I. Background: (Adapted from World Energy Outlook, 2011[i])

a. Although energy alone is *not sufficient* for economic growth and development, it is *certainly necessary*. Yet, nearly *3 billion people* (largely in developing Asia and southern Africa) lack access to modern energy and rely on **traditional biomass**, which causes harm to human health, local environments (e.g, forests) and global climate change.

b. **Access to electricity** is particularly crucial to human development as electricity is, in practice, indispensable for activities such as lighting, refrigeration and appliance use and cannot easily be replaced by other energy. Electricity access is one of the most unambiguous indicator of energy poverty.

c. **Energy transition** is essentially the substitution of traditional biomass fuels by modern energy. By and large, urban households and the wealthy have made this transition, whereas rural households and the poor have not (Leach, 1992[ii]).

II. What do we know? Literature Review (from **Leach, 1992** & **van der Kroon et al., 2013)**

a. As industrialization progresses, reliance on petroleum and electricity increases and the importance of biomass decreases. Researchers in the past have adopted the **"energy ladder"** model to analyze this trend, but the relationship between fuel choice and income level is rarely this strong. Usually, households do not completely switch from one technology/fuel to another; instead they ***stack*** and use an additional technology without abandoning the other.

b. Household energy transition decisions are driven by: (i) **the household opportunity set** (household characteristics); (ii) the **household decision context** (such as government policies or access to markets); and (iii) the **external environment** (such as climate, geographic location and history). (van der Kroon et al., 2013)

c. Socioeconomic determinants in the form of **household characteristics** such as **income, liquidity, family size, educational attainment, female bargaining power** have received most attention and allow us to identify distinct groups of households based on fuel choice behavior.

d. Considering the decision context, **poor access to modern fuels** and the **high cost of acquiring appliances** are major constraints on energy transitions. Consequently, **urbanization**, which improves access to and reliability of modern fuel supplies, is an important driver of the transition, especially when complemented with income growth. The evidence on the impact of differences in relative prices of various fuels is mixed.

III. What do we not know? – *Research gaps* (Drawing from van der Kroon et al., 2013)

a. Existing research has put most emphasis on describing household behavior through the socioeconomic characteristics of the household opportunity set. Relatively little attention has been devoted to **decision context and the external environment** such as *social marketing programs, MFI's,* and *information campaigns*. In particular, we do not know if and how grassroots micro-institutions and supplier incentives impact transitions (Pattanayak et al., 2014).[iii]

b. The focus in the literature has been largely on conventional forms of energy. Little is known about the sustainability of fuel choice and switches and the impact of **renewable energy technologies** on human health, local forests and low-carbon development in LMICs.

c. While we have mixed evidence that improved biomass stoves deliver benefits, we have growing evidence that advanced energy services improve health and socio-economic outcomes.

d. While there is much evidence that the transition is occurring rapidly in many urban areas of the developing world, the **present situation and prospects for rural areas are much more uncertain**., partly because of incomplete and poor data about anticipatory policies in rural areas (Leach, 1992).
e. Because the supply and demand of energy is affected as much by individual choice, preference, and behavior, as by technical performance, the literature must draw on a broader (social science) pool of expertise. Four worrisome trends are evident in prominent publications in energy studies over the last 15 year: (i) an undervaluation of the influence of social dimensions on energy use; (ii) a bias towards science, engineering and economics over other social sciences and humanities; (iii) a lack of interdisciplinary collaboration; and (iv) the underrepresentation of LMIC authors, especially women (Sovacool, 2014[iv]).

IV. Going forward – *Policy efforts*

a. Steps to address these problematic trends are desperately needed to make energy studies more socially oriented, interdisciplinary and heterogeneous. For example, energy ministries, statistical agencies and public utility commissions should focus more (data collection and monitoring) on energy behavior and demand, rather than just supply, and Administrators should make energy research more problem-oriented.
b. Given its crucial importance to human development, finally the (proposed) inclusion of energy access in the **Sustainable Development Goals** is a promising step. This move accompanies calls for a shift away from setting goals to meet basic survival needs and instead to focus on energy solutions that reduce poverty and improve livelihoods. To minimize political resistance to energy SDGs, future efforts can integrate energy interventions with other development priorities (Best, 2013[v]).
c. An example of finding common ground comes from the political gridlock that has resulted because of the current focus on **emissions** related to **equitable solutions to climate change**. We urgently need a new narrative, motivated by people's **equal access to energy and not their right to emit CO2**, measured at their comparable stage of development. This puts greater onus on **maximizing efficiency and low-carbon growth**, given the technology available now and into the future. (Birdsall & Subramanian, 2009[vi]).
d. Previous attempts at increasing access offer important lessons. For example, Barnes (2007[vii]) suggest that rural electrification programs must institutionalize program management, set subsidies and prices optimally, and ensure community "buy-in". Likewise, Sovacool (2012[viii]) identifies six design principles to improve off-grid energy, which mirror Barnes (2007) but also emphasize lowering credit barriers (*e.g.*, MFIs and community-cost sharing), adopting nested 'polycentric' institutions design, building local capacity, and providing quality assurance.

---

[i] http://www.worldenergyoutlook.org/resources/energydevelopment/accesstoelectricity/
[ii] Leach, G. (1992). The energy transition. *Energy policy*, *20*(2), 116-123.
[iii] Pattanayak S, Jeuland M, Lewis J, Bhojvaid V, Brooks N, et al. 2014. Cooking up change in the Himalayas: evidence from mixing quasi-experiments with an experiment on cookstove promotion. Work. Pap., Sanford School of Public Policy, Duke Univ.
[iv] Sovacool, B. K. (2014). Energy studies need social science. *Nature*, *511*(7511), 529-530.
[v] Best, S. (2013). *Shaping a global goal on energy access that leaves no one behind*. *International Institute for Environment and Development (IIED) Briefing Papers*. London. Retrieved from http://pubs.iied.org/17183IIED.html
[vi] Birdsall, N., & Subramanian, A. (2009). Energy needs and efficiency, not emissions: Re-framing the climate change narrative. *Center for Global Development Working Paper*, (187).
[vii] Barnes, D. F. (2007). *The challenge of rural electrification: Strategies for developing countries*. Washington, DC: Resources for the Future.
[viii] Sovacool, B. K. (2012). Deploying off-grid technology to eradicate energy poverty. *Science*, *338*, 47-48.