Energy for a Decent Life: Bringing together Poverty and Climate

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Pathways that limit global warming generally do not include a representation of inequality. Using, a mixed-methods approach this projects aims to assess how **climate mitigation pathways** change when dynamically including **energy needs for human development**.

The Decent Living Standards (DLS, Table 1) aim to represent the material **prerequisites for supporting a decent life**, rooted in a capabilities approach to wellbeing [1]. Using data from Multi-Regional Input-Output (MRIO) tables and Life Cycle Analysis (LCA) literature, the **energy requirements** operating and constructing these materials can be calculated [3],[4], as well as estimate the current share of energy going towards supporting basic needs rather than luxury services [2],[3].

This research uses energy to **link poverty and wellbeing (using DLS) and climate (through energy-related emissions)**.

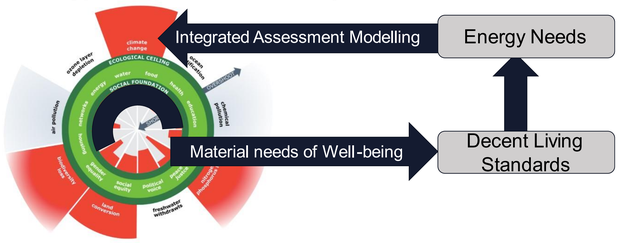

Figure 1. *Sketch of the theoretical framework of this PhD project. Using the concept of minimum energy requirements to support decent living, this project links parts of the social foundation (e.g. housing, energy, food, and education) to planetary boundaries (including climate change, through greenhouse gas emissions), here illustrated using the Doughnut popularized by Kate Raworth [5].*

Decent Living Standards

	Needs groups	Sub-Dimensions	Material Satisfiers
Physical	Shelter	Housing	Minimum space (10 m²/cap), durable quality
		Indoor comfort	Heating/Cooling/Lighting/Clothing
	Nutrition	Food	Sufficient calories, cold storage (Fridge), clean cooking
	Heath & Hygiene	Water	65 litres/day, improved access
		Sanitation	Access to improved sanitation
		Provision of health care*	National health care expenditure
Social	Socialization	Education	Lower secondary education
		Social connectedness	TV, cell phone (Internet)
	Mobility	Physical connectedness	8,527 p-km, motorized transport

Table 1. *A selected overview of decent living standards based on ref. [1] with adjusted global values as in ref. [2].*

Multidimensional Poverty around the world

The **mean decent living standards deprivation indicator** is an average of mean gaps in physical and social well-being indicators. Here, we show the estimated share of the population below a decent living standard threshold for 12 indicators. It provides a materials-based approach to estimating global multidimensional poverty. Furthermore, it provides a **starting point to calculate the energy requirements to eradicate poverty**. The highest shares of population living below DLS are found in sub-Saharan African countries, which on average see deprived population of over 60% for more than half of the decent living indicators. South Asia and Pacific Asia also have large gaps in the same dimensions, including clean cooking and heating (mostly traditional biomass with negative health impacts).

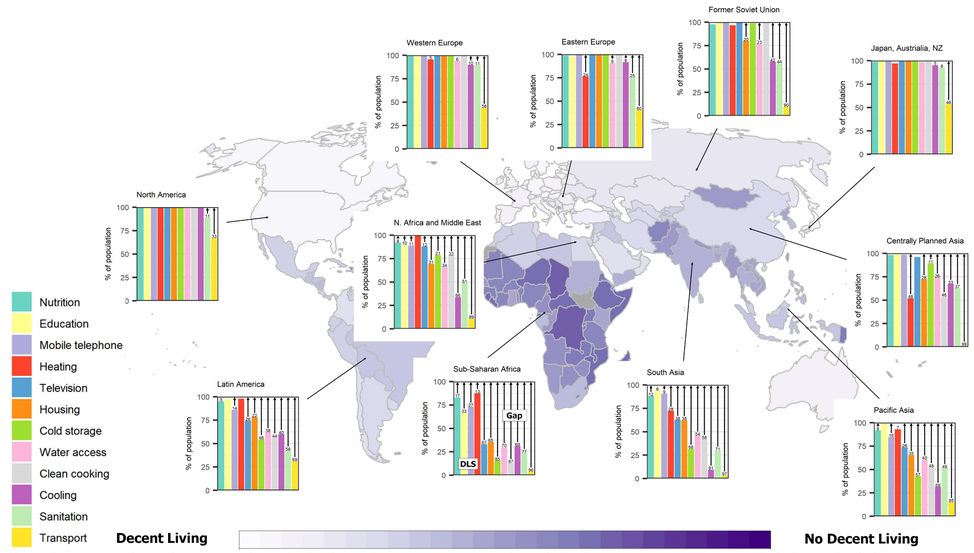

Figure 2. *The map shows the mean DLS deprivation for each country as a share of population from zero to one. The mean DLS deprivation indicator is the mean of social and physical wellbeing, which are both taken to be the mean of their sub-indicators. Bars show the regional average percentage of population with decent living standards, with numbers indicating the decent living gap in percentages for each DLS dimension. Figure adapted from [2].*

Decent Living Energy: a mixed-methods approach

Total annual energy need to support decent living in 2050 is approximately 150-160 EJ/year [2]. The biggest chunk of this energy is to support motorized transport, with health and shelter coming in after that (Figure 3, for the 11 regions as modelled by MESSAGEix).

While **Decent Living Standards are assumed to be universal, energy needs are not equal**. For instance, energy intensities of different regional transport systems vary significantly. Likewise, to reach comfortable indoor temperatures, some regions only need cooling in summer, while other regions require heating almost all-year round.

This means that annual **Decent Living Energy (DLE) varies between ~ 9 GJ/cap/year for South Asia to ~36 for the North America** region.

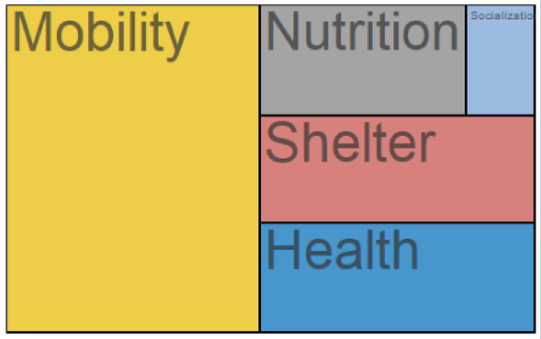

Figure 3. *Relative shares of energy requirements by need group. Total annual energy requirements for supporting decent living energy to the total global population under SSP2 in 2050. Figure adapted from [2].*

Climate mitigation and energy needs

Global **DLE is less than half of current global final energy consumption**, and much lower than any of the 1.5°C-compatible mitigation scenarios assessed by the IPCC [9]. This indicates that from an energy perspective, climate mitigation and development are **not mutually exclusive** [2, 6].

Current mitigation scenarios generally do not consider elements of justice like the eradication of multidimensional poverty. This can lead to significantly lowered energy growth in the Global South under climate mitigation, restricting the potential for development.

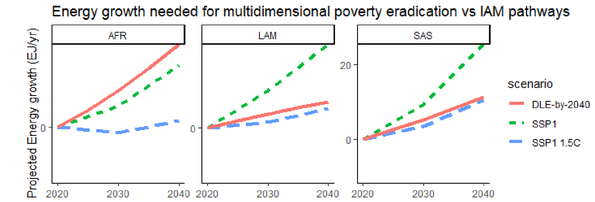

Figure 4. *Comparing SSP1 and a 1.5 °C-compatible SSP1 mitigation scenario from [9] versus a scenario (using current technologies) with enough energy growth to support decent living for all by 2040 (DLE-by-2040). Shown are Sub-Saharan Africa (AFR), Latin America (LAM) and South Asia (SAS) as in [7].*

Trade-off between equality and growth

To estimate what share of society has access to enough energy to support a decent life, both the total energy consumption in a country and its distribution need to be taken into account. Using data from refs. [2] and [8], Figure 5 illustrates the trade-off between growth and equality. In many cases, **both redistribution and growth are likely required to achieve a situation with enough energy for all**.

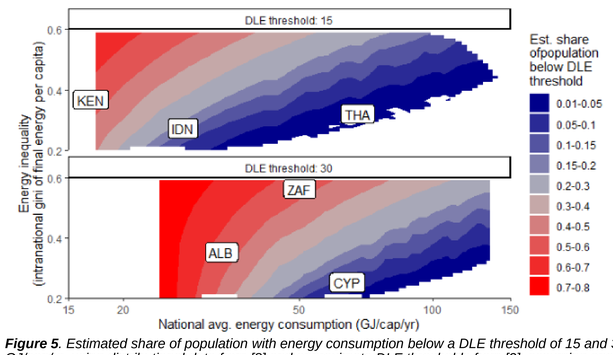

Figure 5. *Estimated share of population with energy consumption below a DLE threshold of 15 and 30 GJ/cap/yr, using distributional data from [8] and approximate DLE thresholds from [2], assuming energy is lognormally distributed. Shown are Kenya (KEN), Indonesia (IDN), Thailand (THA), South Africa (ZAF), Albania (ALB) and Cyprus (CYP).*

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[4] Mastrucci, Alessio, et al. "A framework for modelling consumption-based energy demand and emission pathways." *Environmental science & technology* 54.3 (2020): 1799-1807.
[5] Doughnut figure adapted from Kate Raworth and Christian Guthier/The Lancet Planetary Health
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