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Nexus between Water, Energy Poverty and Food safety, in urban areas of a developing country: Colombian case.

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#### Abstract



According to the Sustainable Development Goals (SDGs) put forth by the United Nations (UN), the main challenges facing humanity approaching to the year 2030 are as follows: no poverty; zero hunger; clean water and sanitation; affordable and clean energy; and climate action among others (United Nations, 2015).

To achieve these goals is necessary to know the Nexus between Water, Energy and Food known in the literature as WEF Nexus. This paper attempts to establish relationships between Water (sanitation and potable water), Energy (modern cooking fuels), and Food (food scarcity). The results are based on The Quality of Life National Survey (QLNS) collected by the National Administrative Department of Statistics (DANE, 2017).

# LASALLE Literature Review



Recent literature addresses topics like water-energy Nexus in urban areas, the objective is to minimize water and energy consumption and achieve maximum efficiency in end-use. In urban areas the relationship consist in urbanization, supply and demand, and population growth (Ahmad et al., 2020). The Water-Energy and Food consumption is also important node of study. The research question is: how water-energy in the food system is assessed.

The use of water and energy in the urban food system in low GDP countries are related to processing and distribution: preparation and cooking (Islam et al., 2020). The COVID-19 pandemic brought disruptive consequences in WEF Nexus mainly in low and middle income countries, different aspects like: sanitation; drinking water; affordable and clean energy; and food sufficiency.

These factors shows the crosslinking between COVID-19 and the WEF Nexus (Al-Saidi and Hussein, 2021). The WEF Nexus node can be focused into three categories: internal relationship analysis; external impact analysis; and evaluation of the coupled system (Zhang et al., 2018).





#### Colombia

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Located in the north of South America, the country covers an área of 1,418,748 square kilometers (547,782 sq mi) and a higher population of 50 million. The population is a mix between: native indigenous, European settlement (Spain), forced African labour, and also immigration from the Middle East.

Colombia is rich in natural resources such as: oil, minerals, metals, precious stones, fruits and other agricultural products.

Population in main cities of Colombia (DANE, 2018):

Bogotá D.C. --- 7,387,400 Medellín --- 2,382,399 Cali --- 2,172,527 Barranquilla 1,205,284

Gini Coefficient: (51.3 – 2019) Percentage of Urban Population: (81.1% - 2018)

#### Energy and socioeconomic indicators in Colombia

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Variable	2010	2017
GDP (constant 2011 - USD) -	286.5	372.7
Billion		
GDP per capita, PPP (constant	11,823	14,219
2017 international USD)		
Urban population	77.9	80.4
(% of total population)		
Poverty gap at 1.90 USD a day	2.8	1.6
(2011 PPP) (%)		
Access to rural electricity	96.7	98.5
(% of total population, on		
interconnected areas)		
Gini Index	54.6	49.7
Population living in slums (% of	14.3	
urban population)		





The data used in this study taken from the QLNS 2010 (DANE, 2010) corresponds to 8,974 households and the QLNS 2017 (DANE, 2017) corresponds to 8,612 households in Colombia. These database contains information related to: kind and features of the households; goods and services; consumption of goods; health; education level; workforce; energy en-user; food safety and others related data.

The specific information used in this paper for each household is described as follows:

- (i). Water: Potable water (binary) and sanitation (binary).
- (ii). Energy poverty: Type of fuel used for cooking (Categorical).
- (iii). Food: safety: Food scarcity (Binary).

(iv). Another parameters: Income that corresponds to the income per household, expressed in constant dollars (USD) of 2018.



#### Water Results

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## **Energy Poverty**

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#### 2010

Modern Fuels (Electricity and Natural gas): In 2010 corresponds to 55%. Transitional Fuels (LPG): In 2010 corresponds to 40%. Dirty Fuels (Mineral Coal, Firewood and Waste): in 2010 corresponds to 5%. **2017** 

Modern Fuels (Electricity and Natural gas): In 2017 corresponds to 65%. Transitional Fuels (LPG): In 2017 corresponds to 32%.

Dirty Fuels (Mineral Coal, Firewood and Waste): in 2017 corresponds to 3%.



#### Conclusions

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The literature in the Nexus between Water, Energy and Food is relatively recent. To understand these relationships, allow to stablish best programs, for compliance of SDGs in developing countries. This work provides a first step in relationship the Nexus Water, Energy Poverty and Food safety, in urban areas of a developing country applied to urban areas of Colombia.

These analyzes also allow to determine and to quantify the fraction of the population with restrictions in Water, Energy and Food. We are trying to explain these interlinks using unilateral and mutual relations. The analysis was focused on Water (potable water and sanitation); Energy Poverty (cooking fuels and electricity access); and Food Security (food scarcity) with a center on household income.

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## Questions ?

#### Thanks

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