

Sustainable Development Perspectives on Energy Modelling

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Scope

- Transformation need to include all countries in the world at different development stages
- Addressing sustainable development (SD) is a prerequisite for meeting low stabilization targets
- IPCC Chapter 17: Acceleration of mitigation in the context of sustainable development
- State of the art in international energy research: IAM's
- Challenges facing studies for developing countries - access, affordability, income generation



The Synergies and Tradeoffs Issue

- Major criteria in decision making
- Tradeoffs have to be openly addressed
- Mapping of mitigation options synergies and tradeoffs need to be context specific
- Conclusions like "the benefits of mitigation exceed the costs at very aggregate level" are not very useful
- Tradeoff and synergy issues are linked Just transition and stranded assets issues



Policy Relevant Questions

- Energy sector planning perspective:
 - Impacts of mitigation options on SDG's. Energy and SDG
 - What to consider beyond energy system modelling boundaries
- What can be considered as green energy options - EU shortlist criteria
- Green investments and finance:
 - Financial climate policy risk
 - Institutional investors

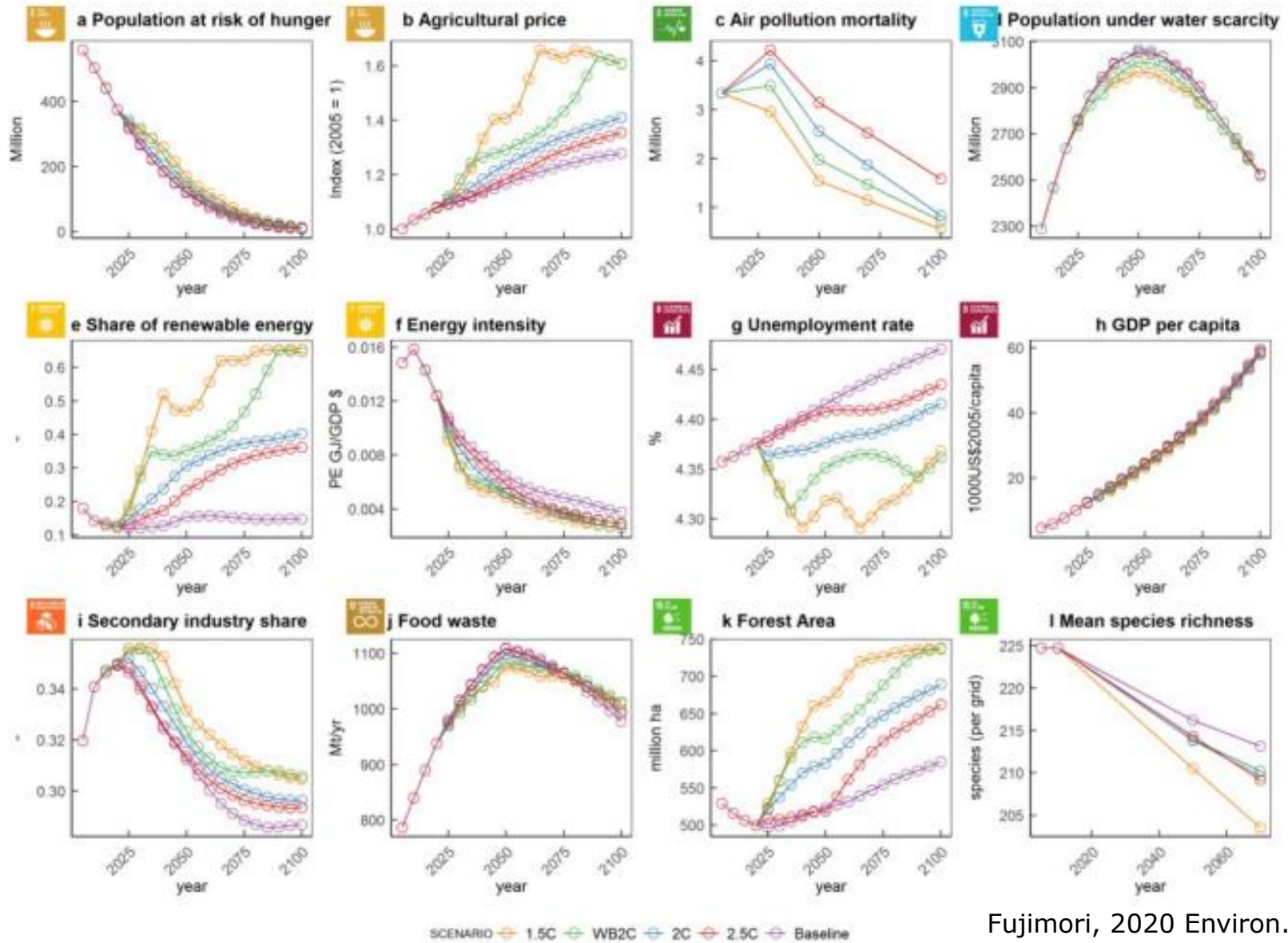


Energy Model Structures and SD

- Energy models are structured around technologies and systems - SDG7 energy access and costs can directly be modelled
- Indirect impacts on e.g. health (airpollution), and energy for education, health clinics, industry etc can also be assessed
- Energy modelling studies have to be supplemented with studies on other sustainable development issues - e.g. land use models
- Socioeconomic sustainability include human and society centric aspects - e.g. development studies on energy access and income generation

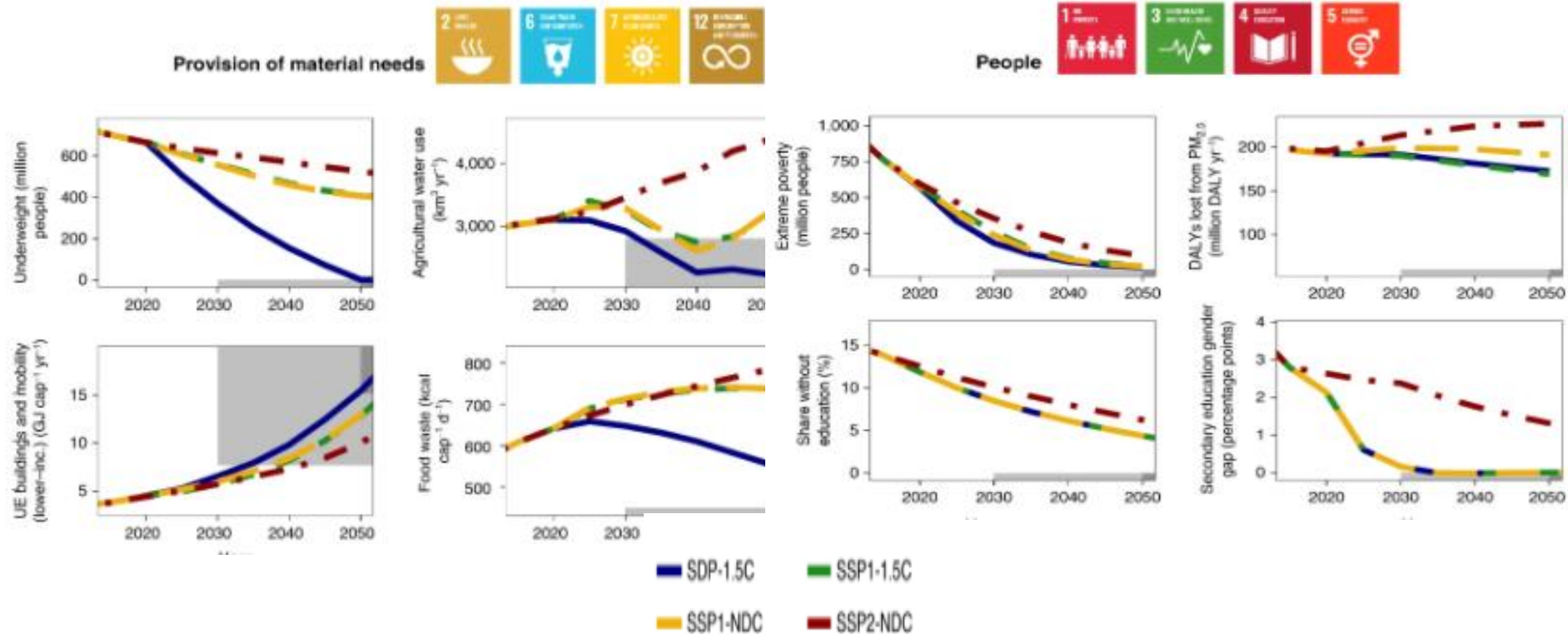


SDG Energy Modelling Results



Fujimori, 2020 Environ. Res. Lett. 15 (2020) 085004
10-05-2017

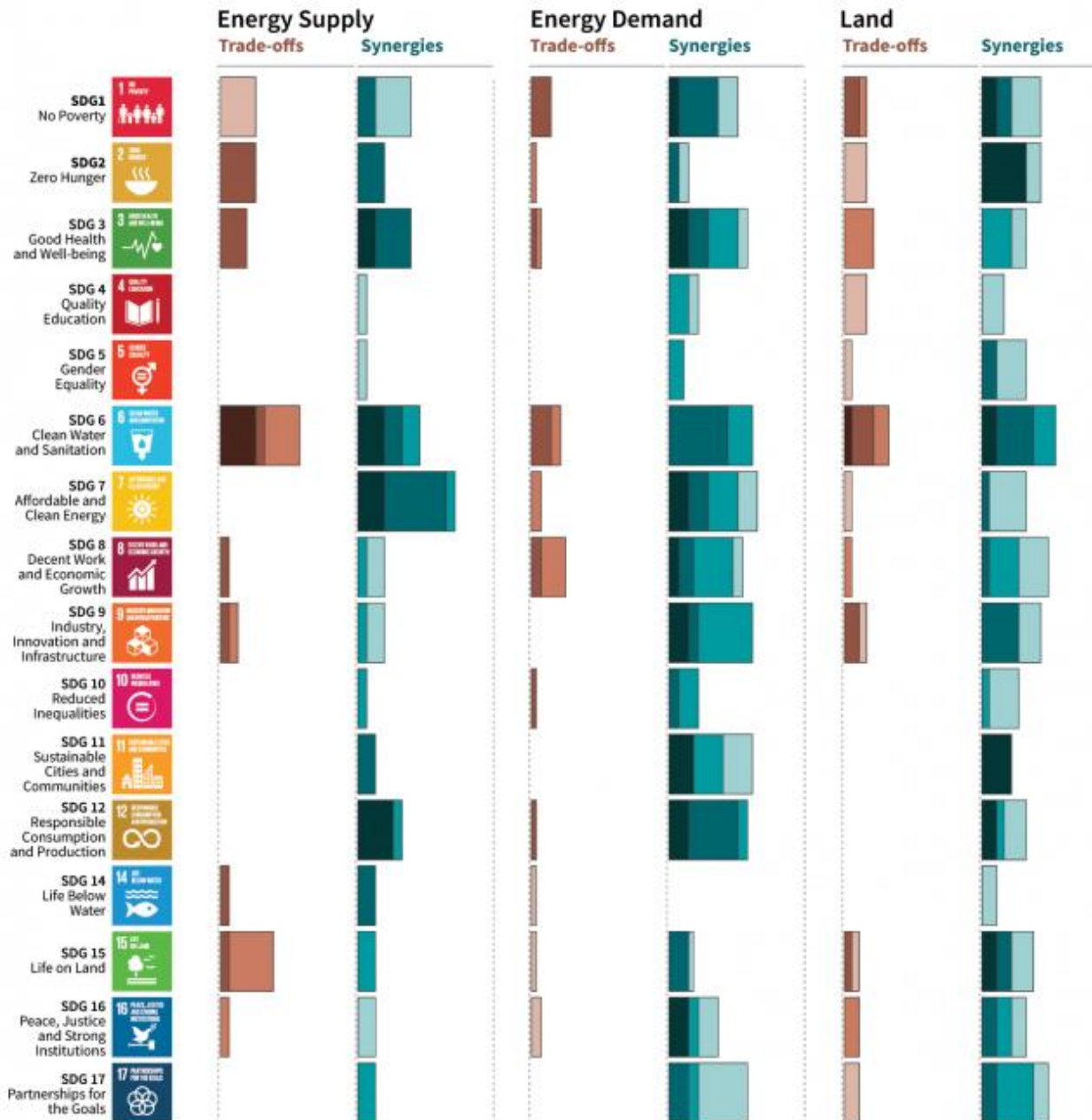
SDG Energy Modelling Results



Soergel, B. et al., 2021a: A sustainable development pathway for climate action within the UN 2030 Agenda. *Nat. Clim. Chang.*, **11**(8), 656–664, doi:10.1038/s41558-021-01098-3.

SDG Energy Modelling Results

IPCC 1.5
report

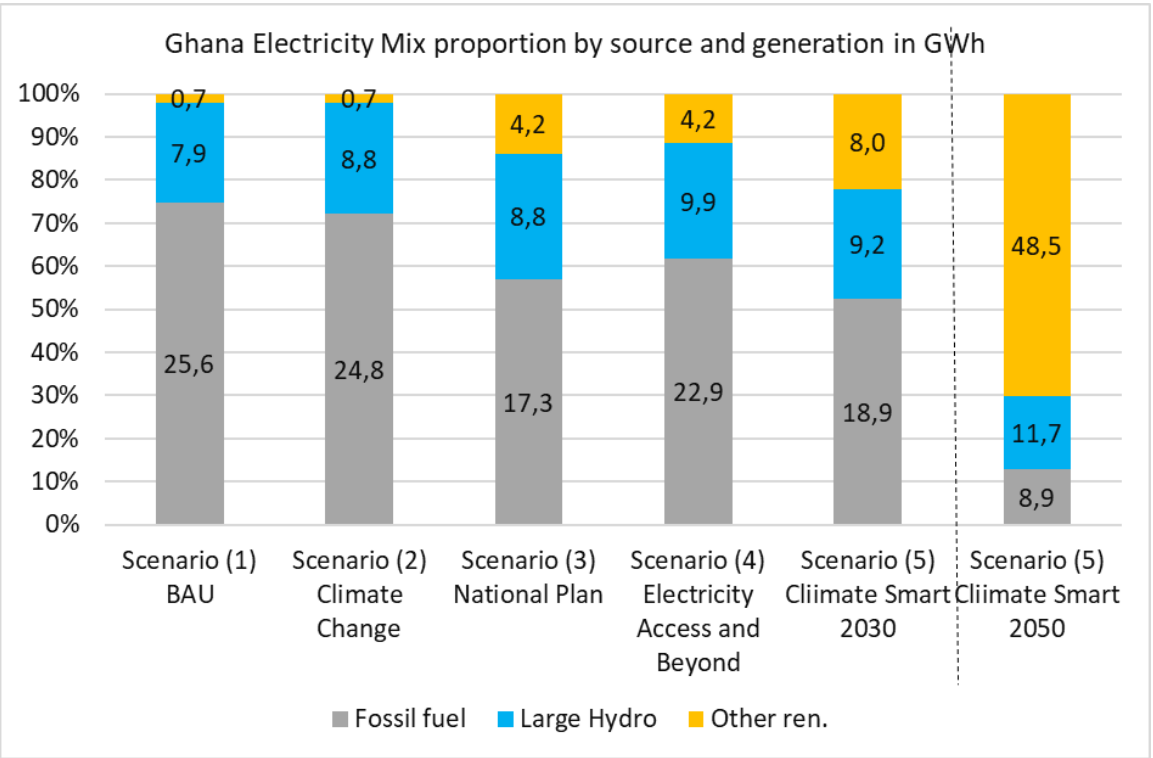
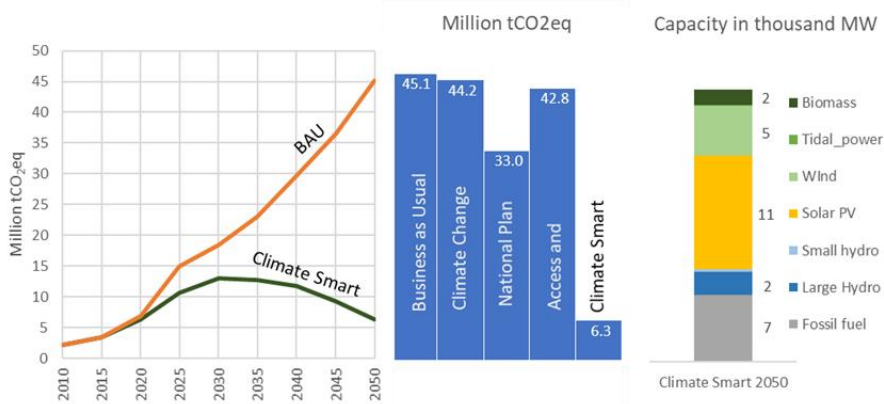


General Model Conclusions

- There are **tradeoffs** between some energy supply options and landuse related to bioenergy crops, renewable energy facilities etc
- **Tradeoffs** on water demand for energy and agriculture
- **Tradeoff SDG's**: No poverty, zero hunger, biodiversity etc
- **Synergies** are related to no poverty, education, health, industry etc
- Large agreement across modelling studies



Renewable Energy Study for Ghana



Energy Access in Poor Ghana Regions

What is the most used source of electricity in your household pct. share	Northern	Upper East	Upper West
National grid	53,5	42,2	56,0
Local Mini grid	0,0	0,0	0,8
Private generator	0,1	0,0	0,0
Solar home system	0,6	0,8	0,3
Solar lantern/Lighting	0,4	5,8	0,1
Rechargeable battery	2,2	5,9	0,3
Other	0,3	0,0	0,0
No electric power	43,0	42,5	42,5

Power supply of households in Ghana in the Northern, Upper East and Upper West Regions in 2017 based on GLSS 7

	Northern	Upper East	Upper West
Grid is too far away	68,2	39,0	37,4
Cost of electricity connection	12,7	18,3	15,7
Monthly fee is too high	3,1	4,6	5,2
Satisfied with current connection	0,7	0,0	0,2
Landlord decision	0,2	0,0	0,0
Service unreliable	0,4	7,3	5,0
Administrative procedures	3,3	1,2	11,9
Company refused to connect	4,8	11,7	10,5
Other	6,8	17,9	14,1

Main reasons for not being connected to the main grid, percentage shares in the Northern, Upper East, and Upper West regions of Ghana (GLSS 7)

SDG Measures in LDC's

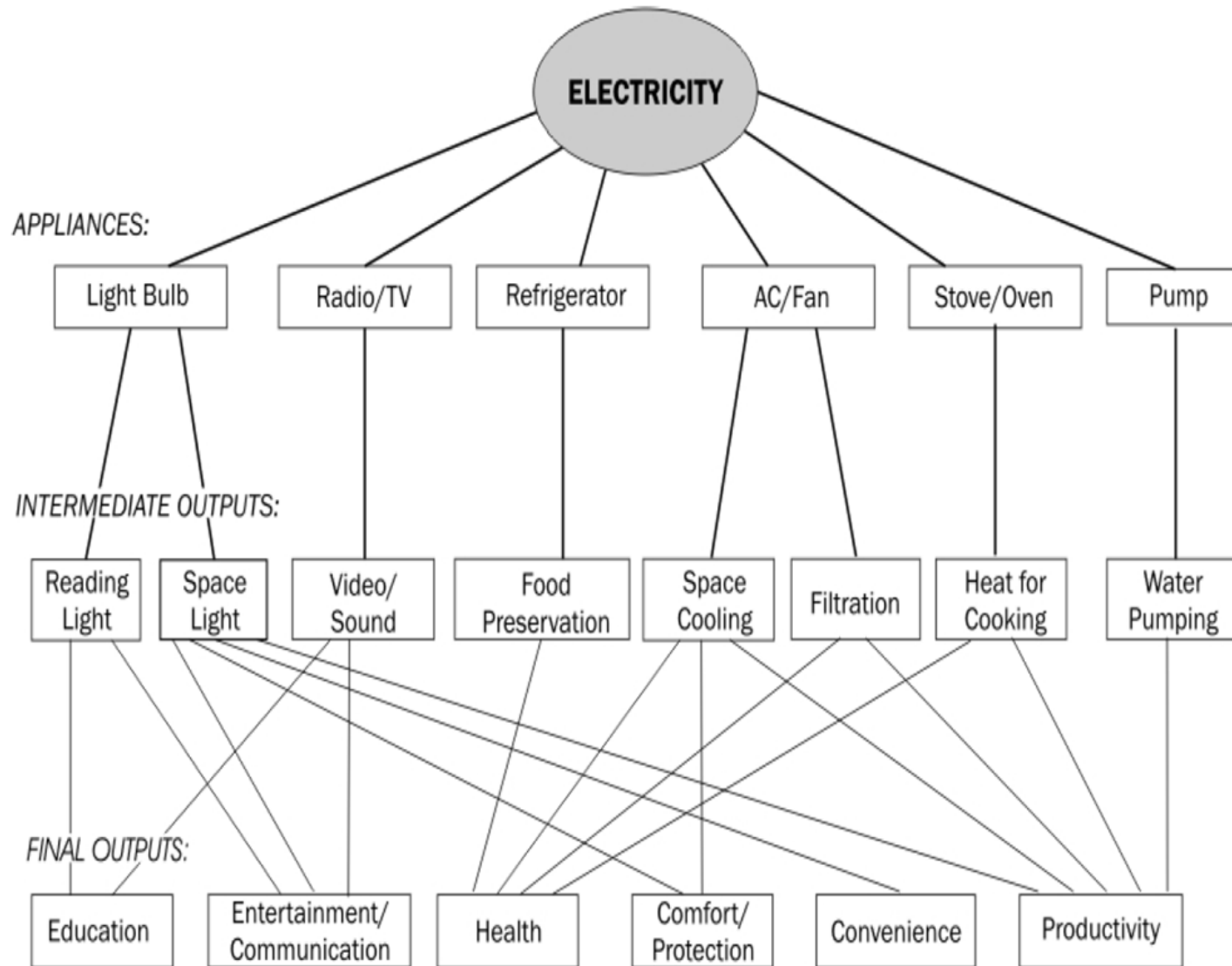


- Energy demand - willingness and ability to pay
- Quantity and type of energy supplied:
 - Energy supply reliability (renewable versus other sources)
 - Costs and affordability issues (renewable versus other sources)
- Water-food-energy tradeoffs and synergies:
 - Irrigation, pumping, drinking water
 - Land use for biomass
- Income generation associated with:
 - Energy for production
 - Energy for water: pumping, irrigation
 - Profit of energy companies and services
 - Ownership / cost-benefit sharing models for local energy supply
- Access to the markets: Prices, business opportunities, information, internet
- Education:
 - Lighting for reading
 - Time savings and childrens' school attendance
- Health:
 - Pollutants, Work quality
 - Health clinics

Focal Areas for Energy SD Studies

- Common conclusions: land use conflicts, energy and food access, employment, costs, biodiversity
- Green finance play a key role in meeting low stabilization targets
- More complete assessment of costs and benefits are needed to promote investments
- Assessments in low income countries are particularly challenging in order to access development energy access links
- Standardized framework could be an option to support renewable investments by ODA's, MDB's, and private investors
- Support methodology development and applications by local institutions
- Other important issues of concern include stranded assets and just transition





WB P
study