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THE RELEVANCE OF COOKING FUEL IN ENERGY POVERTY: THE CASE OF ARGENTINA

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INTRODUCTION

Worldwide, there is an increasing concern about reducing energy poverty, especially since the promotion of the Sustainable Development Goals in 2015 by the United Nations. In particular, goal 7, "Affordable and clean energy" is the most relevant when discussing energy poverty as it involves ensuring access to affordable, reliable, sustainable and modern energy for all by 2030. Within energy poverty, the particular problem of access to clean cooking has called the attention of many international organizations and policy makers.

In this sense, energy poverty cannot be defined solely as the lack of access to energy, since it also relevant attributes such as the quantity and quality of energy. At the same time, the access, quantity and quality of the equipment of a household is relevant, since what really matters to determine the well-being of the households is energy services. However, there are several factors that affect the aforementioned attributes such as socio-economic, geographical, building and cultural factors, which ultimately affect energy services. Therefore, energy poverty is defined as the lack of satisfaction of the energy services essential for human life, induced by a lack of access, quantity and quality not only of energy but of equipment, which is caused by various factors, such as socioeconomic (insufficient level of income, education, etc.), geographical (disconnection to the network), buildings (type of construction, insulation in openings, etc.) and cultural (fees for certain energy sources); which ultimately affects the level of well-being of household.

For all this, this document is a first explorative study about energy poverty based on lack of access to clean cooking energy service in Argentina. For this, a brief discussion about the choice of cooking material, the options available in Argentina and the situation in the country is presented.

I. WHY FOCUS ON COOKING FUEL?

To measure energy poverty, it is ideal to account for all the energy services that households use. However, this research will focus exclusively on the end use of cooking due to two reasons. The first one is that cooking is one of the main energy services in the residential sector, in fact it represented 29% of energy consumption in 2010 (Lucon et al., 2014). The other one is related to the fact that cooking is a vital energy service since human beings cannot live without food.

Access to clean cooking is so important that internationally there are different organizations working on promoting this issue, for instance the Clean Cooking Alliance[1], the Clean Cooking Implementation Science Network[2], the Climate and Clean Air Coalition[3], Cooking for Life[4] and the Sustainable Energy for All[5]. At the same time, there are databases related to clean cooking.

[1] Sometimes referred as The Global Alliance for Clean Cookstoves, https://www.cleancookingalliance.org/about/ourmission/index.html
[2] From the World LPG Association, https://www.fic.nih.gov/About/Staff/Policy-Planning-Evaluation/Pages/clean-cooking-implementation-sciencenetwork.aspx
[3] https://ccacoalition.org/en
[4] https://www.wlpga.org/initiatives/cooking-for-life/
[5] https://www.seforall.org/

One example is the report of Regulatory Indicators for Sustainable Energy (RISE) in which clean cooking is one of the pillars analyzed in addition to access to electricity, renewable energy and energy efficiency (World Bank, 2018). Another example is the database of Access to clean cooking of the International Energy Agency. According to this data, worldwide in 2017, 36% of the population did not have access to clean cooking. For the Latin America, this percentage is 11% and for Argentina less than 1% (IEA, 2019). In addition, 2,359 millions of people rely on biomass for cooking in the world, 56 millions in Latin America and less than 1 million in the case of Argentina (IEA, 2019).

It is important to note that modern and non-polluting fuels are electricity, liquefied gas and biogas systems, or the efficient use of biomass. On the contrary, traditional fuels are garbage, manure, organic waste, coal, wood and kerosene (PNUD, 2018). Using biomass or other traditional fuels represents a complex problem because it has significant climate, public health, economic and social impacts. Cooking with traditional stoves causes indoor air pollution and contributes to climate change in developing countries because it generates Greenhouse Gases emissions, such as carbon dioxide, methane, and black carbon. In addition to the environmental impact, it is one of the largest contributors to disease and early mortality (World Bank, 2018).

In particular, women, children and the elderly are the most exposed to the indoor air pollution, resulting in respiratory infections, chronic obstructive pulmonary diseases, eye problems, and lung cancer (Heltberg, 2005). For these reasons, the transitions from biomass to clean fuels will empower women and girls, because they will gain time and reduce drudgery by avoiding the collection of firewood (Lewis et al., 2017 in Rosenthal et al., 2018).

To quantify the impact of environmental risks on the health of the population, the database called Global Burden of Disease can be used. It was created by the Institute for Health Metrics and Evaluation of Washington University. According to this data, the environmental risk factor of household air pollution from solid fuels for Argentina represents 0.24% of total DALYs[6] or 0.37% of total deaths in 2017 (IHME, 2019).

Making clean energy accessible to all has the co-benefits of preventing diseases and premature deaths (Troncoso y da Silva, 2017). Therefore, the choice of cooking fuel is a relevant aspect to understand energy poverty and the trends of different energy uses.

II. HOW IS THE TRANSITION TO CLEAN ENERGY?: ENERGY LADDER AND FUEL STACKLING MODELS

It is also relevant to discuss how the process of transition is towards clean energy for cooking in households. Generally, the energy ladder model is assumed (Masera, 2000). This approach implies a simple progression from traditional to modern fuels as household income increases, that is, as families gain socioeconomic status, they abandon technologies that are inefficient, less costly, and more polluting (Op. cit). Under this approach, there are three phases. The first one is characterized by universal reliance on biomass. In the second, households use transition fuels such as kerosene, coal, and charcoal in response to higher incomes, urbanization, and biomass scarcity. Finally, in the third phase, households switch to Liquefied Petroleum Gas (LPG), natural gas or electricity for cooking (Heltberg, 2004). The idea behind this theory is that income and relative fuel prices are the determinants of the speed of the household fuel switch (Heltberg, 2004).

[6] Disability - Adjusted Life Years is the sum of years lost due to premature death and years lived with disability. DALYs are also defined as years of healthy life lost. The interpretation would be that 0.24% of the working days in which the individual does not attend work are related to diseases caused by environmental risk factors associated with air pollution due to the use of solid fuels in homes.

However, the energy ladder model is not appropriate partly because energy and energy consumers cannot be treated as independent technical, institutional and economic systems, mostly in underdevelopment countries. It is important to link the practice of cooking with the material world, skills, competencies and meaning ascribed by people who perform the task (Herington et al., 2017). The transitions from traditional to modern energy sources are haphazard, incremental and typically involve a practice of employing multiple stoves. Because of this, some authors use the term 'fuel stacking' and it implies that instead of substituting one stove with another, people will often use several cooking technologies or operate modern stoves only on special occasions (Herington et al., 2017).

Under this approach, the fuel choice depends on aspects related to fuel availability, the local cultural, social context that ultimately determines household preferences regarding cooking fuels and lifestyles (Masera, 2000). Generally, households use an additional technology without abandoning the old one. The use of multiple fuels in households is the result of complex interactions between economic factors (mainly prices), social factors (household incomes and education background) and cultural factors (practices, habits, and religious beliefs). Therefore, any fuel transition is a complex process (op. cit). Therefore, when studying the choice of cooking fuel it is important to account for all of these factors.

According to Troncoso y da Silva (2017) clean fuels are expensive, involve a significant change in user habits, and in general are not highly-valued initially and motivation is low, since usually clean technologies cannot perform the same tasks performed by the traditional stove. The authors argue that in Latin America the price is the most important factor for the use of liquefied petroleum gas (LPG) as a cooking fuel, even surpassing cultural barriers.

III. COOKING FUEL CHOICE IN ARGENTINA

Argentina has a high level of energy access and households tend to use modern energy fuels, which are electricity, natural gas and liquefied petroleum gas (LPG). In fact, as it can be seen in Table 1, Argentina had approximately 95% of household energy consumption from modern fuel in 2000. In addition, this situation improved in 2010 as Argentina increased modern fuel consumption up to 97% and it reached 98% in 2018.

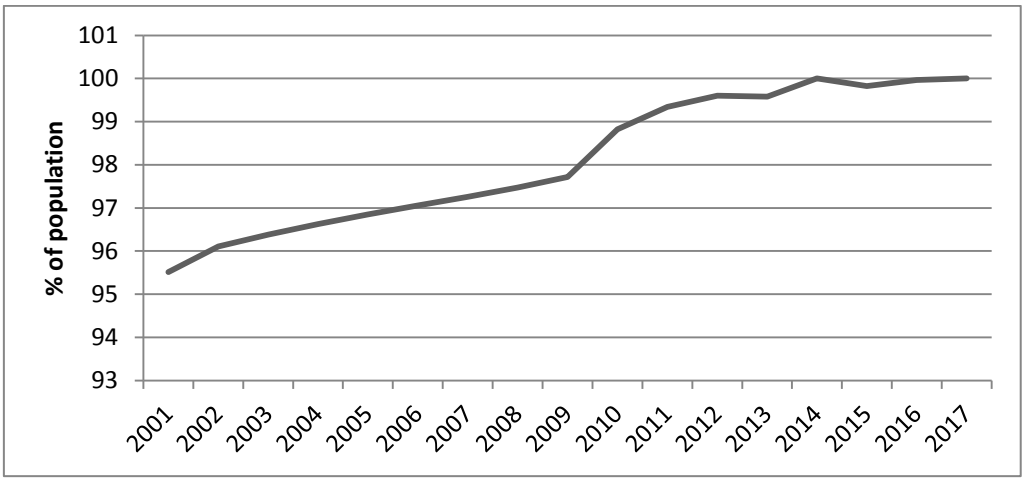
Table 1. Household energy consumption by type of fuel according to development phase

Type of fuel	2000	2010	2018
Traditional[1]	2.38 %	0.76 %	0.65 %
Transition[2]	2.22 %	1.55 %	1.28 %
Modern[3]	95.40 %	97.68 %	98.07 %

[1] Firewood; [2] Kerosene, Aerokerosene and Charcoal; [3] LPG, Natural Gas and Electricity
Source: own elaboration based on National Energy Balances from Secretary of Energy

Regarding energy access Argentina has a high level of electricity, as shown in Figure 1. As it can be seen, not only has the indicator increase in between 2001 and 2017, but it has also reached 100% in 2017.

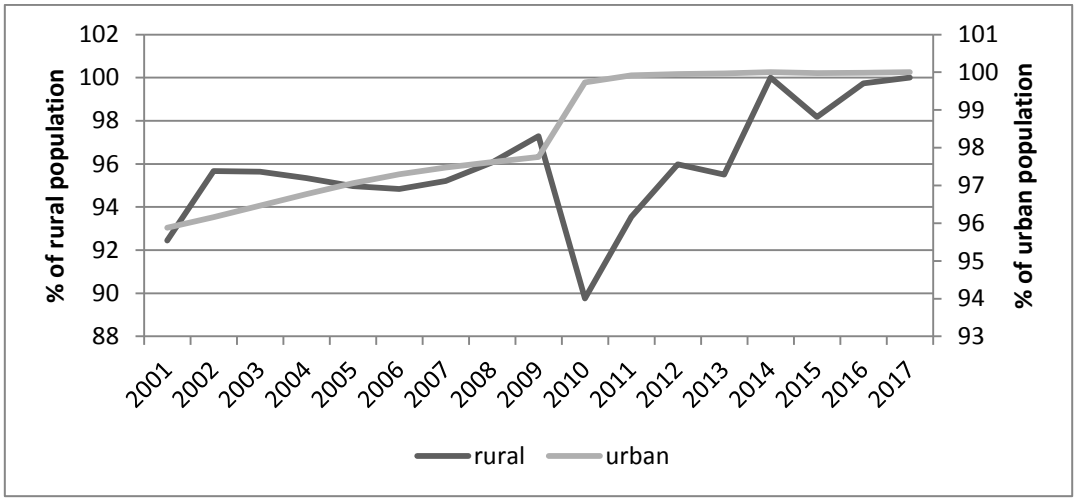
Figure 1. Evolution of electricity access in Argentina in 2001-2017



Source: own elaboration based on World Bank database

However, there are differences between urban and rural electricity access, as shown in Figure 2. Urban electricity access has increased over the entire period. On the contrary, rural electricity access has significantly reduced between 2009 and 2014. At the same time, rural electricity access has been always less than urban access, except in 2017 which both indicators reached 100%.

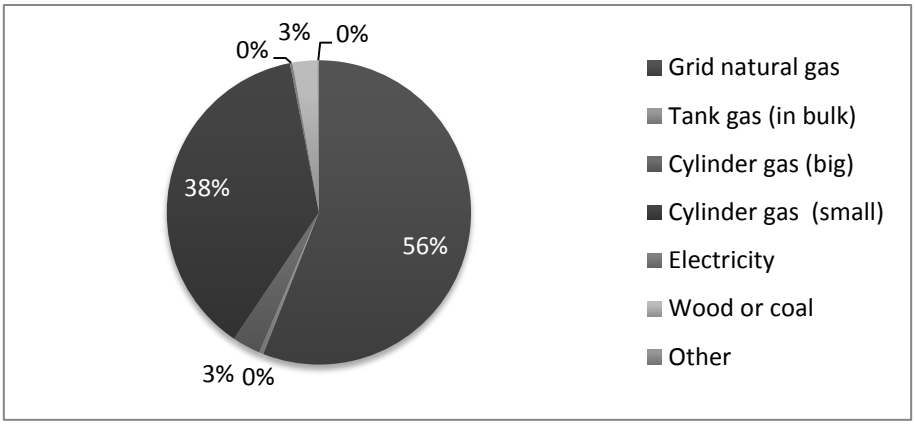
Figure 2. Evolution of rural and urban electricity access in Argentina in 2001-2017



Source: own elaboration based on World Bank database

According to the Secretary of Energy (2020), in 2018 the residential sector of Argentina the three main energy uses are heating (representing approximately 35% of total energy consumption), cooking (approximately 17%) and domestic hot water (approximately 16%). These are the preliminary resulted of the Useful Energy Balance for the residential sector of Argentina. To explore fuels used for cooking data from the populations' census of year 2010 is analized. In Figure 3, it can be seen that 56% of household use grid natural gas for cooking, 41% use cylinder gas and 3% use wood or coal.

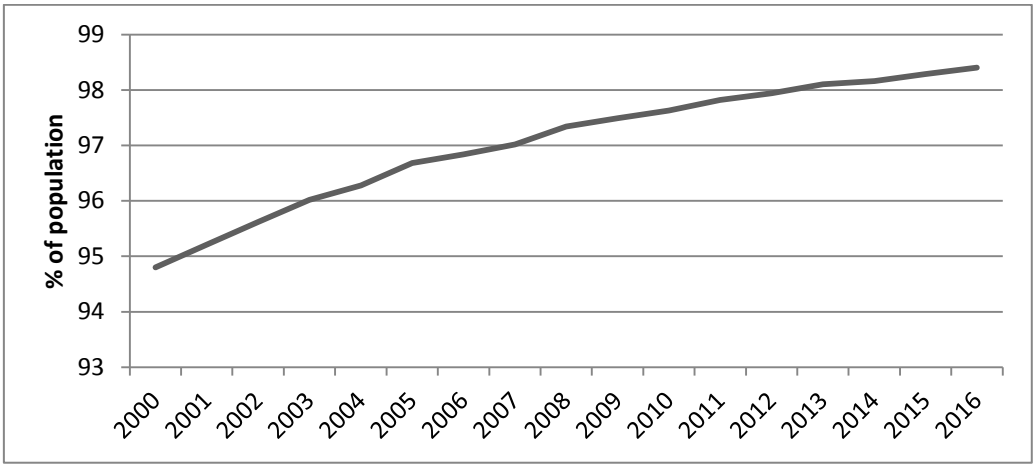
Figure 3. Main cooking fuel in Argentina in 2010



Source: own elaboration based on INDEC data (2010 population census)

Nonetheless, there were important changes with respect to the census year as it can be seen in Figure 4, which shows the evolution of access to clean fuels and technologies for cooking. The indicator steadily increases in all the period, especially from 2010 forward, reaching 98.4% in 2016. Even though it is a good performance, 1.6% of the population still does not have access to clean fuels, which represents approximately seven hundred thousand people[7].

Figure 4. Evolution of Access to clean fuels and technologies for cooking in Argentina in 2000-2016



Source: own elaboration based on World Bank database

IV. FINAL REMARKS

Energy poverty is an important phenomenon to be addressed by academic and political discussions because of its impact on the level of welfare of the population. Energy poverty can be defined as lack of access to energy services, that is, access to both energy and equipment to meet energy needs.

Within the energy uses of households, cooking has a central role worldwide, regionally and nationally. In turn, the condition of energy poverty assessed through cooking is determined by the material used in households. In the case of Argentina, gas is used mostly (in its various forms) and, therefore, access to clean cooking sources is high. That is, few households use

[7] Considering that population in 2016 was 43,590,368 according to World Bank data.

traditional cooking materials. However, 1.6% of the population still does not have access to clean fuels, which represents approximately seven hundred thousand people.
This situation deserves to be addressed by energy and social policies, which guarantee a greater use of clean sources for cooking in excluded populations. A possible policy reflection would be to evaluate the targeting of energy subsidies, particularly those that are destined for Liquefied Petroleum Gas since it is one of the modern fuels that do not require connection to the grid. In this sense, Troncoso and da Silva (2017) argue that a higher LPG fuel subsidy, directed only to the poor, could be more effective in the transition to clean technologies for cooking. It is therefore strategic to reduce the number of people receiving subsidies and to more effectively target the poorest.

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