The interplay between energy poverty and energy security within the energy trilemma framework

A plea for more integrative approaches

by Tudor Găitan[1]

Introduction

This research paper draws on the framework of the energy trilemma (security, poverty and sustainability) to explore both the conceptual kinship and the practical implications of the relationship between energy security and energy poverty. Given the fragile equilibrium between the three mentioned policy goals, the paper aims to provide some insights to better understand their interplay. The main contribution resides in stressing the interdependence between and co-evolution of energy security and energy poverty, and why successful policy efforts should have an integrative approach, rather than "one at a time" mindset.

The first two sections of this paper review the existing literature on energy poverty and energy security, respectively. The subsequent section aims to bridge the gap in the academic literature by highlighting how the two notions correspond to a micro and a macro dimension of a similar challenge, namely energy welfare, thus calling for concerted action on both levels; it also analyses their interplay from an energy transition and climate change perspective, as well as from a consumer welfare standpoint. The final section explores Romania's positioning along the security-poverty axis and the country's recent developments as part of a wider and similar geopolitical context.

Energy poverty: the conceptual architecture

Energy access and affordability are a central pillar of citizenship and a core provision of the social contract (Sinea & Jiglau, 2021). In a digital democracy where political participation depends on your access to minimal energetic means these become a prerequisite for any individual's wellbeing and "capacity to work, relate, and participate" (Jones, 2016). The notion

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of energy poverty (EP) is usually confounded and interchangeably used with the idea of *fuel poverty* (FP)[2]. EP is defined based on the share of energy expenditure in a household budget exceeding 10%.

EP is critically linked to mental and physical health, as poor housing conditions, social vulnerability cripple productivity and ultimately reduce general welfare. Considering that around 10% of the EU population is affected by these issues justifies the increased attention paid to the phenomenon.

Capturing the quintessence of energy poverty and its economic implications is a methodologically difficult enterprise. This is part of the reason why there is no political or even academic European-wide accepted definition, just as the phenomenon is not addressed through legislation at the level of all Member States' domestic regulatory frameworks. Countries often elude a clear definition (Teschner et al., 2020) and responsibilities are assigned between several institutions like ministries, agencies, and across hierarchical layers, from local to national level.

EP can manifest in a plurality of shapes and forms depending on the specific social and cultural context in which it occurs (Thomson & Snell, 2016: 103), the definitions and measurements employed (INSIGHT_E Report, Pye et al, 2015), as well as the political judgement driving the process (Thomson & Snell, 2016). For example, Teschner et al. (2020) distinguish between EP as household access to proper infrastructure in developing countries versus issues of affordability in developed countries.

The literature also highlights a European core-periphery divide: for instance, countries in Central and Eastern Europe, particularly the former communist countries have specific challenges: a different configuration of the housing stock in terms of thermal efficiency, building quality or behavioural patterns and steady, above inflation price increases. These conditions led to higher levels of EP (Bouzarovski & Tirado Herrero, 2016). Furthermore, self-assessed thermal comfort, purchasing power and historical legacies further differentiated needs and conceptions of. Additionally, the consequences it produces are strongly correlated with other aggravating factors (geographical location, level of development of a region or

[2] Fuel poverty describes the situation in which a household experiences considerable difficulties in affording the fuels (i.e., gas, woodfire, electricity) necessary to heat or cool down their home. Using the indicator Low Income Low Energy Efficiency (LILEE), a household is considered to be fuel poor when the energy required to ensure thermal comfort is higher due to low energy efficiency of the property; and the residual income after such expenses pushes the household members below the poverty line.

country, historical path-dependence) and the chain of causality is often simultaneous (for example, EP and variables like levels of education, health or age).

Two other notions related to EP are worth mentioning. Firstly, the narrower "fuel poverty" which points to a household's lack of proper access to resources needed for domestic heating, cooking (Anser et al., 2022), and means for private transportation. In some accounts, FP might refer to the issue of energy affordability encountered in developed countries (Thomson & Snell, 2016 EUEP). However, oftentimes FP is not confined to heating only, and used interchangeably with EP.

Secondly, there is the more extensive notion of "vulnerable consumer" (VC), which encompasses the risk for some individuals to be affected by material deprivation leading to unmet energy needs. While VCs are not necessarily poor, they belong to an income decile which makes them particularly vulnerable to price volatility in energy products, high fixed costs for grid connection or exogenous financial shocks. A guide published by EU Energy Poverty Observatory in 2019 shows that energy vulnerability is, to varying degrees, acknowledged in 23 out of the 28 EU member states.

In the case of Romania, it seems that vulnerable consumers (defined through a combination of metrics relating to age, health, income and social-isolation risks) and EP/energy efficiency are addressed in a series of official legislative frameworks. Compared to EP, VC is a much more fluid condition for individuals and encompasses different elements like the risk of negative outcomes in market interactions or personal wellbeing, reduced capacity to defend their interests and to assess market information, as well as to make informed decisions relative to their condition (London Economics, VVA Consulting & Ipsos Mori Consortium, 2016: 46-49). The VCs are usually identified and addressed through cooperation among social security and protection institutions, labour agencies, and ministries of economic affairs (Kyprianou et al., 2019).

It becomes clear that EP is a multifaceted issue. Despite the lack of an overarching consensus, there is considerable overlap in the operative classifications employed by academics, public institutions and other relevant epistemic authorities to define EP. Energy Poverty does not operate in a vacuum, being in a concerted dynamic with complementary issues like energy security, welfare benefits, or environmental, education and health. EP usually consists of a general and critical incapacity of an individual or a household to secure the bare minimum amount of socially- and materially necessary levels of energy for daily activities (Buzar, 2007; Bouzarovski & Petrovna, 2015; Kyprianou et al., 2019).

More recent definitions depict EP as "the inability of families to have enough and affordable high-quality energy to survive and satisfy their development needs" (Han et al., 2021; Li et al., 2020; Nwuankwoala et al., 2018 in Rao et al., 2022: 1). As expectations of economic development, electrification and digitalization advanced in the last decades, the literature witnessed a paradigm shift in the way it relates to energy: from descriptions of its desirability to normative accounts depicting energy as an intrinsic enabler of democratic citizenship, political participation, welfare, and human dignity (Sinea & Jiglau, 2021; European Commission, 2020). Energy needs are so profoundly embedded in every instance of social interaction that lack of access or affordability results almost instantly in seclusion, deprivation and ultimately social polarisation.

Constitutive elements of Energy Poverty

There are three core components of EP: high energy bills, low energy performance of buildings and low income. Figure 1 illustrates the interaction between these three factors and the sub-issues resulting from it (Pye and Baffert, 2015 in INSIGHT_E Report). The three main drivers of EP correspond to the demand-side of the issue (household income), supply side (energy prices), as well as the structural dimension. However, there are additional drivers like employment status, the presence of a disability or health condition, or age which might worsen EP (Bouzarovski, 2014).

In general, the literature refers to three types of indicators to measure EP. Turai et al. (2021: 11-14) thoroughly explain these three categories, namely consensual/subjective approach, expenditure-based approach, and complex indicators. The first category uses the perception of household members and data from other surveys as primary inputs. The self-assed 'inability to keep home adequately warm' or 'share of people living in dwellings not comfortably cool during summer' are some of the indicators used from Eurostat's Survey on Income and Living Conditions (SILC). Through this method, EP is also measured indirectly by looking at, for example, 'arrears on utility bills. The expenditure-based approach includes the 2M indicator (people who pay more than double of the median expenditure share on energy); M/2 - also referred to as 'hidden EP' (this indicator looks at households with extremely low expenditure levels on energy needs and refers to people who spend less than half - relative to their income - of the median expenditure level); Low Income High Cost is another estimator which looks at people's residual income after energy-related expenditure. Finally, we have complex indicators which consist of a series of different combinations of the ones mentioned in the previous two categories.

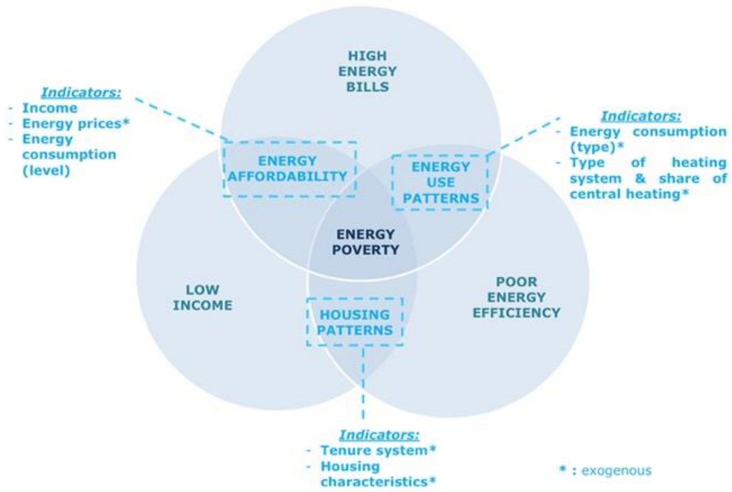

Figure 1: Drivers of energy poverty and key indicators

Figure 1. Source: INSIGHT_E Policy Report, 2015

All these variables make measuring the magnitude of the phenomenon particularly cumbersome and imprecise, given their fluidity and overlapping nature, especially as EP is conceptually distinct from conventional income poverty (IP). This calls for the need to derive special indicators to measure it. Figure 2 illustrates how income poverty relates to EP (in this instance referred to as FP). The first important observation we could derive is that, somewhat counterintuitively, EP is much more widespread relative to IP. The vast majority of people that are income poor, also find themselves in the energy poverty trap. However, a big share of those who are energy poor do not reside in the IP diagram.

On the one hand, this highlights how pervasive EP is, amplifying the spectrum of threats it poses to vulnerable citizens. Being confronted with such difficulties complicates how policy makers should aim to identify EP people and lift them up from this condition. Henceforth, the methodology employed to define and measure the EP level in any country is critical in reaching the designated target groups. As a suggestive example, Turai et al. show how applying two different indicators to identify vulnerable people rendered completely different results, in this case even contradictory. Unexpectedly, they reported that in Spain "the share of those who spend more than 10% of their income on energy increased between 2006 and 2008, the share of those who reported a lack of thermal comfort decreased in the same period" (2021: 25).

In addition to the causes of EP illustrated above, figure 3 highlights a number of other predictors that contribute to the vulnerability of consumers, as well as the associated risks. We can notice that the regressors of EP cluster around a supply-demand dimension (cost of energy, income level, energy carrier type and energy needs), and a structural dimension (thermal efficiency, household & tenure types, level of occupancy, appliance performance etc.). In the lower diagram of figure 3, Thomson and Snell (2016) highlight the detrimental effects and the living conditions that impact people's mental and physical health, such as the inability to properly thermo-regulate the indoors, arrears on bills, trade-offs (rationing) in terms of critical goods, as well as indoor polluting through damp, mould, cooking fuels, improper ventilation etc.

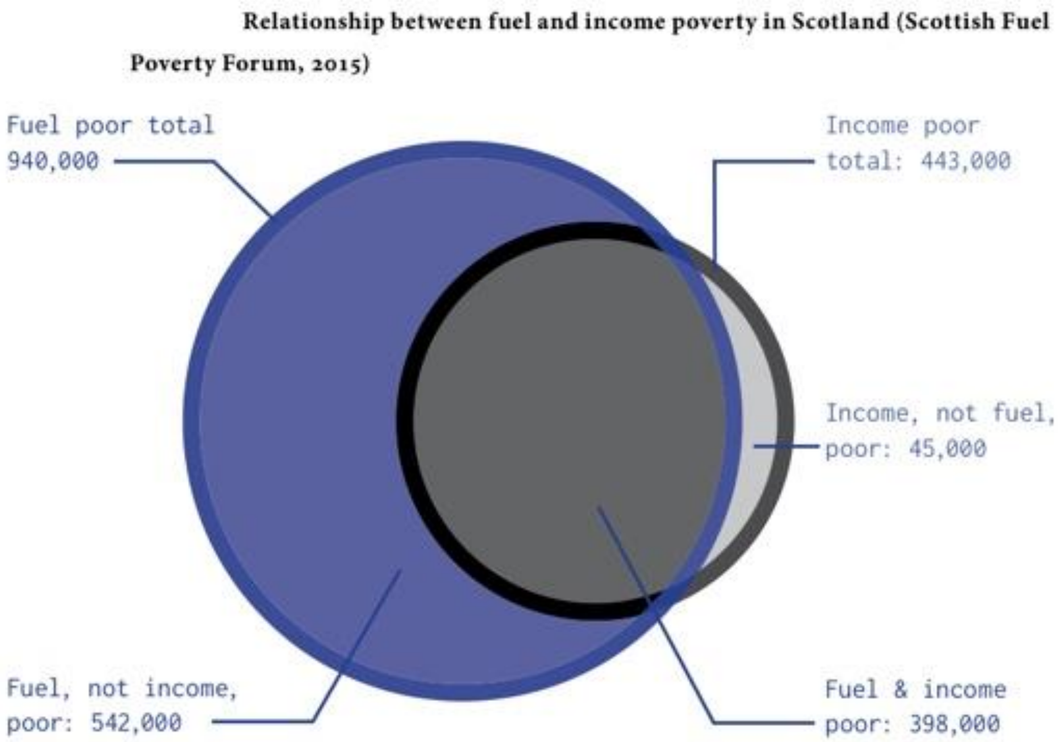

Figure 2. Source: Jones, 2016

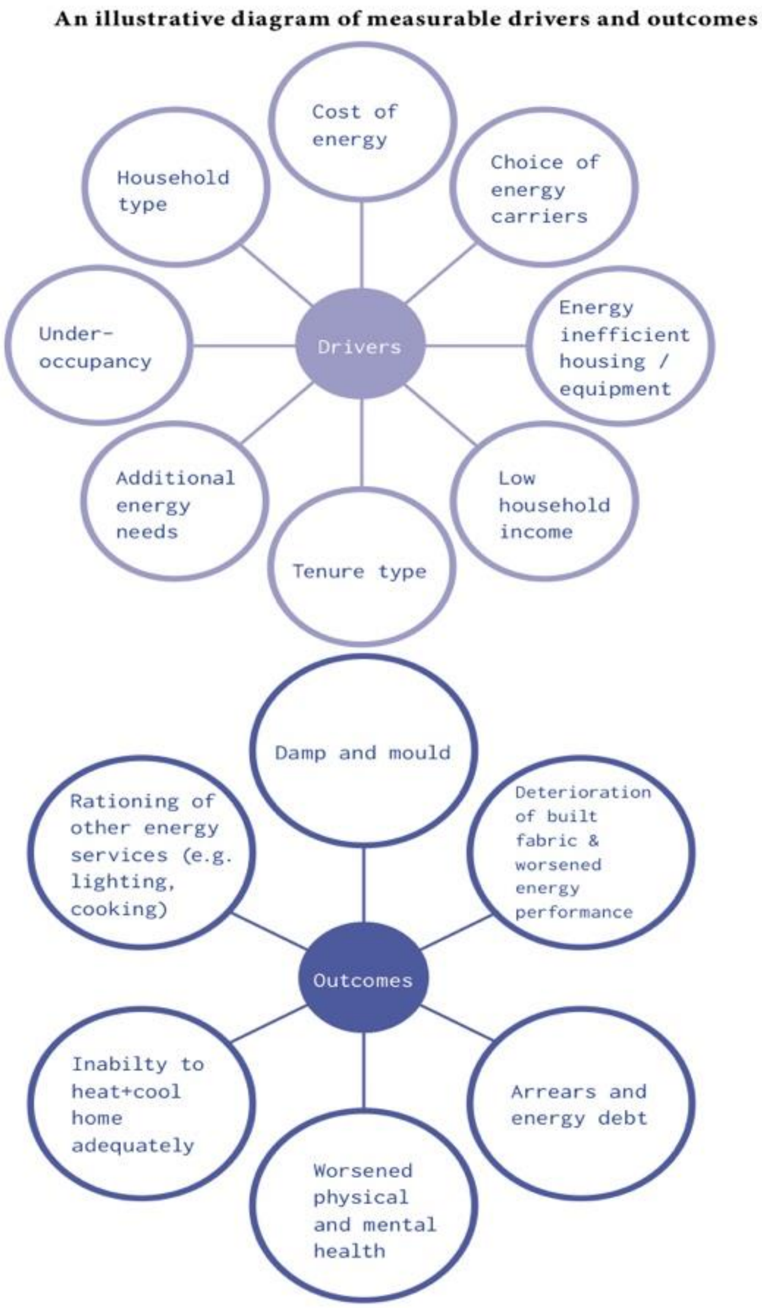

Figure 3. Source: Thomson & Snell, 2016

Mapping the territory of energy security

Broadly speaking, energy security results from targeted efforts towards ensuring long term access to energy supplies such that the consumption patterns of the largest sector of the population is insured. The issue becomes an even more stringent one in the context of electrification, energy transition, spiking demand for energy determined by economic development and demographic expansion.

The notion of energy security is context dependent and dynamic over time (Ang et al., 2015). Geopolitics, natural resource endowment, supply availability, or different policy goals shape what is meant by energy security. Countries like Germany, Russia and Brazil will most likely have very different views as to what ES entails and the means by which it should be attained. Subsequently, not all risks identified as a challenge to ES are on an equal footing across countries and regions. While price stability may be a higher order priority in developing countries that are very sensitive to price shocks, heavily industrialised countries may place a premium on the access to steady and continuous streams of supply.

The differential vulnerability is stressed by Cherp et al. (2012) who assessed the robustness, sovereignty, and resilience of energy systems and concluded that every country will have points of improvement on at least one of those dimensions. Depending on the level of industrial development and income, risks vary from ageing infrastructure or accentuated dependency (industrialised nations) to demand-supply disequilibria or lagging infrastructure (middle income countries) to a combination of all the above in less developed communities. Rodriguez-Fernandez et al. expanded the idea of security by incorporating the robustness (natural sciences and engineering), sovereignty (political science) and resilience (energy transition and adaptation to climate change) framework to address the new paradigm of energy security. This interdisciplinary approach creates room for vectors like scarcity of natural resources, declining production and reserves throughout the EU, alongside the level of greenhouse gas emission, which have been neglected in earlier security considerations (2022: 1-5).

It becomes clear how features such as energy independence, sustainability or reducing the risk of hazard from nuclear waste or coal emissions can rank high in shaping political behaviour (Winzer, 2011: 2) of different countries. For instance, ES policy goals and ideals vary between a Middle Eastern and North African (MENA) country, which is rich in hydrocarbon fuels, compared to a highly import dependant European Union (EU) country in the midst of a green transition, faced with supply contraction, price volatility and ambitious electrification goals.

Several authors remark how blurry (Loschel et al., 2008), elusive (Kruyt et al., 2009) or slippery (Chester, 2010) the concept is. The lack of widespread agreement in the scholarly literature (Vivoda, 2010; Chester: 2010; Winzer: 2011; Ang et al: 2015) determined several meta-analyses of discourses on ES. Ang et al. (2015: 1090-1091) identify over eighty-three different definitions of ES in over one hundred studies. These definitions vary in what and how they measure, ranging from import independence, or diversification of energy portfolio, to economic or environmental dimensions of ES, or affordability or hazardous waste (APERC, 2007).

In an attempt to clarify the boundaries of the concept, Winzer identifies three different *schools of thought,* consisting of those who define ES in terms of "commodity supply continuity", those who further distinguish between "secure" and "insecure" levels of continuity, and finally, those who extend the scope of continuity beyond mere supply, to "the continuity of services, the continuity of the economy and impacts on sustainability and safety" (2011: 4). In other words, this last paradigm emphasises the final use of energy, rather than energy as an end in itself. Hence, resilience of energy infrastructure and supply is tightly linked with that of the economy as a whole. It is only when the former contaminates the latter that energy security is threatened, as the social welfare is negatively affected.

The literature also distinguishes between two other levels of ES. On one hand, there is the technical or natural kind of ES. This branch calls for proofing against risks such as equipment breakdown, extreme weather conditions (temperature/water level rises) and natural disasters (earthquakes, hurricanes) (Loschel et al., 2010). On the other hand, there is the geopolitical or human category of risks, which include sabotage, terrorism, capacity underinvestment and neglect (Ikonnikova, 2006; Baldick and Salmeron 2009 in Winzer, 2011), as well as military confrontations (Iraq invasion in 2003, Russian aggression against neighbouring countries, Venezuela strikes in 2002/2003) as reported by Loschel et al. (2010).

However, what has been noted so far represents what Winzer calls implicit definitions of ES. There are also a vast number of attempts to explicitly define in as much of a comprehensive manner as possible what ES stands for; Ang et al. (2015) identified over eighty such attempts. The International Energy Agency (IEA), for example, states that lack of ES "stems from the welfare impact of either the physical unavailability of energy, or prices that are not competitive or overly volatile" (IEA, 2007a: 12). Asia Pacific Energy Research Center (APERC) defines ES as "the ability of an economy to guarantee the availability of energy resource supply in a sustainable and timely manner with the energy price being at a level that will not adversely affect the economic performance of the economy" (APERC, 2007: 5). Ang et al. (2015: 1082-1083) also observe a trend to increasingly emphasise the role of sustainability and efficiency in defining ES. More recently, IEA defines ES as "the uninterrupted availability of energy sources at affordable prices" (IEA, 2021).

Another concern when discussing energy security is either too narrow definitions gravitating primarily around fuel security (mainly coal, oil or gas), or too lax definitions that end up being imprecise and difficult to employ methodologically. For example, Cohen et al. restrict their analysis of ES to oil and gas only, posing the problems in terms of diversification of supply sources (2011: 4860-4862). For that reason, the authors also remark that ES is often confounded with energy independence, mainly from other states or suppliers, which overlooks important pillars such as the risk of resource depletion, sustainability of energy sourcing, or environmental and social impact.

In order to bypass such inconveniences of classification, Savacool and Mukherjee (2011) develop a five-dimensional framework (availability, affordability, technology development, sustainability, and regulation) to thoroughly decipher the constitutive features of ES. This conceptual architecture is further dived in 20 sub-elements, resulting in 320 simple and 52 complex indicators that can aid policy making and research in their efforts to better diagnose problems and identify solutions. The similar "four A's" is another common conceptual architecture used to evaluate ES, namely "availability (geological issues), affordability (geopolitical issues), accessibility (economic issues) and acceptability (environmental and social issues)" (Rodriguez-Fernandez et al., 2020: 2; Cherp & Jewell, 2014). Despite the overwhelming variability in defining ES, there is a shared understanding that present efforts in this industry conform to the precautionary principle, that is, strengthening future capabilities through current strategic expenditure committing to a form of intergenerational sustainability (Axon & Darton, 2021: 1198).

In other recent attempts, ES is defined by International Energy Agency (IEA) as the unhindered and continuous access to sources of energy at reasonable prices (Anon, 2021). Analysts recognize the importance of both short-term flexibility of systems and capacity to incorporate sudden shocks, as well as long term, strategic foresight and timely investment. The notion underwent a process of conceptual enlargement to accommodate pressing realities like environmental concerns, international geopolitical developments, but also technological progress in terms of clean energy (Esfahani et al., 2021: 3571). More attention is paid recently to newer variables such as air pollution, climate change, GHG emissions as factors of disruption (Rodriguez Fernandez et al., 2022).

The silent conversation between ES and EP

Although the two concepts are often approached in the literature as separate phenomena, this paper will highlight how they are, in fact, more closely interconnected than the academic literature and policy analyses have acknowledged thus far. No policy can aim to address one of the problems in complete disregard of its impact on and correlation with the other. The two concepts are part of a more holistic conceptual framework, the energy trilemma, which acknowledges deep trade-offs. This gives rise to coordination dilemmas between state and non-state actors, rendering a very fragile policy equilibrium.

Only a handful of articles identify the gap in understanding the link between energy security and energy poverty, albeit either indirectly or in an insufficient manner (Pachauri, 2011; Ang et al., 2015; Ali et al., 2020; Nasir et al., 2022). ES is usually employed to describe national and supra-national policy-making processes, operating at macro levels, while EP operates primarily at individual, households, and businesses levels. Evaluating this micro and macro dichotomy, Pachauri confirms their common denominator and claims that “energy security is often viewed at a regional or national level, and largely defined from a political or economic perspective. However, few analyses exist that assess this from the perspective of individual households and analyse its socio-economic dimensions” (Pachauri, 2011: 191). ES and EP are thus in a closer interaction than it has traditionally been granted in the literature.

To illustrate, in a recent econometric analysis conducted in Vietnam, the intertwining of the three pillars of the energy trilemma is clearly highlighted, Nasir et al. recognizing an inverse correlation between ES and EP. Specifically, looking at the case of Vietnam between 2001-2018, the authors observed that, mediated by the environmental tax, there has been a considerable increase in ES and a significant decrease in EP (2022: 8-9). Throughout this period, a lot of efforts have been invested in energy related issues, which resulted, after 2017, in 100% electrification of the Vietnamese population, including “82 million people who traditionally have no grid access” (Nasir et al.: 1). Showing the mediating role of environmental tax on both EP and ES can serve as reference point for European efforts in addressing the same issues within a liberal democratic setting. Further on, Pachauri argues that "from a household perspective, energy security can be defined in terms of access to secure, stable, and reliable supplies of modern energy at affordable prices in amounts adequate to meet demands for energy services in full so as to ensure human health and well-being" (Pachauri, 2011: 191-192). As it will be presented later on, the absence of these conditions ushers states of energy vulnerability, poverty and fragile security.

Furthermore, the interdependence between EP and ES is briefly discussed in an analysis of what Ali et al. (2020) call the Australian "climate policy paralysis", although the sustainability component of the trilemma has been replaced with "jobs" and "public acceptability" to better explain the deadlock. Additionally, in their extensive, longitudinal analysis of ES definitions and indexes, conducted for the period between 2001 and 2014, of 104 studies that deal with this topic, Ang et al. (2015) suggest a more integrative approach when it comes to ES. One of their claims is that the literature has rarely scrutinised ES in the more holistic context of the energy trilemma – a set of competing energy goals that cannot be simultaneously achieved without some degree of trade-offs between one another. The pillars of this trilemma are economic competitiveness, energy security, and environmental sustainability. These pillars can also be seen as elements of a multi-layered challenge.

Firstly, economic competitiveness speaks more to the interests of individuals, households and businesses. These micro-elements comprise the subject matter of what energy poverty refers to. Such actors are mostly concerned with budget constraints and are the first to be affected by price hiccups or availability disruptions. These shocks impact the ability of companies to remain solvable, to deliver affordable service or products, and affects the access to energy for the general population. The economic competitiveness pillar of the trilemma engulfs both affordability and availability for the end consumers, whether they are private individuals or commercial enterprises. Depending on the magnitude of these indicators, one can talk about energy vulnerability (EV) or energy poverty (EP).

Secondly, ES involves national and international actors such as states, international organizations, NGOs or think tanks, and concerns geopolitical struggles among these agents. From this perspective, ES could be regarded as the macro-level equivalent of EP. Although ES is a self- or comparative assessment of the strategic risks related to accessibility of energy products, this evaluation falls within the scope of international relations, global diplomacy, commerce, and smart power. States compete and cooperate in pursuit of their strategic energy interests. For example, a country, despite a potential access to a substantial stock of energy resources, it cannot deem itself energetically secure in the absence of a favourable geopolitical setting, strong alliances, friendly or at least non-belligerent neighbourhood, and strong economic ties with trade partners. The ultimate aim of international actors which pursue ES is satisfying the domestic demand with steady streams of supply at affordable costs, while ensuring this desideratum remains feasible under all circumstances and in a long-time horizon.

Finally, environmental sustainability has both the performance-oriented element – which seeks to ensure access to energy stocks at affordable prices to support social welfare and economic thriving –, as well as a time-oriented consideration – in the sense of instilling a responsible use of resources. Proper management of scarce supplies enables both low levels of poverty, high levels of energy security, and a prolonged enjoyment of limited stocks within a thriving natural environment. On the other hand, mismanagement can lead to interstate conflict over resources, harness social unrest and hinder economic development. Environmental sustainability ensures that the other two pillars of the trilemma are dealt with in a policy synergy, while raising awareness that environmental losses are always globally socialised and asymmetrically harmful, rather than geographically limited. Most often than not, the environmental and social costs will burden the most vulnerable.

Energy transition and climate change

In the context of the ongoing energy crisis, decarbonisation ambitions, large-scale electrification, and transition toward renewables, the link between EP and ES becomes more evident. One way to offset the financial burden of rising energy prices that drive EP is through a systematic focus on renewables. There are several ways in which policy makers should understand how the two issues co-evolve. Energy security requires a readily available regulatory framework to reduce frictions for households interested to (dis)connect from the grid and sell or store excess supply of energy production back into the system. Strategic foresight is important in this regard, as infrastructure can become overburdened. This requires timely investment in ensuring the grid can accommodate higher flows, and more dynamic markets. In order to incentivize a critical mass of the population, with a distinctive emphasis on most vulnerable consumers, policy aid is required to facilitate the absorption of European funds, channel existing pools of resources, cut down on red tape to minimise bureaucratic friction, and raise awareness on the mechanisms and urgency to embark on this collective mission.

From the EP standpoint, people should have sufficient exposure to adequate information regarding the availability of additional technologies such as heat pumps, solar and photovoltaic panels to shield themselves against price shocks, adopt more sustainable sourcing behaviours, and cut down on energy waste. This, of course, assumes a certain level of cooperation between officials and the citizenry, effectiveness from the bureaucratic apparatus, and active support schemes from the government to ensure that transition is both feasible and affordable for all income deciles.

A similar reasoning can be applied in the case of deep renovation projects. Energy subsidies and social cheques are, at best, temporary solutions that barely alleviate the perceived weight of energy bills. But long-term action in terms of reducing the structural causes of energy poverty can make a lasting difference. Joint investments in deep renovation projects that increase thermo-performance and reduce rotting walls, damp, mould, and sub-optimal ventilation pay generous dividends in the long run. Whether we talk about prosumers/consumers partially sourcing their energy capital from their own renewable infrastructure, or higher energy performance in both individual houses and multi-family apartment buildings (MFABs), it implies a lower EP index, higher ES index, healthier and wealthier citizens, and ultimately safer communities. The individual, as the ultimate object of analysis in any security framework, is the core beneficiary of strategic investments. Thus, any improvements in the overall level of energetic security, eventually results in spill-over effects for the population

While ES might involve future proofing against natural resource depletion by fast-tracking investment in transition infrastructure and ensuring a diversified portfolio of suppliers, EP requires little to no gap in people's ability to connect to and consume the energy products and services. Insufficient investment in renewables to make it widely accessible undermines the desideratum of ensuring minimal levels of energy comfort. Affordable, secure, inclusive and sustainable energy are cornerstone principles in recent policy developments at EU level (Schneller et al., 2021: 4), which is why a synergy in approaches towards EP and ES must be pursued. Failing at addressing either of them (EP or ES) compromises both indiscriminately. Keeping track of macro goals – such as national security– as a vehicle for delivering micro-level (for households and businesses) welfare is the way to avoid policy cacophony.

The way forward to a low or zero carbon world requires creative foresight and strategic planning. The leaps ahead in the energy, industry and production sectors cannot afford to leave anyone behind. Incoherent policy and lack of institutional coordination – both horizontally and vertically – can deepen the already wide income gap and compound the number of those who lose from the transition process. This is a key sector in which the EP–ES axis harmonise macro environmental goals with micro wellbeing. The energy transition is not only a matter of decarbonizing industries, but also a key component in reducing import dependencies in many member states by shifting to renewables and thus reducing exogenous security risks. At the same time, the shift to smarter energy mixes must avoid replacing one dependency with another, since renewables also involves complex supply chains in terms of technology, raw inputs and manufacturing.

Consumer welfare

So far, multiple studies draw attention to the way in which the entire energy transition driven, among other things, by EU institutions too, has widened the gap between haves and have-nots, growing the flanks of those energetically vulnerable, economically marginalised, and socially excluded (Popkostova, 2022: 6, Schneller et al., 2021: 9-10, Bouzarovski & Tirado Herrero, 2016: 88-89).

If anything, the reconfiguration of behavioural patterns and consumption needs during and after the Covid-19 pandemic, the threat of Russia halting gas supplies, and soaring energy prices clearly highlight the concatenation between ES and EP. The multi-layered crisis we are experiencing at the moment is not only a perfect storm of exogenous factors (war, viruses, depletion of resources, climate change), but also the compounding effect of strategic negligence and lack of ex-ante worst-case scenario planning on behalf of European institutions (Popkostova, 2022). Production of hydrocarbons peaked in the last decade, aggregate dependability on imports has not improved, and decarbonisation further complicated an already dire situation through coal phase-out and zero emissions ambitions.

All these have not occurred overnight, but are the results of cumulated trends over time, suggesting they could have been planned better. Unpreparedness resulted in severe worsening of both poverty and security dimensions of energy. Being confronted with the threat of inaccessible and/or unaffordable gas supply clearly speaks to each and both issues at the same time. On the one hand, the effects on citizen welfare are both direct – through spiking prices across the EU in electricity, natural gas and oil which reflect the scarce supply and security vulnerability–, and indirect – through two digits inflation in consumer goods due to increased prices in inputs, thus worsening the poverty rates (Misik, 2022: 1). On the other hand, being at the mercy of hostile external suppliers like Russia clearly does not strengthen the ES score, nor provide with any leverage in negotiating a compromise.

Another angle that reveals the conceptual kinship between EP and ES lies at the core of the supply and demand equilibrium framework. No sound economic analysis would ever dissect a problem from only one side of the equation. Demand and supply are the two core elements of a seesaw that swings in pursuit of equilibrium. Studying only one extreme of the seesaw would render narrow and contextually displaced information. The interplay between EP and ES replicates a similar dynamic. Most scholarly literature focuses only on the supply side of the equation, including infrastructure, import dependability, and portfolio diversification. However, a thorough energy welfare assessment should account for the supply side (that is, energy security), as well as the demand side (energy poverty).

Although with a slightly different approach in that they focus on the security and sustainability pillars of the energy trilemma, Axon & Darton remark a similar link, namely that "demand-side indicators are just as important as those for the supply side, in any assessment of energy security, which involves meeting *energy needs*" (2021: 1196). In this updated understanding, energy security becomes the vehicle for generalised welfare by ensuring the availability of tools required to address and reduce poverty levels. EP and ES are two mutually reinforcing dynamics. High EP weaken the level of ES through large sectors of the population being trapped in survival mode, absent from the common affairs of their community, and vulnerable to polarizing narratives. Conversely, a poor ES system leaves the population vulnerable to exogenous interference, unpredictable supply, and low bargaining power.

Romania and the wider Central and Eastern Europe

Romania's position at the intersection of EP and ES can be better understood by looking at the wider regional and historical context that shaped its development in the last few decades. While there is an estimated 10% of people in the EU confronted with EP (Sinea & Jiglau, 2021: 13), Romania stands as an outlier, with almost a quarter of its population being affected by general poverty (Parliament of Romania, Law 891/2021). Several authors recognize that this condition is partly due to post-communist developments and efforts associated with democratisation such as liberalisation of the markets, wide-spread privatisation, and the rising level of prices at a higher rate than inflation which contributed to a core-periphery divide between Western and Central-Eastern Europe (Bouzarovski & Tirado Herrero, 2016). Although EP was encountered during communism too, the literature emphasises the role of transition in augmenting some energy gaps, especially through the quick rate of urban development, or the features of communist developed housing stock (Babes-Bolyai University, 2021: 2-3; Schneller et al., 2021: 4). Figure 4 highlights one such difference. It displays that former communist countries require, on average, a higher level of heat consumption in residential areas.

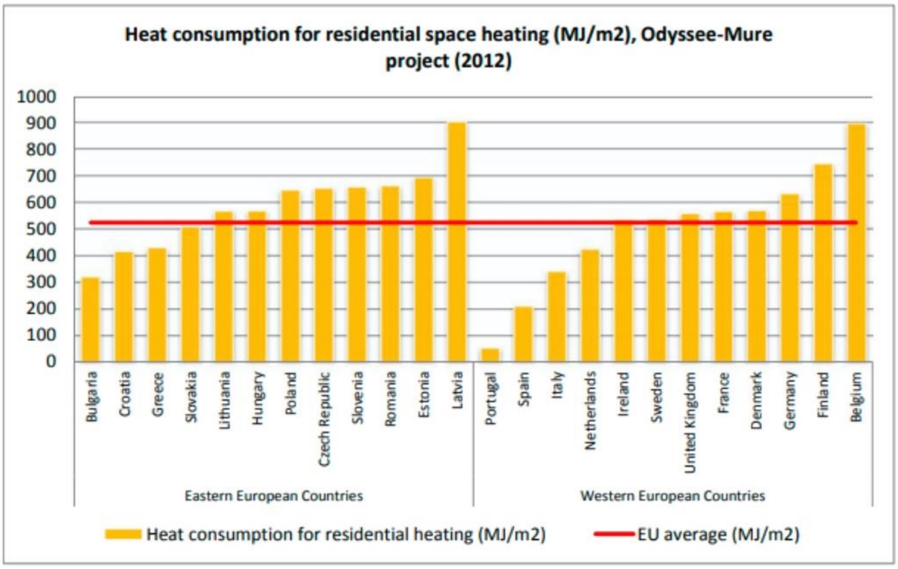

Figure 4. Source: Turai et al., 2021

Deprivation of the basic energy goods during the communist times determines different behavioural patterns in the aftermath of the revolutions in Romania and the CEE. This subsequently translates in disproportional levels of self-assessed thermal/energy comfort and incoherence in EP measurements. This can be the result of several factors. The aggregate energy efficiency of buildings is considerably lower in CEE countries like Romania compared to the median Western efficiency level. Romanians' lower relative purchasing power coupled with the tendency of Romanian households to heat their homes during the winter at 25-26 degrees Celsius (compared to an average of 20-21 degrees in Western Europe), heightens the magnitude of the issue (Clodnitchi & Busu, 2017). Other cultural factors might be involved, such as the perception that high indoor temperature during winter indicates affluence and testifies to one's socio-economic status. Such cultural legacies have been systematically cultivated in the collective psyche during communist decades (many of which are still at play nowadays) when heat and other basic goods were considered luxurious.

The housing stock is also worth mentioning. In Romania, home ownership ranks at an incredible rate of over 95%, the highest in the EU, whether we are talking about multi-family apartment buildings (MFABs) or private houses. Similar to Hungary, almost 70% of dwelling in Romania are houses, the rest being flats in collective buildings (Heeman et al., 2022: 14). Such a high rate of owner-inhabited dwellings avoids the common issue of tenant-landlord dilemma and the split incentive barrier to improving housing features. These concepts refer to the complicated dynamics between tenants demanding better housing conditions and landlord inertia in committing resources to improve property quality.

While high levels of home ownership and ownership-inhabited houses might indicate an enhanced level of agency over the quality of housing, several issues are observed. One such issue is the pronounced urban-rural divide in terms of income, access to information, as well as level of status-quo inertia. Countryside households often rely on polluting fuels to heat their houses (mainly woodfire). They manifest suboptimal energy consumption trends due to underdeveloped infrastructure for public services like natural gas, running water, electricity or sewage systems. Thus, besides the lack of financial resources to upgrade the energy performance of their houses, we witness generalised (energy) poverty, unsustainable behaviour, and environmentally damaging practices.

On the other hand, despite some common existing issues, people living in urban areas in MFABs also confront coordination dilemmas. Upgrading energy performance of the building requires concerted action. Neighbours sometimes are reluctant to pay even small contributions, are not very cooperative, and are not always convinced of the utility of such endeavours. Therefore, the potential enhanced agency resulting from home ownership does not always translate into effective action due to a range of market, structural and behavioural barriers.

A report published by Babes-Bolyai University in 2021 highlights some interesting findings relative to behavioural patterns concerning the population of Cluj-Napoca. Although almost 90% of people state they consider climate change a real threat, the overwhelming majority of them claims comfort takes a front seat in household choices. Somewhat counterintuitively, the study also found that people affected by EP occur throughout the city in both newer and older areas, in both separate houses and MFABs. Another hypothesis rejected through the study relates to the impact of a building being refurbished. Without undermining the positive impact of refurbishing a building, the study discovered that not even those buildings are EPfree, as people still incur higher costs that they can afford and live in precarious conditions. A conclusion that can be drawn from this is that no single one approach can ever hope to cut down EP. This reaffirms the need for a holistic, integrative approach that targets concomitantly low income, high costs, energy efficiency, as well as access to information (with particular focus on minimising wasteful behaviour and acknowledging how to access funding instruments for vulnerable people).

Recent thinking links EP with larger societal concerns, and indirect spill over effects in "the entire system of energy policy, regulation and service delivery" (Heeman et al., 2022: 6). A large population below or residually above the poverty line is a major vulnerability for any country, including in the security framework. Energy poverty and energy security interact both ways, being in a co-dependent relationship. Policy efforts targeting these two issues must seek stable equilibrium points, otherwise risking nulling out one another.

In security terms, several studies show that Romania ES scores vary within safely good intervals, especially relative to other member states. Rodriguez-Fernandez et al. (2020: 5-6) report an almost 5% increase in Romania's Weighted Energy Security index (WESI) for gas in the period 2005 to 2010, (looking at geopolitical risks and vulnerability). They also observe improvements in terms of dependence and infrastructure vulnerability. In another study published in 2022, Rodriguez-Fernandez et al. expand their analysis of security risks by incorporating environmental factors like greenhouse gas emissions as well as availability of resources (gas reserves). Romania seems to have made considerable progress in the timespan analysed (2005-2015) having one of the lowest Supply Concentration Index in the EU, reducing its dependency rate and emissions substantially and increasing its gas reserves, having better outcomes in virtually every category (except for emissions) when compared to the EU benchmark.

There is no way in which a high level of EP can co-exist with an integrative vision of ES. With almost a quarter of its population being under the poverty threshold and another third of its people in the vulnerability spectrum, Romania faces as much an EP, as well as an ES problem.

Conclusion

This paper highlights how lack of policy harmonisation as the EP-ES is concerned can lead to nulling out sectorial efforts independently addressed at either EP or ES. This essay argues that, within the energy trilemma, EP and ES are not best understood and dealt with when they are approached as separate phenomena. Rather, they speak to the same concern of energy welfare, but from different perspectives, within the micro-macro dichotomy.

While EP accounts for individual households and companies, ES assesses the level of state preparedness. As any element of the policy trilemma ultimately spills over citizen welfare, a synergy in approaches must be pursued in order to achieve sustainable and cross-sectional development. In the aftermath of global challenges like violent conflict, pandemics, democratic erosion, and shifting consumption patterns, the link between EP-ES requires ever more understanding and integration in policy efforts. One cannot speak of energetically wealthy citizens in situations of price or supply uncertainty, just like security is far from being achieved in the presence of vulnerable private and business consumers. In a world of cross-sectional problems like climate change, it is paramount to recognize the interplay between seemingly independent phenomena.

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