, articulating the global, the national and the local [8].

Research was supported by quantitative data, collected from official reports of national and international public bodies. Data sources, for Argentina, include: Compañía Administradora del Mercado Mayorista Eléctrico[1] —CAMMESA-, Instituto Nacional de Estadísticas y Censos[2] —INDEC-, Ente Nacional Regulador del Gas[3] —ENARGAS-, the Undersecretariat of Energy Planning and the Energy Secretariat. Other sources -ministries and national organizations-from neighbouring countries, were also consulted. Statistical information was put in relation to reflect on the effects of the pandemic. It was complemented with a bibliographic review that included scientific and press articles. In order to identify and analyze emerging experiences in Argentina, semi-structured interviews with key informants were conducted, in the context of fieldwork.

The contemporaneity of the events studied, which are in permanent evolution and have no definite transformations, represented a difficulty worth overcoming, due to the relevant nature of the issue studied.

3. Theory

The energy transition is understood as a slow-paced process which involves the use of new energy sources, technological innovations, and adaptations in forms of production and consumption [9]. It is a process of structural change that pursues long-term objectives. The energy transition occurs within a highly complex and dynamic system, conditioned and influenced by the level of political commitment and agreement, the investment climate, the development and adoption of new technologies, among other contextual factors [10].

The concept of "environmental" or "border conditions" represents a starting point to analyze the COVID-19 associated emergency and its effects on the energy sector. These are understood as factors that determine the design implementation and performance of energy policies in favor of sustainable development [11,12]. These conditions stem from the broader institutional, regulatory and political framework. They influence, determine, facilitate or hinder the viability of sectoral or sub sectoral policies. Additionally, technological and market conditions, institutions and country-specific resources should be considered, as they may be subject to change in response to government actions [13]. The COVID-19 pandemic has acted as a "border condition" that affected the energy system in Argentina and the world.

The emergence of a multidimensional crisis - sanitary, economic and social - derived from the COVID-19 pandemic, has been a shock to most countries. This pandemic differs from past ones in its speed of spread and the large-scale containment policies that were put in place, causing a global stop in economic activity. Highly globalised economies and integrated cross-border supply chains explain the global-scale of the impacts [14]. Cost-benefit analyses have been made by most governments, deciding the stringency and duration of the preventive measures.[4] According to a study on the impacts of COVID-19 on oil and electricity demand in China [15], the pandemic affected economic parameters, mostly growth of Gross Domestic Product, which affected energy demand and supply.

The radical change in the global context has called for a revision of the challenges of energy and climate policies. Academic literature begins to emerge on this matter, with very different analysis and hypotheses. The question is whether the pandemic will put a brake on the transition process or if it might accelerate the path to a sustainable future. While some authors state that the COVID-19 crisis will shift the attention from the environment to the economy and health, others indicate a possible boost to the energy transition.

Compared to other crises faced by humanity, such as the environmental one, the COVID-19 crisis represents an immediate and tangible threat [16]. It has forced States and companies to concentrate their priorities in health, social and economic factors, and relegate plans to achieve sustainable development goals or favor the energy transition. This involves a slowdown in actions outlined in the green road map, proposed by some countries [17]. Indicative of this shift in priorities is the fact that the 26th Conference of the Parties (COP 26), in which countries were expected to present their updated climate commitments, was postponed. According to this analysis, the shift of focus from climate commitments to the emergencies created by the pandemic could lead to higher environmental challenges in coming years.

From another point of view, some authors emphasize that the health crisis opens up new opportunities to rethink options for

[1] Administrator of the Wholesale Electricity Market.
[2] National Institute of Statistics and Census.
[3] National Gas Regulatory Entity.

[4] Following a decline in the number of cases, by June 2020 most European countries had lifted restrictions on circulation and economic activities restarted. However, in August, the number of infections began to rise again.

sustainable urbanism, mobility and production and consumption systems [18,19]. The challenge is readjusting the energy transition to the post-COVID-19 era. The commitment to more efficiency and a higher percentage of renewable sources would be decisive to ensure that the economy has the energy it needs and, at the same time, that greenhouse gases remain low. The United Nations Organization; the Global Commission on the Economy and Climate; and the International Renewable Energy Agency support this view. In this direction, the design of economic recovery plans should consider the introduction of measures which stand for the energy transition and the deployment of renewable energies [20]. This article stands for this latter perspective: alternatives for production and consumption, based on the predominance of renewable energies and local territories, which have been revalorized during the pandemic, may pave the way for a sustainable future.

4. Results and discussion

The spread of the virus responsible for the COVID-19 initiated in December 2019, in Wuhan (China) and it quickly reached a global scale. In August 2020, 715.000 deaths and 19.000.000 infections had been registered in the world [21].

Once the pandemic was declared, preventive isolation and lockdown measures were promptly implemented in most countries of the world. The heterogeneity of the measures among countries was high: there were those where greater flexibility prevailed, while others were more restrictive. Some lockdown measures were only implemented in specific regions or cities, while in some countries the lockdown was imposed on a national scale. Among the countries with more lax measures were: South Korea, where there were recommendations of social isolation for 76 days and a national-scale lockdown was not established, and Sweden, where the State left compliance with isolation measures in the hands of its population. In an intermediate situation were countries such as the Netherlands, which bet on a 28-day quarantine, and soon after allowed normal activities with social distancing; and the United States, which did not impose a national lockdown, and the measures were more or less strict, depending on each State. Similarly in Brazil, the president refused the possibility of a lockdown, but some states imposed measures to avoid collapses of their health systems. Among the most restrictive countries were Italy, the first to issue a nationwide and mandatory lockdown for 55 days, and the Philippines, where very severe penalties were ordered for breach of confinement [22,23].

In Latin America, where the lockdown measures have lasted longer – examples are Bolivia with 50 days of lockdown, Ecuador with 60 days, Colombia with 75 days, and Peru with more than 100 days [24], Argentina has had an extra long lockdown. In Argentina, the preventive and mandatory isolation accumulates the longest duration in the region, and the lockdown has been stricter. Despite its length and severity, it has not been successful in preventing numerous deaths. The lockdown was imposed on 20 March (Decree 297/2020), with the aim of “flattening the curve”, that is, to ensure that infections increased at the lowest possible rate, thus avoiding the collapse of the health system. People were obligated to stay in their homes, they were only allowed to go out in search of food or medical supplies. Workers in essential sectors, such as food, health, security and the media were exempted.

When first introduced, in March 2020, the lockdown was announced to last for a period of 10 days. However, it was repeatedly extended over weeks and months. By mid-August, isolation measures and circulation restrictions were still in place. During the 150 days since the beginning of the preventive measures (between 20 March and 16 August), the country went through different “stages” of lockdown with higher and lower levels of strictness. Nonetheless, all stages have included: suspension of face-to-face classes at all levels of the educational system, and of cultural, religious and sporting events; closure of businesses and shopping centers; ban on circulation and the use of public transport (except for workers of essential sectors); prohibition of social gatherings and obligation to use masks in the street. The latest modifications include fines and the opening of criminal proceedings in the event of violating any measure.

The lockdown made it impossible for large part of the population to work and earn a living. It mainly affected informal workers and Small and Medium-sized Enterprises SMEs. In the Metropolitan Area of Buenos Aires (AMBA), which has about 15 million inhabitants [5], 39.3% of them have been placed on leave of absence, and 8.2% lost their job or the demand for their services decreased considerably [25]. In AMBA, the preventive measures implied that 57.6% of households experienced a reduction in their income, in some cases of up to more than half; 51.2% of households had to receive economic and food assistance from the State[5] or social organizations; and 25% went into debt[6] [26].

The long and strict lockdown has meant a profound worsening of the pre-existing vulnerability condition in which part of the Argentine population already was. During the first semester of 2020, 40.9% of the population were considered poor[7] [27]. The social inequalities gap is even wider when considering the fact that part of the population does not have access to basic services, such as running water (11%) [28] and electricity (1.2%) [29].

In this context, the world and Argentinian population faced changes in their lifestyles: new daily routine, greater uncertainty, and economic difficulties triggered or aggravated by the COVID-19 crisis. This new scenario quickly began to affect various dimensions, including energy.

4.1. 1-Lockdown-triggered energy symptoms

The energy sector has played a vital role during lockdown. In particular, electricity has gained relevance. It has allowed hospitals to continue their activities and expand their services. It has enabled schools and universities to shift to digital teaching in order to ensure continuity of learning. And it has made it possible for people to work from their homes, and to maintain social contact. Without electricity, the COVID-19 crisis becomes greater and more severe, especially for vulnerable populations.

The energy system has suffered the consequences of the protective measures taken by the government to contain the exponentially increasing spread of the virus. Energy variables presented extraordinary oscillations, showing different patterns, in relation to previous years. These oscillations constitute direct symptoms in demand and production. Some sectors were more deeply affected than others.

4.1.1. Variation of demand: reduction and increase

The lockdown led to a pronounced decline in economic activities[8] and mobility. The demand for energy - liquid fuels, gas and electricity –decreased significantly, mainly in the transport and industrial sectors.

[5] Social benefits include: Emergency Family Income, extraordinary bonuses for Universal Child Allowance or retirements, Food Card, groceries and/or food bags or withdrawal of food from school or soup kitchens.

[6] Including debts with family, friends, employers or with financial institutions, companies or businesses.

[7] Households whose income does not exceed the value of the Total Basic Food Basket.

[8] World Bank estimates foresee a contraction in economic activity of 5.2% for the year 2020, with a fall of 3.6% in Gross Domestic Product per capita [30].

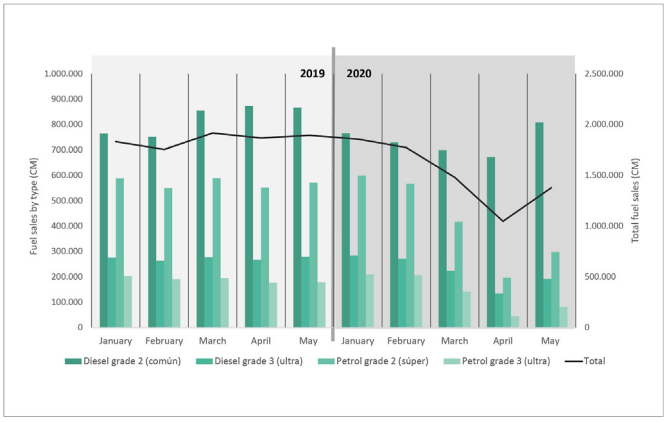

Fig. 1. Comparison of fuel sales, January–May 2019 and January–May 2020. Source: own elaboration based on data from Undersecretariat of Energy Planning [34].

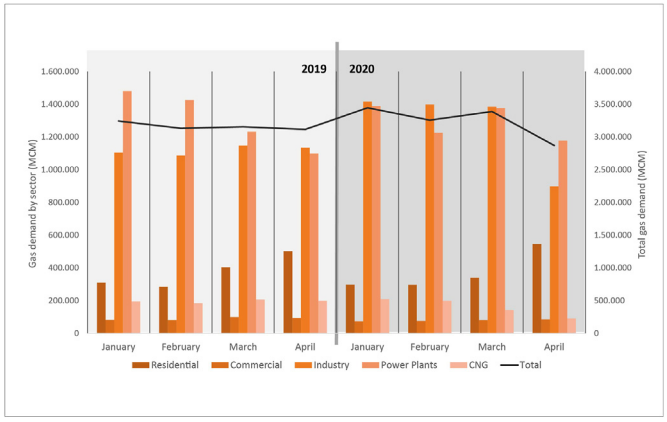

Fig. 2. Gas demand comparison: January–April 2019 and January–April 2020. Source: own elaboration based on data from ENARGAS [37].

In March 2020 the International Energy Agency forecast the downward trend in oil demand as a result of the health crisis. At the end of April, comparing the first four months of 2020 with those of 2019, a 5% drop in demand was confirmed. Associated with the drop in demand from China, the first epicenter of the pandemic, and the decrease in international travel,[9] 90,000 less barrels of oil are consumed per day. This has a downward impact on the price [31].

In South America, Chile experienced a reduction in sales of diesel and petrol of 42%, comparing April 2020 to April 2019 [32]. Comparing the same period, in Uruguay, the decrease in sales was 13% [33].

In Argentina, the prohibition to circulate led to a rapid drop in the demand for vehicle and transportation fuels. Although consumption continued in essential activities such as health, safety and food, sale levels of these products were altered. Considering diesel (grade 2 and3[10]) and petrol (grade 2 and 3), the main fuels used in vehicles and cargo transport, a significant drop in sales occurred during the months of March, April and May 2020, compared to the same month of 2019. The sharpest decrease occurred in April: 1,800,000 cubic meters were sold in 2019 and around 1,000,000 cubic meters in 2020. The drop in sales was 43% for April, compared to 2019, with a sharp decrease in fuels used in vehicles (Fig. 1).

Regarding gas, the International Energy Agency indicated that its consumption decreased by more than 3%[11] in the first three months of 2020 compared to the same period of 2019. This was before the COVID-19 pandemic, as a result of warmer temperatures in the Northern hemisphere. The IEA estimates that during 2020 global demand will decline by 5%, which is less than the forecast drop in oil demand (8%). An important part of this drop is related to the lower generation of electricity and the decrease in demand in the industrial sector, given the slowdown in the development of certain economic and social activities and the slowdown in the consumption of manufactured goods [35]. In both oil and gas, world production did not adjust to the drop in demand, which resulted in an excess supply of these products in the market.

In South American countries, similar changes in demand patterns have been observed. In Brazil, for example, comparing April 2020 to April 2019, the volume of commercialized gas went from 54,390 MCM[12] to 41,004 MCM. Gas demand decreased in most sectors: commercial (42%), industrial (32%), co-generation (23%) and for electrical generation (10%). Only the residential sector increased its demand (by 14%). Additionally, the use of compressed natural gas (CNG) fell by 45% [36].

In Argentina, variations were similar. Gas demand decreased in industries and electricity generation, but increased -slightly- in households (Fig. 2). In the industrial sector, the demand for natural gas fell by 20% in April 2020 compared to April 2019: from consuming around 1,100,000 MCM, it fell to around 900,000 MCM [34]. The main industries that are supplied with this resource are the steel, chemical and petrochemical industries, ceramics, oil, food, cement and distillery. Residential demand, which in April 2019 was around 500,000 MCM, in 2020 reached 550,000 MCM [37]. Lastly, the demand for compressed natural gas (CNG) was affected by restrictions on circulation and transport, decreasing by more than 50%. While in April 2019, about 200,000 MCM were consumed, in April 2020, only 90,000 MCM were consumed [37].

Regarding electrical energy, in countries that took severe preventive isolation measures, the demand for electrical energy fell by an average of 15% [38]. In the country first affected by the pandemic, China, the drop was 10% in February, compared to February 2019. In Italy, during the strictest stage of the lockdown, the drop in energy demand exceeded 25%. As preventive measures relax, electricity demand begins to recover, although as of July 2020, demand in Europe still showed a decrease of 10% below the level registered in 2019 [38]. With the spread of the disease, Latin America implemented lockdowns that also resulted in drops in electricity demand: of 28% in Paraguay, 19% in Bolivia, 12% in Colombia, and 10% in Ecuador [39]. In Brazil, April and May 2020 were the months with the lowest levels of energy demand [40]. In Chile, the decrease of electricity demand between March and April 2020 was near 5%[13] [41]. Forecasts state that the drop in world electricity consumption during 2020 will be the steepest since the Great Depression [42].

In Argentina, total electricity demand decreased by 23% between March (11,063 GWh) and April (8470 GWh) 2020 [7]. In May 2020 the decrease was in the order of 20% in the industrial sector, and 11.5% in the commercial sector, compared to the same month of the previous year (Fig. 3).

[9] The International Air Transport Association canceled 4.5 million trips through June 30, 2020.

[10] Grade 2, also known as common diesel fuel, is intended for the bulk of diesel fuelled vehicles. Grade 3 is the highest quality diesel fuel.

[11] Analyzing markets in Asia, North America and Europe.

[12] MCM stands for Thousands of Cubic Meters, which is the standard unit of measurement for gas in Argentina.

[13] Data calculated from an average of daily demand in the National Electric System of Chile.

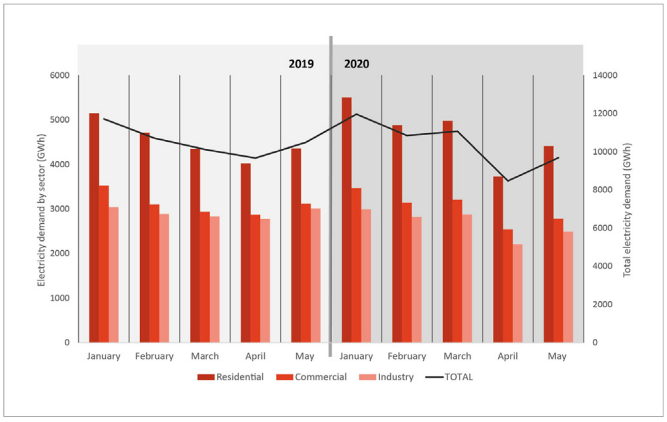

Fig. 3. Comparison of electricity demand (GWh) during the periods: January–May 2019 and January–May 2020. Source: own elaboration based on data from CAMMESA [7].

Among the industries that reduced their consumption the most (over 40%) were textile, construction, automotive and metal manufacturing industries. In the commercial sector, the users that were most affected are supermarkets and shopping centers (22.7%) [7]. The food sectors and activities related to the oil value chain had a smaller decrease, as they were exempted from the preventive measures.

In households, the situation is different. The health crisis and isolation measures forced the population to stay in their homes. Family, work and recreational life share the same place. For this reason, household electricity consumption increased. The average daily electricity demand curve for a household took a similar shape to that of a Sunday: reduced activity in the morning, with a growth slope towards noon and a nightly peak half an hour ahead and extended for a longer time [7]. According to data from the Compañía Administradora del Mercado Mayorista Eléctrico, the demand of the residential sector in May 2020 showed an increase of 8.1%, compared to the same month of 2019. Much of this increase is the result of higher electricity consumption in the most densely populated areas of the country (provinces of Buenos Aires, Córdoba and Santa Fe). In these areas electricity service is provided by the distributors: Empresa de Energía Norte EDENOR, Empresa de Energía Sur EDESUR, Empresa Provincial de Energía EPE de Santa Fe and Empresa Provincial de Energía de Córdoba. Together they cover 58% of the country's electricity demand [7].

In the residential sector, the increase in gas and electricity consumption occur in a context of general deterioration of the economic conditions of a large part of the population. In many cases, consumers find it difficult to pay their utility bills. To address this situation, Decree 311/2020 delayed, for 180 days, service disconnections due to lack of payment. As a result, electricity and gas distribution companies suffer income losses and begin to accumulate large debts[14] to CAMMESA [43,44].

As a result of the preventive isolation measures taken to tackle the COVID-19 crisis, the energy sector experienced a variation of demand patterns. The pandemic had relatively low effects on residential demand levels (with a slight increase and change in hourly pattern) since energy is an essential good, and therefore inelastic [15]. The strongest effects were felt in the industrial and commercial sector.

4.1.2. Oscillation in hydrocarbon and electricity production

Energy production - like demand - was affected by the lockdown enforced in Argentina on account of COVID-19. The health crisis and the isolation measures meant multiple challenges for the production of oil, gas and electricity, the main resources with which Argentina's energy services are covered.

In relation to hydrocarbon production, the fall in oil's international prices and the restrictions on socio-economic activities resulted in a decrease in exploitation activities in the sedimentary basins and a decrease in production levels. These symptoms, which occurred in the national hydrocarbon sector, are in line with the global scenario that the industry is going through. In the United States, a pioneer country in the exploitation of unconventional hydrocarbons, oil production decreased by 5% and gas production by 3%, between March and April 2020 [45]. In Argentina, national oil production in April 2020 was 14% lower than that of the previous month. In gas, for the same period, the decrease was 10% [34].

National oil production had a decline during the months of March, April and May 2020. The comparison between April 2019 and April 2020 results in a decrease of 9% in national production: from 2,400,000 CM[15] to 2,200,000 CM. In the Golfo San Jorge basin, the largest oil producing basin in the country, the decrease was 5%: in 2019 more than 1,100,000 CM were produced and in 2020 it was around 1,050,000 CM [34].

National production of gas, the main energy resource with which the country's demands are supplied, declined in April. Comparing April 2020 to April 2019, the decrease in national production was 11%, from 3,900,000 MCM to 3,500,000 MCM. In the Neuquén basin, the main gas producing basin in the country, the decrease was 12%: from 2,400,000 MCM in 2019, to 2,100,000 MCM that were produced in 2020. However in May, this trend was reversed, with production exceeding 2,300,000 MCM [34].

Unconventional hydrocarbon production began to take centre stage in the decade of 2010, mainly in Neuquén basin, as a result of the exploitation of Vaca Muerta. In this location, the lowest level of production of unconventional gas was in April 2020, when it dropped to 1.380.000 MCM. In May, production increased, reaching 1.500.000 MCM. Unconventional oil production in both April and May 2020 was around 470.000 CM [34]. In terms of energy sectors, Neuquén basin is the hardest-hit by the pandemic. The great impulse given to the development of unconventional hydrocarbons in previous years suddenly ceased. Impacts affect exploitation activities, and employment. The new global context raises several questions about the prospects of this project.

Electric power generation decreased. In April 2020 generation was 8.989 GWh, which represented a reduction of 7.7% in comparison to April 2019, and of 23% in comparison to March 2020. Comparing April 2020 to April 2019, the generation that decreased the most was hydroelectric (38.8%) –the decrease in the flow rates of the binational dams Yacyretá and Salto Grande with respect to historical values stands out-. Thermal power generation also decreased 5.4%, (as a result of a drop of 88% in steam-driven turbine generation plants, 51% in diesel fuel generation and 35% in gas-driven turbine generation plants). In relative terms, as the proportion of these conventional energy sources is lower, both nuclear and renewable energy sources increase their share in the electricity generation mix, by 50% [7] (Fig. 4).

Of lower scale, but eloquent of the prospects of the Argentinian electric system in the long term, is the fact that on-grid distributed generation continued to increase during lockdown, with numerous new user-generators connected to the grid.

[14] Electricity distributors, since the beginning of 2020, have seen their historical debt with CAMMESA increase by 140%, reaching a total of more than $ 97,000 million [43].

[15] CM stands for cubic meters, which is the standard unit of measurement for oil in Argentina.

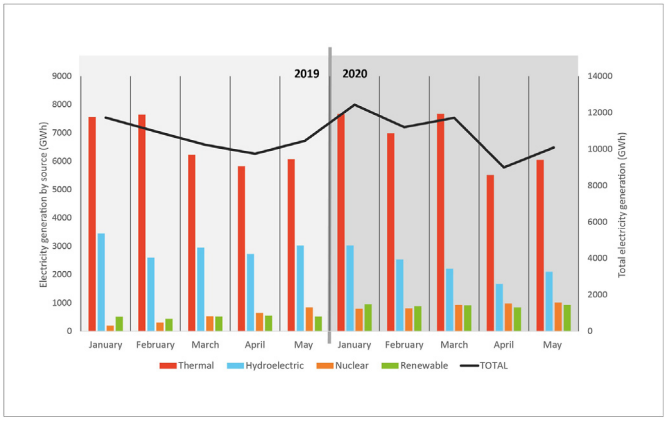

Fig. 4. Electricity generation comparison (GWh), by type of generation, in January–May 2019 and 2020. Source: own elaboration based on data from CAMMESA [7].

In other countries of South America, during the same period, electricity generation, although it has decreased, it has been variable. In Brazil, in April 2020 electricity generation was 11% lower than in April 2019 [46]. In Uruguay the decrease was even more pronounced (33%), going from 1.017.832 MWh to 677.505 MWh [47]. In Chile, electricity generation remained stable, around 6000 GWh, for both April 2019 and 2020 [41].

In electricity exchanges with neighbouring countries, Argentina achieved a positive trade balance in April and May, in which exports were higher than imports. In April 2020, 166.6 GWh were exported to Uruguay, while 91.8 GWh were imported from Uruguay and Paraguay. In May 114.9 GWh were exported mainly to Uruguay and to a lesser extent to Brazil. In that same month, imports reached 85.3 GWh. As of June, due to the relaxation of isolation measures, electricity demand recovers and Argentina once again needs to import electricity [7].

Regarding hydrocarbons, oil exports gained importance. As the domestic demand for fuels decreased, the companies opted to sell their production on the foreign market. During the months of April and May the export peak occurred, with more than 0.6 CM exported. The participation of light crude oil, which is extracted mainly from the Neuquén basin, was relevant. Thus, the province of Neuquén exported 1,850,000 barrels of light crude oil during the month of July, equivalent to 40% of the total production of that month. Regarding gas, the highest export volume occurred in March, around 10 MCM per day [48].

4.2. 2- Collateral damage due to a brake on projects and investments

The COVID-19 pandemic caused direct energy symptoms, expressed in changes in energy demand and production patterns. It also caused collateral damage, which in turn affects the energy sector. The latter, with a history of deficits and pending challenges in terms of universal access to energy and social inclusion, experiences the pandemic as a new destabilizing shock.

4.2.1. Unstable prices, repercussions in Vaca Muerta

The prices of hydrocarbons, mainly those of oil, have experienced significant fluctuations during the pandemic. The stop of activities led to a brake on the consumption of fuels for land, air and sea transport. This quickly affected oil supply in the global market.

Major players in the oil market, the Organization of the Petroleum Exporting Countries (OPEC) and Russia, initially failed to find agreements on the daily production of barrels that were destined for the market. As a consequence, crude oil supply expanded, while demand slowed. This generated an increase in storage needs. As onshore tanks for crude oil storage became full, numerous ships, distributed in international waters, had to remain afloat with their cargoes [49,50].

This oversupply drove prices down. 20 April 2020 became a milestone in hydrocarbon history: for the first time, the price reached negative values. That day, the reference price of crude oil in the United States reached USD -37 per barrel, in a market where there were plenty of barrels and no buyers.

In order to tackle price instability, it was agreed to reduce the amount of barrels injected into the global market. During May and June, OPEC, its allies and the United States decided to cut back the supply of barrels to 9.7 million per day, becoming the largest agreed production cut in history [51,52]. Subsequently, the price of a barrel increased and by mid-2020, it was around USD 40. However, agreements are once again required to sustain the volatility of the market: some countries consider that it is necessary to continue with the cuts, while others argue that supply could increase in line with the gradual relaxation of isolation measures.

In this context, the development of unconventional hydrocarbons in Argentina raises important questions. The exploitation of Vaca Muerta (which requires the hydraulic fracturing and horizontal drilling technique), needs millionaire investments and high international prices in order to achieve profitability. In addition to the multiple crises that this project had been going through, due to changes in national sectoral and economic policies, the health crisis added another blow [53].

Activities, although considered essential, were carried out by a reduced number of staff and only to ensure operation and maintenance of the exploitation site of the deposits. The presence of personnel in the locations and the performance of certain tasks were reduced, thus affecting the pace of activities. Added to the instability of the international market, the drilling of new wells was almost completely stopped [54].

The Neuquén and Golfo San Jorge basins showed the most significant slowdowns in activity. In the former, where the Vaca Muerta exploitation is central, in April 2020 the number of new drillings decreased (Fig. 5). In total, the drilling of wells in the country had a decrease of 94%: while in April 2019, 73 wells were drilled, in the same month of 2020, only 4 wells were drilled [34].

In this scenario of slowdown in activities, employment has been deeply affected, due to the lower income received by companies. The situation is variable. The largest operators have offered their

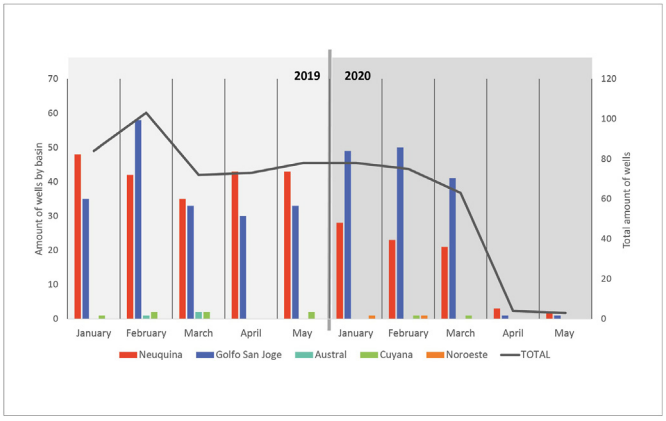

Fig. 5. Drilling of wells by basin. January–May 2019, 2020. Source: own elaboration based on data from Undersecretariat of Energy Planning [34].

employees voluntary retirements, with extra severance payments. Many workers have remained employed, but placed on temporary leave of absence. Some press sources indicate that about 25,000 workers in the sector would be on standby, earning a salary equivalent to 60% of their income [55]. Companies demand revisions of the collective bargaining agreement, to adjust the activities to the new context. SMEs, mostly linked to the development of Vaca Muerta, constitute one of the main sources of employment in the sector. The crisis affected them even more than large companies. Some have requested a preventive crisis procedure, through which they could compensate their employees at a lower cost [56].

Assistance to the national hydrocarbon sector came in the form of state subsidies. As a result of agreements between the national, provincial and oil companies, Decree 488/2020 was enacted, where the commercialization price of oil in the local market was temporarily set until the end of 2020. The support price was set at 45 US $ per barrel of oil. In return, the producers will have to sustain the activity levels and the production levels registered in 2019 and will have restrictions in the exchange market. In turn, refining companies must acquire the total demand for local oil, without carrying out import operations, of products available in the domestic market.

The measure is a relief in this context, although some tensions arise between the actors in the sector. The economies of the producing provinces, where royalty income makes up the bulk of their budget, benefited. However, other measures are required. Thus, Neuquén, one of the most affected provinces because of the Vaca Muerta brake, is promoting the creation of an anti-crisis fund, although the resources that will nourish that fund are still under discussion [57,58].

The latest regulations promoted by the national State, which grant differentiated prices in the domestic market to the production of oil and gas, encourage companies to reinvigorate activities in the sector. This could have a positive long term impact on the investments that companies allocate in the activity, in the revitalization of the labor market, and in the royalties that the provinces receive for the activity.

4.2.2. Low funding, renewables on pause

Press sources and specialized organizations agree on the worldwide deterioration of financial conditions which is comparable to that evidenced during the global financial crisis of 2008–2009. With the increase in uncertainty and volatility in macroeconomic variables, there were capital outflows from emerging markets and a depreciation of most currencies against the dollar [59]. In Argentina, the imbalances in the hydrocarbon sector, introduced by isolation measures, in addition to the instability of the sector itself, reinforce the need to diversify the energy matrix and continue betting on renewable generation projects. However, the sector faces financial difficulties.

The renewable energy sector is highly dependent on financing, either from local or from international organizations. Its growth is related to access to competitive costs throughout the value chain, from the working capital of SMEs, through the financing of residential and industrial user facilities, to the construction of large generating plants. Because they are capital-intensive, renewable projects have a high risk component, which requires sufficient trust to compensate for uncertainties.

Renewable energies, promoted in Argentina since the 1980s, received a new boost from the National State through law 27,191/2015. The mechanism of calls for tenders was implemented to contract the purchase of electricity from renewable sources through Power Purchase Agreements (PPA). From 2016 to 2019, three bidding rounds were conducted, the so-called “Renovar Program”. Through the tenders, numerous projects were awarded, mainly of wind and photovoltaic energy. In addition, priority dispatch assignments were made in the Renewable Energy Term Market (MATER) – a private PPA market-. Adverse economic and financial situations, which began in 2018, meant difficulties for projects to find funding. The pandemic aggravated the existing crisis.

In April 2020, the national government found it necessary to present a debt renegotiation offer with foreign bondholders, given the risk of falling into default. As a result of increasing country risk (exceeded 3500 points) and the uncertainties regarding the direction of the policy towards renewable energies, perceived risk shoots up. This implies that it is increasingly difficult to access external financing, which is, in the context of internal crisis, even more necessary.

Of the projects awarded in the tenders, some have been completed; others went into difficulties as a result of the economic and exchange rate instability of 2018; others have experienced delays due to lockdown. Additionally, the decrease in the price of oil in relation to other technologies and the fall in energy demand, as a consequence of lower economic activity, has put a brake on the incentives for new renewable generation projects [60]. In May 2020, the Ministry of Energy instructed CAMMESA to temporarily suspend the deadlines and formal default notices of the supply contracts.

Of the 59 photovoltaic projects awarded in the Renovar bidding rounds, 2 were canceled for failing to meet deadlines, 15 are operating, and the remaining 42 are in a previous stage: some are in advanced construction and close to entering operation (most of them propelled by external financing), others in construction phase, and others have not yet been able to obtain financing (mainly those awarded by national companies). Regarding wind energy projects, of the 34 projects awarded, 17 wind farms have entered into commercial operation between 2018 and 2020, incorporating close to 1000 MW of new power. Another 16 wind projects are under construction and it is estimated that they will inject power into the interconnected system by the end of 2020. However, given the hold-ups in the works due to the isolation measures, further delays are expected. Outside of RenovAR, 4 wind projects (of these, 2 went into operation) and 2 photovoltaic projects are promoted under Resolution 202.

Within the MATER framework, 59 priority dispatch assignments have been made to renewable projects, mostly wind energy (22 projects for 866.1 MW), and to a lesser extent, photovoltaic (37 projects for 689.7 MW), for a total of 1555.8 MW of installed power [61]. As of June 2020, 8 solar plants have received commercial operation authorization. In wind power, 13 wind farms in operation sell energy to large users. The existing economic crisis, prior to the pandemic, was registered in the MATER rounds of 2019 and 2020, which were left vacant. In July 2020, a new round was carried out with two photovoltaic projects submitted. Even if they receive priority dispatch, the difficulty is at the time of making it effective, by depositing a surety (a payment as a guarantee of maintenance of the offer), which in some cases amounts to US$ 250,000 per MW.

The works necessary to advance in the construction of renewable generation plants have also been paralyzed by the lockdown. Social isolation has prevented work on construction sites. Some relaxation measures tried to enable the continuity of tasks (administrative decision 468/2020 authorized energy infrastructure workers to return to their workplaces). However, transport and circulation restrictions imply delays in the delivery of equipment and components, and, most importantly prevent workers living outside the town where the project is located, to access it.

In some cases, where the continuity of the projects required the transfer of workers, social distancing was impossible to maintain, and COVID-19 infections occurred. In the south of the province of

Buenos Aires, one of the main wind resource areas in the country, the construction of a wind farm in Mayor Buratovich, caused 11 employees to contract the virus. This triggered a wave of infections in the neighbouring city of Bahía Blanca, where the workers were staying. This motivated local authorities to file a criminal complaint in a Federal Court of Justice, for non-compliance with prevention measures [62]. In the town of Azul, another case of contagion was recorded, associated with the Los Teros wind project, which was followed by preventive closure of the premises [63,64].

Numerous projects awarded in public tenders that have not yet been built are facing great obstacles in accessing financing, have missed deadlines, and face the possibility of not being achieved. The COVID-19 pandemic, combined with existing financial difficulties, has acted as a "border condition" that affected the path to a greater share of renewables in Argentina and the continuity of the projects. Nonetheless, new opportunities open up for a more sustainable energy system, in the post-pandemic.

4.3. 3- "Stay at home" for post-COVID-19 sustainability

Even during an atypical year, in which large part of the world's population was confined to their homes, and economic activities were reduced, the environment remained in danger. Initially, the lockdowns generated a temporary reduction in atmospheric concentrations of polluting gases, for example of nitrogen dioxide over industrial cities in China [65]. However, as restrictions were lifted, emissions increased again and, therefore, environmental concerns remain. Greenhouse gas emissions were not significantly reduced. Although daily CO2 emissions decreased by 17%, for a short period of time, this is a minimal variability in the concentrations of greenhouse gases in the atmosphere, which continue to increase at a worrying rate [66] Global temperature continues to rise and water and ecosystems are increasingly threatened [67].

In this context, the possibility to meet needs in a sustainable, environment-friendly way -by means of valorizing locally-available resources and capacities-, becomes relevant. International trade restrictions motivate countries and territories to try to live on their own produce. On a national scale, it is increasingly necessary to consume what is produced locally, and the closer to home, the better. In the energy sector, renewable sources are key to making this possible, as they may be used at the point of consumption. In this sense, the COVID-19 pandemic constitutes an opportunity to valorize renewable sources. These face the challenge of providing solutions to cope with the crisis while maintaining the desired level of service. Other measures, which appeal to sustainable forms of production, work and mobility, gain predominance in the world and begin to emerge in Argentina. A revision of the energy regime is thus beginning to take place.

4.3.1. Local alternatives emerging in the world

Faced with the alteration of energy consumption and generation patterns and the collateral effects on the energy system, the international community is beginning to think about how to generate a post-COVID-19 agenda for sustainability. Thus, in different latitudes, proposals are outlined that seek to develop alternative paths for the organization of cities, the provision and consumption of goods and services, and the adaptation of citizen practices. Among them it is worth mentioning:

- New modes of urban transport. Generating changes in people's daily transport practices, opens a window for structural and sustainable transformations over time. Over the last decades, the use of bicycles has been promoted in different cities. As a measure, in times of pandemic, it represents a strategy to achieve three goals: reducing contagion thanks to social distancing, reducing the congestion of mass transportation systems, and reducing emissions and pollution derived from traditional forms of mobility. Amsterdam, for example, aims to become the first emission-free European capital by 2025. About 60% of the trips made by its inhabitants are made by bicycle, thanks to the existence of 400 km of exclusive routes for cyclists (*Fietspad*). It is also considered the world capital in electric mobility, due to the development of a wide public charging network that allows users to charge their vehicles near their homes.

Changes in modes of transport may be accompanied by other urban planning measures, where journeys between home, work, social services, and spaces for commerce and recreation become increasingly shorter. An example of this idea is what the mayor of Paris seeks to promote, through the concept of the "city of a quarter of an hour" [68], which is based on the idea that any Parisian should be able to meet all their needs (work, leisure, education, health) within a radius of 15 min, on foot or by bicycle, from home. This way, the proposal is to plan cities, where commuter circuits dominate, to the detriment of the circulation of individual cars. This would eliminate millions of costly trips for the economy, health and the environment.

-The commitment to teleworking. On a global scale, teleworking emerged as an alternative, in the face of the hydrocarbon crisis, in the early seventies, and as a way to reduce costs. Since the beginning of the 21st century, sociologists like Manuel Castells have been analyzing teleworking as one of the new options that the labour market adopts in the information and knowledge society. From that moment on, teleworking has been in constant growth. The Netherlands and Finland are positioned as leaders in teleworking worldwide. In the Netherlands, remote work was already common before the pandemic, 14.1% of Dutch people worked from home. The virtual office has facilitated the development of self-employed or small businesses without the need for an office space. 98% of households in the country have high-speed internet access, so the combination of adequate infrastructure and a culture of trust make the Dutch mode of teleworking successful [69]. In Latin America, before the pandemic, Brazil was the country with the most employees working from home (12 million), followed by Mexico (2.6 million), Argentina (2 million) and Chile (500,000) [70].

The COVID-19 pandemic has forced companies around the world to "virtualize" in order to continue production processes, during lockdown. In some sectors, teleworking has become the best option; in other cases, the form of implementation has been more abrupt due to the urgency of the situation. The prevalence of telework varies strongly across sectors and occupations. It is particularly high in knowledge and information and communications technology-intensive services [71]. Even though possibilities of working remotely, via internet connection, vary according to countries and sectors, adopting this new way of working may be an increasingly important option that could enable companies and workers to redesign the use of space, time and energy consumption. Transferring activities such as work meetings, conferences, and academic events to virtual spaces, would lead to a reduction in the carbon footprint as a result of less circulation. In the European Union -where 40% of the workforce started working from home as a result of the pandemic [71]- and in countries such as New Zealand -where the pandemic caused almost 30% of the workforce to work from home [72]-, many companies offer a more flexible working schedule and teleworking seems likely to continue well after the COVID-19 pandemic.

-Sustainable consumption practices. The pandemic has slowed consumption rates due to the closure of trade and to confinement measures. This has led to reconsider the high levels of consumption in today's societies, and to foster more sustainable, conscious consumption. This would eliminate the pressures on the environment, both in production and transport, and in the consumption of

goods and services [73]. Sustainable initiatives to satisfy needs are revalorized and ideas of decentralized production emerge. "Zero kilometer" products are locally produced -in a radius of less than 100 km-food products. This trend originated in the United States in the seventies and entered Europe in the late eighties associated to the "slow food" movement.[16] Its objective is to favor local economies and prioritize varied and seasonal crops. This way, the shorter the distance traveled, the less CO2 will be emitted into the atmosphere. These trends that aspire to a more sustainable consumption are complemented by practices of reduction, recycling and reuse of waste. Switzerland stands out for its modern and comprehensive waste sorting system, which allows the recycling of 93% of glass, 91% of cans and 83% of PET bottles [74]. Efficient infrastructure, regulations that make recycling mandatory and public awareness seem to be the key to efficient use of waste.

-Distributed energy generation. Although its definition is not univocal, it is understood as the integrated use of small generation units directly connected to the distribution system [75]. It is about producing and consuming energy in the same place, creating new forms of energy management with greater participation of citizens and actors in the territory. Projects of this kind may be considered "territorial projects", that is, those initiatives that, arising from local actors, solve needs *in situ* [76].

Local energy production appears as a possible cure in the context of a pandemic, but also beyond it, taking into account social inclusion problems. Distributed generation projects valorize communities as they mobilize their own resources and create new systems of rules. Through cooperation between actors of different nature and scale, and in the coordination of their actions, sustainable projects are "co-created" [77]. European countries, such as Germany and Spain, have encouraged distributed generation since the decade of 1990, with the spread of biogas and photovoltaic plants. The German experience is particularly renowned for the incentives put in place to promote distributed generation, such as the "1000 solar rooftops" program -between 1990 and 1995- and its expansion to "100,000 solar rooftops" between 1999 and 2003, and the German Renewable Energy Act (EEG) of the year 2000 (which guarantees a fixed remuneration for the energy discharged into the grid for 20 years). In response, citizen participation has been active, to the point that of all the renewable power installed in Germany in 2012, 47% was in the hands of citizens and consumer cooperatives. This path responds to the fulfillment of the European goals to reduce emissions by 40% in 2030, and to decarbonize the economy in 2050. In regions such as Latin America, where part of the population lacks network services, distributed generation represents a possibility for social inclusion. At the same time, it offers a chance, for network users, to gain autonomy in their relationship with energy. Among South American countries, Uruguay, Brazil and Chile may be considered pioneers in the adoption of on-grid distributed generation systems [78]. In Brazil, more than 3 GW of photovoltaic distributed generation systems have been installed [79].

4.4. Experiences in Argentina in valorization

Some experiences in Argentina illustrate the local adoption of alternative ways of working, traveling and socializing, which predominate during lockdown. They show the way forward in order to move to a sustainable system and respond to the challenges of the pandemic. Practices and habits stand out, some employed by previous generations, which are revalorized and gain relevance.

- The impulse to non-motorized transport: in line with the boost to sustainable transport that has been given to the sector in some European capitals, the Autonomous City of Buenos Aires has a Sustainable Mobility Plan, which seeks to reorganize and provide traffic safety, thus improving environmental quality. The design of the Cycle Routes Network favors connection to the central area and transport hubs, as well as those points that concentrate a high number of jobs and students. It began in July 2009 and today it reaches 250 km, connecting 15 communes in the City of Buenos Aires. At the end of 2010, the Public Bicycle Transport System was inaugurated with 3 stations, 72 bicycles and around 100 daily trips. Since then, more than 9 million trips have been made and the system today has almost 300,000 users. By 2019, the so-called "Ecobike system" reached 4000 bicycles and 400 stations for public use [80].

Cycle routes have been created in other Argentinian cities: Junín, Morón, San Miguel, and Florencio Varela in the province of Buenos Aires; Alto Comedero in the province of Jujuy; Avellaneda in Santa Fe; General Ramírez, in Entre Ríos.

-Expansion of virtual activity. Remote jobs have been the subject of discussion since 2003, when the Telework Coordination was created within the Ministry of Labor, Employment and Social Security. It is in charge of advising, accompanying and promoting best teleworking practices throughout the national territory with the aim of guiding workers and employers in this modality. In 2008, the Program for the Monitoring and Promotion of Telework in Private Companies was implemented, the first program in Latin America to promote telework. Several companies joined it (Yacimientos Petrolíferos Fiscales, Banco de la Provincia de Buenos Aires, Garbarino, Telecom, Personal, Dell) and from 2010 to 2012,600 employees were counted working under this regime [81].

In 2020, the introduction of mandatory preventive isolation led to many non-essential activities to mutate their way of working towards the virtual environment. Among the sectors that massively turned to telework, education stands out. During 2020 14.2 million students have not attended face-to-face classes since 16 March [82]. Instead, teachers carry out their work online. With respect to other areas of activity, a study by the Center for the Implementation of Public Policies for Equity and Growth CIPPEC [83] found that near 29% of jobs have the potential to be done from home. The increase in teleworking, driven by lockdown, prompted the enactment of a law to regulate it (Law 27,555/2020). It establishes basic rights for workers who provide services from their homes.

-Sustainable consumption practices. In order to aim towards a more conscious and healthy consumption, experiences of urban allotment gardens, local producer fairs and initiatives of sustainable communities are launched. Through them the tendency to produce and consume locally is reflected. Long-standing in Argentina is the "Pro Huerta" Program, implemented by the Ministry of Social Development and the National Institute of Agricultural Technology. It promotes agro ecological production and supports people in the production and marketing of their own food. Accordingly, in 2012, the Ministry of Agriculture, Livestock and Fisheries of the Nation created the National Fairs Program for Local Development (Resolution 900/2012) to encourage local fairs.

Another example is the city of Rosario (Santa Fe), where the Urban Agriculture Program (PAU) promotes social enterprises dedicated to growing crops using ecological techniques and which are destined for family, community and market consumption. This program is complemented by the Social Urban Agro-Industries Program, based on social enterprise models of food production and transformation (vertical integration). In addition, the initiative of urban allotments arises from taking advantage of urban spaces-on the accesses to the city, the edges of streams or spaces on public lands-, which do not have an assigned use.

[16] Carlo Petrini founded this movement, seeking to vindicate the way of understanding food compared to fast food chains.

-Energy communities. Given the greater demand for energy services in homes, associated to isolation measures, distributed generation gains relevance, as it offers the possibility of generating and consuming energy in the same place. It was authorized at the national level in 2017 (Law 27,424) and 8 provinces, of a total of 24, have adhered to the law. The number of user-generator connections began to increase at a higher monthly rate during lockdown - in August 2020, 204 connected user-generators were registered, including residential (the majority) and commercial users and SMEs [84]-. Other provinces, such as Santa Fe and Salta, already had a different distributed generation system, on a provincial scale.

Local experiences, driven by actors from the community itself and with the support of State institutions and agencies, emerge. An example is the Solar Community of Luque, in Córdoba. There, the local energy cooperative (electricity provider) proposes to adopt a new energy generation and management system, where citizens play a fundamental role: together they invest in a photovoltaic plant (this reduces costs by reaching a higher scale). The cooperative is in charge of the operation and maintenance of the plant. The benefits are distributed collectively: economic savings and greater autonomy for users, and savings in energy purchases from the Provincial Company for the cooperative. In December 2019, a 25 kW pilot plant was inaugurated to present to the citizens this alternative power generation and management system. As the community joins in the project, it is expected that new plants will be built locally and generate power on site, to meet the needs of the population.

To some extent, the effects of the pandemic on the energy sector reflect and herald transformations at the social and cultural level. These could lead to long-term transformations in the way society relates to energy, how it is produced and consumed. The move to new practices, such as teleworking and on-site consumption, are associated with a valorization of homes -as functional units for family and working life- and this is evidenced in the slight increase in residential energy consumption. The restrictions on circulation and the need to avoid social contact call for local production of goods and sustainable urban transport. This way, the sustainable transition is likely to reemerge, revitalized, in the post-pandemic.

5. Conclusions

The COVID-19 pandemic has altered life in most countries of the world. Restrictions imposed on activities, circulation and social gatherings have had multidimensional and multiscalar repercussions. Argentina's extra long lockdown, unsuccessful in containing the spread of the virus, has altered its normal rhythm in social, economic and energy dimensions. In this sense, actions towards a transition seem to have been moved to the bottom of the agenda by more pressing objectives, linked to the health crisis: saving lives and avoiding collapse. However, at the same time, the lockdown has highlighted imbalances or deficits in the energy system that deserve to be reviewed, opening opportunities for the future adoption of sustainable practices and social inclusion of vulnerable sectors.

The Argentinian lockdown has caused energy symptoms that include changes in the rhythm of production and alteration of demand patterns. Moreover, the shock in global oil price of April 2020 and the uncertainty in the face of the economic crisis triggered by COVID-19, have led to collateral damage in the sector. Investments in unconventional hydrocarbons and in large renewable energy projects, which have been highly relevant in the country over the past few years, have been affected. The hydrocarbon activity of the main basins was interrupted and the uncertainties about the exploitation of Vaca Muerta were reinforced. At the same time, several renewable energy generation projects were put on hold, not only as a result of isolation measures, but also as a consequence of lack of financing. Most of this collateral damage is related to the economic situation. Activities in Vaca Muerta have slowly started to reactivate and are likely to continue, associated with the recovery of hydrocarbons demand and economic activities. In the long term, subsidies from the national State are another important factor in the revitalization of Vaca Muerta. Renewable projects, especially those of large scale, which are highly dependent on financing, depend on attractive conditions for investors. In the face of large projects awarded in public tenders that risk not being achieved, small-scale distributed generation projects could be a viable option.

The Argentinian extra long lockdown motivates a revision of the energy regime. The energy system faces the challenge of responding and adapting to an unstable scenario, while addressing deficits and social inequities. The debates around the measures to be implemented in what will be the new post-pandemic normality open up opportunities to rethink habits, practices, and models of production. Two lessons may be derived from the Argentinian lockdown: consumers have become even more aware of energy's key role in daily life -confined to their homes they relied on electricity to continue working, studying and maintaining social contact-, and renewable energies and distributed forms of generation are a possible way of achieving energy security and social inclusion.

In this sense, the commitment to renewable energies, and greater community participation in energy production and management, is presented as a possible remedy. The development of distributed energy systems, managed by and for the territories, could increase their resilience in the face of exogenous shocks and improve the possibilities of inclusion of vulnerable populations without access to services. In turn, the promotion of initiatives that foster more sustainable ways of living, producing and consuming, could have a favorable impact on reducing energy demands and increasing the decision-making capacity of citizens. In this sense, the pandemic context can become a catalyst for the desired transition towards a more sustainable energy regime.

CRediT authorship contribution statement

A. Ise: Conceptualization, Methodology, Writing - original draft, Investigation. **S. Villalba:** Conceptualization, Methodology, Writing - original draft, Investigation. **L. Clementi:** Conceptualization, Methodology, Writing - original draft, Investigation. **S. Carrizo:** Supervision, Project administration, Writing - review & editing.

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References

[1] N. Brooks, S. Anderson, J. Ayers, I. Burton, I. Tellam, Tracking adaptation and measuring development, in: IIED Climate Change Working Paper No. 1, 2011.
[2] M. Pelling, Adaptation to Climate Change: From Resilience to Transformation, Routledge, Londres, 2011.
[3] N. Mathieu, Mobiliser les sciences de la société pour penser et agir face au changement climatique, Académie d'Agriculture de France, 2015, 2015.
[4] K. O' Brien, S. Eriksen, T.H. Inderberg, L. Sygna, Climate change and development. Adaptation through transformation, in: Climate Change Adaptation and Development — Transforming Paradigms and Practices, Routledge, 2015, 2015.
[5] INDEC, Censo nacional de población, hogares y viviendas 2010: censo del Bicentenario: resultados definitivos, Serie B nº 2, 1a ed., 2010. Buenos Aires.
[6] Laws and Decrees mentioned in the text may be found in. http://servicios.

infoleg.gob.ar/infolegInternet/verNorma.do?id=123565.
[7] CAMMESA, Informe Mensual Principales Variables del Mes (Months: March, April, May, June 2020 and 2019), Available at, https://www.cammesa.com/linfomen.nsf/MINFOMEN?OpenFrameSet. Accessed on: 5 August 2020.
[8] R. Bustos Cara, Cambios en los sistemas territoriales. Actores y sujetos entre la estructura y la acción. Propuesta teórico-metodológica. En II Jornadas interdisciplinarias del Sudoeste Bonaerense, Universidad Nacional del Sur. Bahía Blanca, Argentina, 2002.
[9] G. Bridge, S. Bouzarovski, M. Bradshaw, N. Eyre, Geographies of energy transition: space, place and the low-carbon economy, Energy Pol. (53) (2013) 331–340.
[10] B.Y. Kofler, N. Netzer, Requisitos para una transición energética global, Wuppertal Institut. Available at, https://library.fes.de/pdf-files/iez/11038.pdf, 2014. Accessed on: 20 August, 2020.
[11] C. y Guzowski, M. Recalde, Barreras a la entrada de las Energías Renovables: el caso argentino, Avances en Energías Renovables y Medio Ambiente 12 (2008) 31–38.
[12] M.Y. Recalde, D. H y Bouille, L.O. Girardin, Limitaciones para el desarrollo de energías renovables en Argentina, Problemas del Desarrollo 183 (46) (2015).
[13] J. Boldt, I. Nygaard, U.E. Hansen, S. Trærup, Overcoming Barriers to the Transfer and Diffusion of Climate Technologies, UNEP Centre on Energy, Climate and Sustainable Development, Roskilde, Dinamarca, 2012.
[14] F. Boissay, P. Rungcharoentkitkul, Macroeconomic Effects of Covid-19: an Early Review, Bank for International Settlements, 2020. BIS Bulletin 7. Available at, https://www.bis.org/publ/bisbull07.pdf. Accessed on: 20 August, 2020.
[15] N. Norouzi, G. Zarazua de Rubens, S. Choupanpiesheh, P. Enevoldsen, When Pandemics Impact Economies and Climate Change: Exploring the Impacts of COVID-19 on Oil and Electricity Demand in China, Elsevier Public Health Emergency Collection, 2020. Available at, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7305927/. Accessed on: 20 August 2020.
[16] P.V. Calzadilla, La pandemia de COVID-19 y la crisis climáticas: dos emergencias convergentes, Revista Catalana de Dret Ambiental 11 (1) (2020).
[17] I.J. Domingo, El COVID-19 hunde la demanda energética mundial y pone bajo confinamiento la revolución verde. 19 de mayo de 2020, Available at: de, https://www.estrategiasdeinversion.com/analisis/bolsa-y-mercados/informes/el-covid-19-hunde-la-demanda-energetica-mundial-n-448591, 2020. Accessed on: 20 August, 2020.
[18] G. Escribano, Energía y COVID-19 en América Latina: un impacto heterogéneo por sectores y países, vol. 55, Real Instituto Elcano. ARI, Madrid, España, 2020.
[19] N. Imbert, D.D.G.C. France, Covid 19: 10 propuestas para pueblos y territorios más resilientes, Actual. Jurid. Ambient. (100) (2020) 37–42.
[20] I.A. Castillo, Covid-19: un reto y una oportunidad para las energías renovables, CapevLAC. Available at, https://capevlac.olade.org/2020/05/05/covid-19-un-reto-y-una-oportunidad-para-las-energias-renovables/, 05-05-2020. Accessed on: 20 August, 2020.
[21] Y. Clemente, D. Grasso, P. Blanco, L. Pires, M. Zafra, Casos confirmados de Coronavirus en España y en el mundo. El País, Available at, https://elpais.com/sociedad/2020/07/27/actualidad/1595838623_808240.html, 2020. Accessed on: 20 August, 2020.
[22] M.P. Castillo, Cuarentenas en el mundo: de bloqueos exitosos a medidas descoordinadas para frenar el coronavirus. La Nación, Available at, https://www.lanacion.com.ar/el-mundo/tipos-cuarentena-mundo-resultados-a-fondo-nid2356924, 2020. Accessed on: 20 August, 2020.
[23] M.P. Castillo, Cuarentenas en el mundo: un confinamiento prolongado como sólo ocurre en América Latina. La Nación, Available at, https://www.lanacion.com.ar/el-mundo/cuarentenas-mundo-confinamiento-prolongado-como-solo-ocurre-nid2386044, 2020 B. Accessed on: 20 August, 2020.
[24] L. Horwitz, P. Nagovitch, H. Sonneland, C. Zissis, El Coronavirus en América Latina, Americas Society. Council of the Americas, 2020. Available at, https://www.as-coa.org/articles/%C2%BFd%C3%B3nde-est%C3%A1-el-coronavirus-en-am%C3%A9rica-latina. Accessed on: 20 August, 2020.
[25] E. Donza, Escenario laboral del Área Metropolitana de Buenos Aires en tiempos de cuarentena. Serie Impacto de las medidas aislamiento obligatorio COVID-19 en el Área Metropolitana de Buenos Aires. Observatorio de la Deuda Social Argentina, Available at, http://wadmin.uca.edu.ar/public/ckeditor/Observatorio%20Deuda%20Social/Documentos/2020/2020-OBSERVATORIO-LABORAL-INFORME-TECNICO-SERIE-ESTUDIO-IMPACTO-SOCIAL-COVID-19-AMBA.pdf, 2020. Accessed on: 19 August, 2020.
[26] J.I. Bonfiglio, A. y Salvia, J. Vera, Empobrecimiento y desigualdades sociales en tiempos de pandemia. Serie Impacto de las medidas aislamiento obligatorio COVID19 en el Área Metropolitana de Buenos Aires. Observatorio de la Deuda Social Argentina, Availabale at, http://wadmin.uca.edu.ar/public/ckeditor/Observatorio%20Deuda%20Social/Presentaciones/2020/2020_OBSERVATORIO_EDSA%20COVID19_EMPOBRECIMIENTO-II.pdf, 2020. Accessed on: 20 August, 2020.
[27] INDEC, Instituto Nacional de Estadísticas y Censos. Pobreza, Available at, https://www.indec.gob.ar/indec/web/Nivel3-Tema-4-46, 2020. Accessed on: 20 August, 2020.
[28] ODSA Observatorio de la Deuda Social Argentina, Hacia una erradicación de la pobreza. Dimensiones de la pobreza y la importancia de su medición multifactorial, Argentina Urbana 2010-2016. Available at, http://wadmin.uca.edu.ar/public/ckeditor/2017-Observatorio-Informe-Erradicacion-Pobreza-Prensa.pdf, 2017. Accessed on: 20 August, 2020.
[29] R.J. Durán, M.A. Condori, Índice multidimensional de pobreza energética para Argentina: su definición, evaluación y resultados al nivel de Departamentos para el año 2010, Avances en Energías Renovables y Medio Ambiente 20 (2016) 12.21–12.32. Accessed on: 10 August, 2020.
[30] BANCO MUNDIAL La COVID-19, (coronavirus) hunde a la economía mundial en la peor recesión desde la Segunda Guerra Mundial, Available at, https://www.bancomundial.org/es/news/press-release/2020/06/08/covid-19-to-plunge-global-economy-into-worst-recession-since-world-war-ii. Accessed on: 20 August, 2020.
[31] IEA, Global oil demand to decline in 2020 as coronavirus weighs heavily on markets. 9 de marzo de 2020, Available at, https://www.iea.org/news/global-oil-demand-to-decline-in-2020-as-coronavirus-weighs-heavily-on-markets, 2020a. Accessed on: 2 August, 2020.
[32] CHILE, Ministry of Energy, Reporte mensual sector energético, Noviembre 69 (2020). Available at, https://www.cne.cl/wp-content/uploads/2020/11/RMensual_v202011.pdf. Accessed on: 20 August, 2020.
[33] URUGUAY. MINISTRY OF INDUSTRY, ENERGY AND MINING. Series estadísticas de petróleo y derivados, Available at, https://www.gub.uy/ministerio-industria-energia-mineria/datos-y-estadisticas/datos/series-estadisticas-petroleo-derivados. Accessed on: 20 August, 2020.
[34] UNDERSECRETARIAT OF ENERGY PLANNING, Panel de Indicadores. Ministerio de Desarrollo productivo, Available at, https://www.argentina.gob.ar/produccion/energia/planeamiento-energetico/panel-de-indicadores, 2020. Accessed on: 5 August, 2020.
[35] IEA, Global Energy Review 2020. The impacts of the COVID-19 crisis on global energy demand and C02 emissions, Flagship Report. April 2020. Available at, https://www.iea.org/reports/global-energy-review-2020, 2020. Accessed on: 20 August, 2020.
[36] ABEGÁS, Sentindo efeitos da pandemia, consumo de gás natural recua 25% em abril na comparação de 12 meses, Available at, https://www.abegas.org.br/quem-somos, 2020. Accessed on: 20 August, 2020.
[37] ENARGAS, Transporte y distribución, datos operativos, Available at, https://www.enargas.gob.ar/secciones/transporte-y-distribucion/datos-operativos.subsec.php?sec=3&subsec=2&subsecord=02, 2020. Accessed on: 12 August, 2020.
[38] IEA, COVID -19 impact on electricity, Available at, https://www.iea.org/reports/covid-19-impact-on-electricity, 2020.
[39] A. Rebolledo, Energía eléctrica en tiempos de pandemia. OLADE, Available at, https://capevlac.olade.org/2020/04/20/energia-electrica-en-tiempos-de-pandemia/, 2020.
[40] BRAZIL ELECTRIC ENERGY COMMERCIALIZATION CHAMBER -CCEE, Consumo de energia no SIN, Available at, https://public.tableau.com/profile/ccee.informa.es.ao.mercado#!/vizhome/ConsumodeenergianoSIN/AnlisedeconsumonoSIN, 2020. Accessed on: 18 August, 2020.
[41] NATIONAL ENERGY COMMISSION OF CHILE, Demanda Diaria por Sistema SEN, Available at, http://datos.energiaabierta.cl/dataviews/250482/demanda-diaria-por-sistema-sen/, 2020. Accessed on: 18 August, 2020.
[42] IEA, Global energy demand to plunge this year as a result of the biggest shock since the Second World War, PressRelease. 30 de abril de 2020. Available at, https://www.iea.org/news/global-energy-demand-to-plunge-this-year-as-a-result-of-the-biggest-shock-since-the-second-world-war, 2020. Accessed on: 25 July, 2020.
[43] F. Krakowiak, La deuda de las distribuidoras con CAMMESA llega a $100.000 millones, En: Econo J. (2020). Available at, https://econojournal.com.ar/2020/06/la-deuda-de-las-distribuidoras-con-cammesa-llega-a-100-000-millones/. Accessed on: 18 August, 2020.
[44] P. Galand, Distribuidoras sólo pagaron un 15% del gas que compraron a petroleras, Econo J. (2020). Available at, https://econojournal.com.ar/2020/04/distribuidoras-solo-pagaron-un-15-del-gas-que-compraron-a-petroleras/. Accessed on: 18 August, 2020.
[45] EIA, Petroleum overview. Total energy, Available at, https://www.eia.gov/totalenergy/data/monthly/, 2020. Accessed on: 14 August, 2020.
[46] CCEE, Geração, análise mensal, Available at, https://www.ccee.org.br/portal/faces/pages_publico/o-que-fazemos/infomercado?_adf.ctrl-state=o3qhayeef_1&_afrLoop=855262149594378#!%40%40%3F_afrLoop%3D855262149594378%26_adf.ctrl-state%3Do3qhayeef_5, 2020. Accessed on: 18 August, 2020.
[47] URUGUAY. MINISTRY OF INDUSTRY, ENERGY AND MINING, Series estadísticas de energía eléctrica, Available at, https://www.gub.uy/ministerio-industria-energia-mineria/datos-y-estadisticas/datos/series-estadisticas-energia-electrica. Accessed on: 15 August, 2020.
[48] J.J. Carbajales, Hidrocarburos, perspectivas y desafíos, Seminario online, Instituto Argentino de Petróleo y Gas y AmCham Argentina, 2020, 5 de agosto de 2020.
[49] L. Lima, Coronavirus: por qué la crisis por el COVID -19 está dejando al mundo sin lugares donde almacenar el petróleo. BBC News Mundo, Available at, https://www.bbc.com/mundo/noticias-internacional-52057994, 2020. Accessed on: 11 August, 2020.
[50] P. Caridi, El otro mapa de la pandemia que explica la crisis del petróleo. Ámbito, Available at, https://www.ambito.com/opiniones/petroleros/el-otro-mapa-la-pandemia-que-explica-la-crisis-del-petroleo-n5097492, 2020. Accessed on: 12 August, 2020.
[51] I. Fariza, J.M. Cullell, La OPEP y Rusia pactan un drástico recorte de la oferta petrolera para tratar de sostener los precios. El País, Available at, https://elpais.com/economia/2020-04-09/la-opep-y-rusia-perfilan-un-acuerdo-para-recortar-drasticamente-la-oferta-y-elevar-los-precios.html, 2020. Accessed

on: 15 August, 2020.
[52] C. Duffy, J. Disis, La OPEP, Rusia y México llegan a un acuerdo "histórico" para reducir la producción de petróleo. CNN, Available at, https://cnnespanol.cnn.com/2020/04/13/la-opep-rusia-y-mexico-llegan-a-un-acuerdo-historico-para-reducir-la-produccion-de-petroleo/, 2020. Accessed on: 18 August, 2020.
[53] K. Hipple, T. Sancillo, Situación actual en Vaca Muerta: Los planes de explotación de las reservas de esquisto de Argentina se tambalearán más sin inversión privada, Institute for Energy Economics and Financial Analysis, 2020. Available at, https://ieefa.org/wp-content/uploads/2020/06/Vaca-Muerta-Update_June-2020_ES.pdf. Accessed on: 16 August, 2020.
[54] F. Castro, Más petroleras cierran pozos en Vaca Muerta, Available at, https://mase.lmneuquen.com/recortes/mas-petroleras-cierran-pozos-vaca-muerta-n696892, 2020. Accessed on: 11 August, 2020.
[55] D. Mottura, El escenario más temido: Vaca Muerta con "cero fracturas", Available at, https://mase.lmneuquen.com/vaca-muerta/el-escenario-mas-temido-vaca-muerta-cero-fracturas-n701512, 2020 A. Accessed on: 18 August, 2020.
[56] C. Navazo, Informe especial: la radiografía de la crisis laboral de Vaca Muerta, Available at, https://patagoniashale.com.ar/informe-especial-la-radiografia-de-la-crisis-laboral-en-vaca-muerta/, 2020. Accessed on: 18August, 2020.
[57] A. Durán, Convocan a expertos para discutir el fondo anticíclico de Vaca Muerta, Available at, https://www.rionegro.com.ar/convocan-a-expertos-para-discutir-el-fondo-anticiclico-de-vaca-muerta-1435915/, 2020. Accessed on: 16 August, 2020.
[58] R. Bellato, Gutiérrez defendió el barril criollo y adelantó la creación de un fondo anticrisis, Available at, https://econojournal.com.ar/2020/07/gutierrez-defendio-el-barril-criollo-y-adelanto-la-creacion-de-un-fondo-anticrisis/, 2020. Accessed on: 16 August, 2020.
[59] ECONOMIC COMMISSION FOR LATIN AMERICA AND THE CARIBBEAN, Dimensionar los efectos del COVID-19 para pensar en la reactivación, Informe Especial COVID-19 N°2. Available at, https://repositorio.cepal.org/bitstream/handle/11362/45445/4/S2000286_es.pdf, 2020. Accessed on: 13 August, 2020.
[60] C.Y. Guzowski, M.F. Zabaloy, ¿Cuál es el impacto del COVID-19 sobre la transición energética de América Latina y el Caribe? Perspectivas a futuro. Energía Estratégica, Available at, https://www.energiaestrategica.com/cual-es-el-impacto-del-covid-19-sobre-la-transicion-energetica-de-america-latina-y-el-caribe-perspectivas-a-futuro/, 19-05-2020. Accessed on: 16 August, 2020.
[61] Cammesa, Informe renovables. Junio 2020, Available at, https://portalweb.cammesa.com/Documentos%20compartidos/Noticias/Mater/Informe%20Renovables%20JUN%202020.pdf, 2020. Accessed on: 16 August, 2020.
[62] Nueva Provincia, Ya son 11 positivos por el parque eólico: 10 en Bahía y 1 en Villarino, Recuperado de, https://www.lanueva.com/nota/2020-5-17-15-2-0-decimo-positivo-por-el-parque-eolico-un-hombre-que-vive-en-buratovich, 2020. Accessed on: 15 August, 2020.
[63] Nuevas Energías, Suspenden las actividades del parque eólico Los Teros II ante nuevos casos de coronavirus, Available at, http://revistanuevasenergias.com/2020/07/14/suspenden-las-actividades-del-parque-eolico-los-teros-ii-ante-nuevos-casos-de-coronavirus/, 2020. Accessed on: 14 August, 2020.
[64] EL Popular, Coronavirus en Azul: dio positivo un operario del Parque Eólico Los Teros I, Available at, https://www.elpopular.com.ar/nota/144520/coronavirus-en-azul-dio-positivo-un-operario-del-parque-eolico-los-teros-i, 2020. Accessed on: 14 August, 2020.
[65] EUROPEAN SPACE AGENCY, COVID-19: nitrogen dioxide over China, Available at, https://www.esa.int/Applications/Observing_the_Earth/Copernicus/Sentinel-5P/COVID-19_nitrogen_dioxide_over_China, 2020. Accessed on: 4 December 2020.
[66] J. Plenio, Ni el confinamiento por COVID-19 da tregua al cambio climático: los gases que calientan la Tierra llegan a niveles récord, United Nations News, 2020. Available at, https://news.un.org/es/story/2020/11/1484462. Accessed on: 3 December, 2020.
[67] M. Howard, El cambio climático avanza implacablemente a pesar de la pandemia COVID-19, advierten los científicos, United Nations News, 2020. Available at, https://news.un.org/es/story/2020/09/1480142. Accessed on: 3 December, 2020.
[68] C. Moreno, La ciudad del cuarto de hora: por un urbanismo de proximidad, Available at, https://la.network/la-ciudad-del-cuarto-de-hora-por-un-urbanismo-de-proximidad/, 2019. Accessed on: 17 August, 2020.
[69] K. Bishop, Teletrabajo y coronavirus: lo que el mundo puede aprender de los Países Bajos sobre el trabajo desde casa, BBC, 2020. Available at, https://www.bbc.com/mundo/vert-fut-53239051. Accessed on: 16 August, 2020.
[70] L. Ripani, Coronavirus: un experimento de teletrabajo a escala mundial. Banco Interamericano de Desarrollo, Available at, https://blogs.iadb.org/trabajo/es/coronavirus-un-experimento-de-teletrabajo-a-escala-mundial/, 2020. Accessed on: 11 August, 2020.
[71] European Commision, Telework in the EU before and after the COVID-19: where we were, where we head to. Science for policy briefs, Available at, https://ec.europa.eu/jrc/sites/jrcsh/files/jrc120945_policy_brief_-_covid_and_telework_final.pdf, 2020. Accessed on: 13 August, 2020.
[72] N. Green, D. Tappin, T. Bentley, Working from home before, during and after the Covid-19 pandemic: implications for workers and organisations, N. Z. J. Employ. Relat. 45 (2) (2020).
[73] T. Wiedmann, et al., Scientists' warning on affluence, Nat. Commun. 11 (1) (2020) 3107.
[74] Swiss Embassy In Argentina, Recycling. The Swiss are champion waste recyclers, Available at, https://www.eda.admin.ch/aboutswitzerland/en/home/umwelt/natur/recycling.html. Accessed on: 20 August, 2020.
[75] IEA, Distributed Generation in Liberalised Electricity Markets. Peter Fraser, IEA Publications, Paris, 2002, 2002. Available at, http://library.umac.mo/ebooks/b13623175.pdf. Accessed on: 12 August, 2020.
[76] P. Landel, L. Durand, Y. Regnier, Penser l'autonomie énergétique territoriale, in: Bailleul, E. *Renouveler les politiques locales de l'énergie*. Les pratiques N.22 Cédis, 2016.
[77] S. Carrizo, G. Jacinto, Co-construcciones de redes energéticas. Acciones colectivas territoriales en Argentina, siglo XXI, Confins 35 (2018).
[78] A. Ise, S. Carrizo, M. Forget, Challenges of South American energy transitions, in: L. Guimaraes (Ed.), The Regulation and Policy of Latin American Energy Transitions, Elsevier, 2020.
[79] P. Sanchez Molina, Brasil supera los 300.000 sistemas fotovoltaicos de GD conectados a la red. PV Magazine, Available at, https://www.pv-magazine-latam.com/2020/09/28/brasil-supera-los-300-000-sistemas-fotovoltaicos-de-gd-conectados-a-la-red/, 2020. Accessed on: 4 December, 2020.
[80] GOVERNMENT OF THE CITY OF BUENOS AIRES, Ecobici, Available at, https://www.buenosaires.gob.ar/ecobici. Accessed on: 14 August, 2020.
[81] MINISTRY OF LABOUR, Teletrabajo, motor de inclusión socio-laboral. Ministerio de Trabajo, Empleo y Seguridad Social, Available at, http://www.trabajo.gov.ar/downloads/difusion/141107_libro_teletrabajo.pdf, 2012. Accessed on: 12 August, 2020.
[82] A. Artopoulos, COVID-19: ¿Qué hicieron los países para continuar con la educación a distancia? Observatorio Argentino por la Educación, Available at, https://cms.argentinosporlaeducacion.org/media/reports/ArgxEduc_SolucionesEducativas_Coronavirus.pdf, 2020. Accessed on: 5 August, 2020.
[83] R. Albrieu, Evaluando las oportunidades y los límites del teletrabajo en Argentina en tiempos del COVID-19. CIPPEC, Available at, https://www.cippec.org/publicacion/evaluando-las-oportunidades-y-los-limites-del-teletrabajo-en-argentina-en-tiempos-del-covid-19/, 2020. Accessed on: 12 August, 2020.
[84] ENERGY SECRETARIAT, Generación distribuida en Argentina. Evolución de trámites. Conexión de usuario-generador, Available at, https://www.argentina.gob.ar/economia/energia/generacion-distribuida/que-es-la-generacion-distribuida/reportes-de-avance-implementacion-de-la-ley-27424, 2020. Accessed on 2 August, 2020.