

The potential power of different levels of energy access to reduce poverty, improve health, education and gender equality

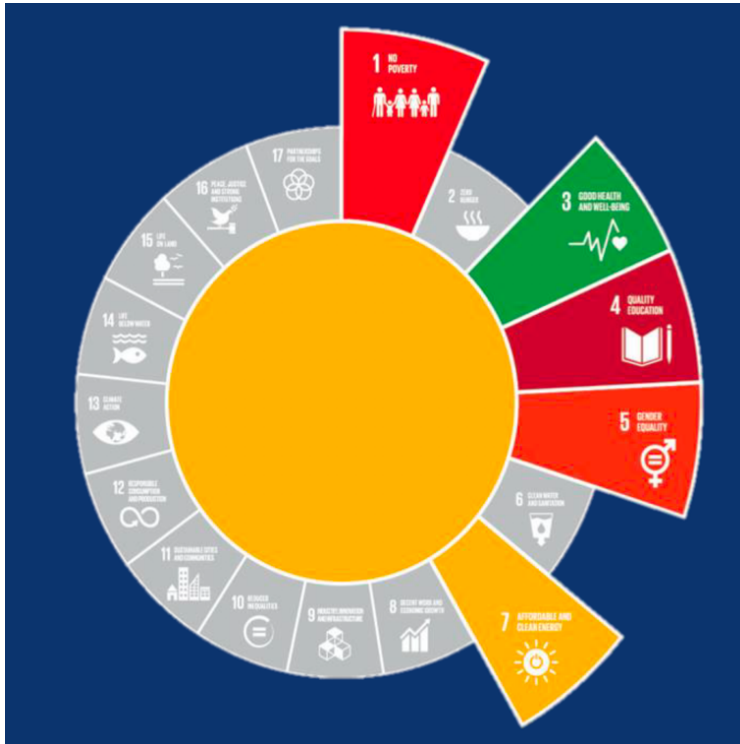
Energy Evaluation Europe

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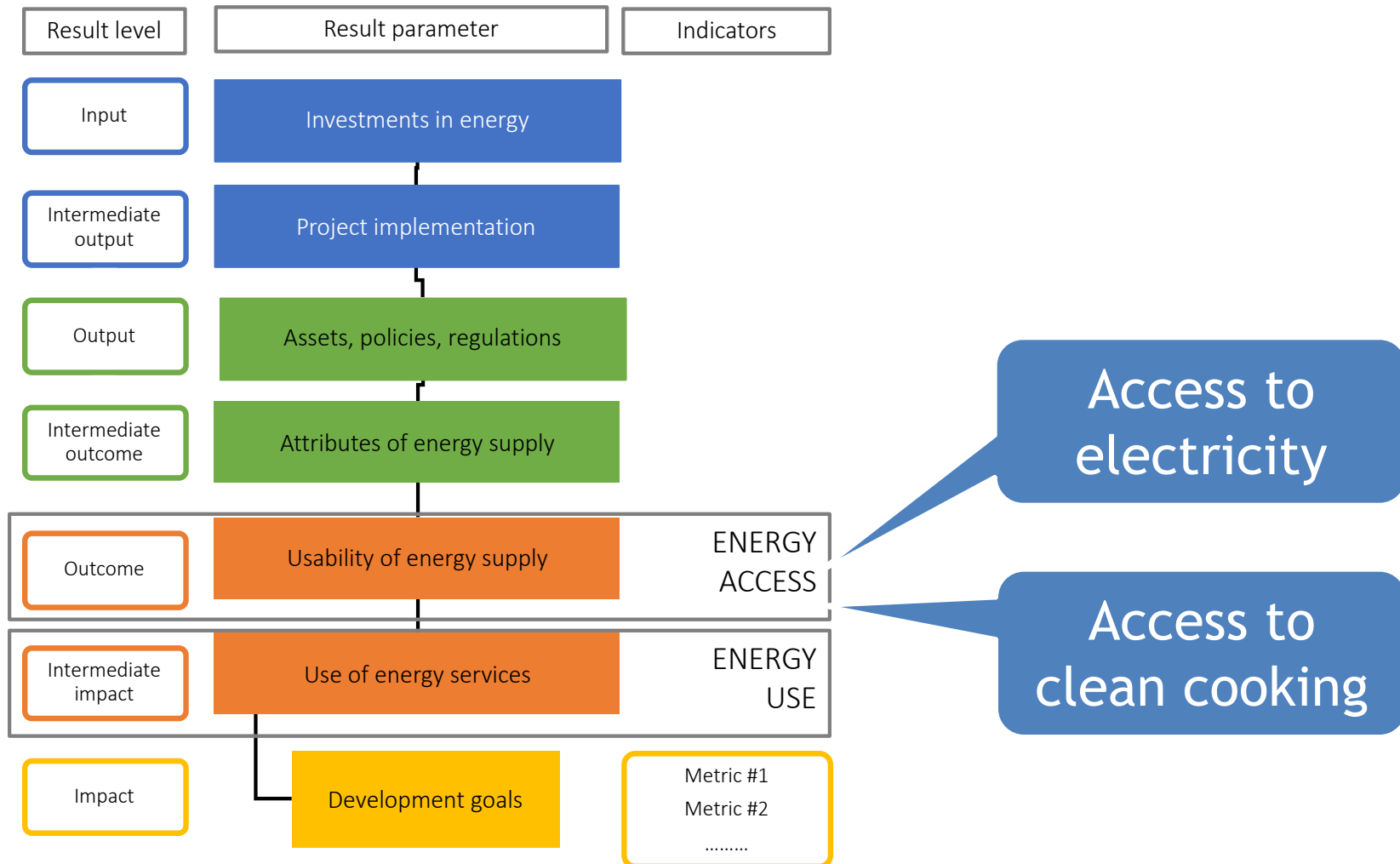
Four SDG's directly SDG 7 “Access to affordable and clean energy”



Project objectives & approach

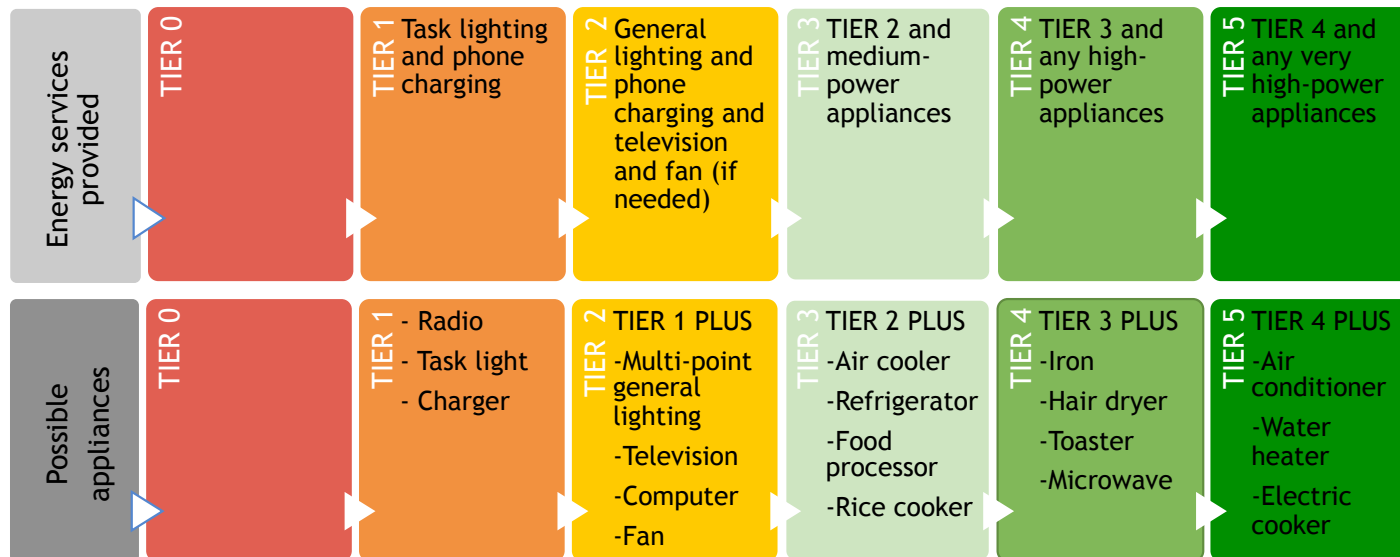
- Objectives
 - Provide indication on the degree of social and economic benefits that can be observed for different types of energy access projects.
 - Develop a 'scoring' tool to be used by project managers, for a straightforward scoring of social and economic benefits
- Approach
 - Stock taking literature review of approaches and actually reported impacts
 - Processing and summarizing results into the developed scoring tool

Impact pathways of energy access projects



Categorization of levels of access to electricity

	TIER 0	TIER 1	TIER 2	TIER 3	TIER 4	TIER 5
Capacity	No electricity	Min 3 W	Min 50 W	Min 200 W	Min 800 W	Min 2000 W
Availability (hours/day)		Min 4		Min 8	Min 16	Min 23
Availability (hours/evening)		Min 1	Min 2	Min 3	Min 4	
Reliability					Max 14 disruptions per week	Max 3 disruptions per week of total duration < 2 hours
Quality					Voltage problems do not affect use of desired appliances	
Affordability				Cost of standard consumption package of 365 kWh/year < 5% of household income		
Legality					Legal payment of bill demonstrated	
Health and safety					Absence of accidents	



Scoring of literature findings on social and economic impact of access to electricity (1/2)

- (0) No benefit
 (1) Small benefit, compared with tier 0
 (2) Moderate benefit, compared with tier 0
 (3) Significant benefit, compared with tier 0

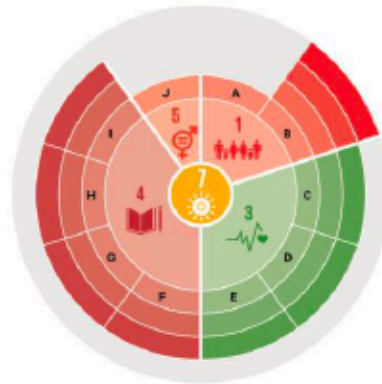
			TIER 1	TIER 2	TIER 3	TIER 4	TIER 5
			Task lighting and phone charging	General lighting and television and fan	TIER 2 and any medium-power appliances	TIER 3 and any high-power appliances	TIER 4 and any very high-power appliances
#SDG	Metric	Indicator	Indication of the degree of the benefits, compared with TIER 0				
No poverty (SDG 1)	Increase in economic activity	Household income Employment, male and female No. of new firms/year	0	0	1	2	3
	Decrease in expenditure on lighting	Expenditure on lighting	2	3	3	3	3
Good health & well-being (SDG 3)	Decrease in indoor air pollution due to access to clean lighting	Carbon monoxide concentration PM _{2.5} concentration	1	2	3	3	3
	Decrease in occurrence of diseases related to indoor air pollution due to access to clean lighting	Occurrence of respiratory disease symptoms Occurrence of eye infections Averted DALYs	1	2	3	3	3
	Decrease in number of accidents with lighting	Occurrence of burn accidents Occurrence of electrocution accidents	1	2	2	3	3
Quality education (SDG 4)	Additional time spent on homework	Hours/day	1	2	2	3	3
	Increase in number of children finishing school	No. of children finishing school/year	1	2	2	3	3
	Increase in education level	Years at school	1	2	2	3	3
	Increase in school enrolment	No. of children enrolling in school/year	1	2	2	3	3
Gender equality (SDG 5)	Increase in time for activities other than household chores	Additional hours/day available for other activities	0	0	1	2	3

Scoring of literature findings on social and economic impact of access to electricity (2/2)

TIER 1: Task lighting and Phone Charging



TIER 2: General lighting and Television and Fan



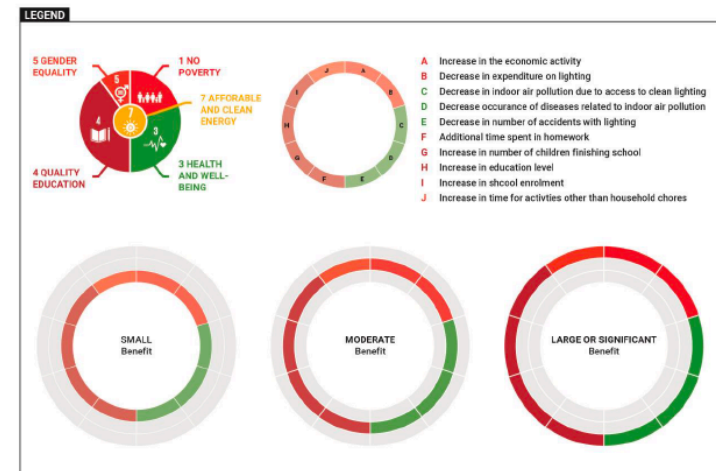
TIER 3: Tier 2 + Medium Power Appliances



TIER 4: Tier 3 + Any High-Power Appliances



TIER 5: Tier 4 + Any very High-Power Appliances



Categorization of levels of access to clean cooking

	TIER 0	TIER 1	TIER 2	TIER 3	TIER 4	TIER 5
Availability of primary fuel	Availability inadequate				Available at least 80% of the year	Available all year
Quality of primary fuel: Variations in heat rate that affects ease of cooking	Low quality				High quality	
Affordability	Primary solution not affordable				Levelized cost < 5% of household income	
Convenience: Fuel acquisition & preparation time (hours/week)			< 7	< 3	< 1.5	< 0.5
Convenience: Stove preparation time (minutes/meal)			< 15	< 10	< 5	< 2
Health and safety	Self-made stove	Manufactured stove	Biogas/LPG/electricity/natural gas stoves			

	TIER 0	TIER 1	TIER 2	TIER 3	TIER 4	TIER 5
		IMPROVED SOLUTIONS		CLEAN-COOKING SOLUTIONS		
Cookstove classification		LEGACY & BASIC IMPROVED COOKSTOVE	INTERMEDIATE IMPROVED COOKSTOVE	ADVANCED IMPROVED COOKSTOVE	MODERN FUEL STOVES	RENEWABLE FUEL STOVES
Key features		Small improvements in efficiency over tier 0	Rocket style designs with highly improved fuel efficiency and moderate gains in combustion efficiency; some with high-end materials	Fan jet or natural draft biomass gasifiers with very high fuel and combustion efficiencies; may require pellet/ briquette fuel	Rely on fossil fuels or electricity, have high fuel efficiency, and very low particulate emissions	Derive energy from renewable nonwood fuel energy sources; some are supplementary rather than primary cookstoves
Typical technologies /fuels		<ul style="list-style-type: none"> Legacy biomass and coal chimney Basic efficient charcoal Basic efficient wood 	<ul style="list-style-type: none"> Portable rocket stoves Fixed rocket chimney Highly improved (low CO2) charcoal stoves 	<ul style="list-style-type: none"> Natural draft gasifier Fan gasifier/ fan jet TChar stoves 	<ul style="list-style-type: none"> LPG and DME Electric and induction Natural gas Kerosene 	<ul style="list-style-type: none"> Biogas Ethanol Methanol Solar ovens Retained heat cookers

Scoring of literature findings on social and economic impact of access to clean cooking (1/2)

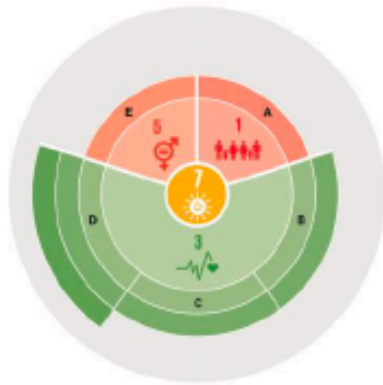
- (0) No benefit
 (1) Small benefit, compared with tier 0
 (2) Moderate benefit, compared with tier 0
 (3) Significant benefit, compared with tier 0

TIER 1	TIER 2	TIER 3	TIER 4	TIER 5
Legacy and basic improved cookstoves	Intermediate improved cookstoves	Advanced improved cookstoves	Modern fuel stoves	Renewable fuel stoves

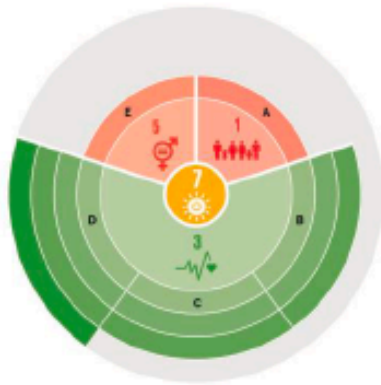
#SDG	Metric	Indicator	Indication of degree of benefit, compared to TIER 0				
No poverty (SDG 1)	Increase in economic activity	Female employment rate	0	0	1	2	3
		Increase in household income					
Good health & well-being (SDG 3)	Decrease in indoor air pollution due to access to clean cooking	Carbon monoxide concentration PM _{2.5} concentration	1	2	3	3	3
	Decrease in occurrence of diseases related to indoor air pollution due to access to clean cooking	Occurrence of respiratory disease symptoms Occurrence of eye infections Averted DALYs	1	2	3	3	3
	Decrease in number of accidents with cooking	Occurrence of accidents	2	3	3	3	3
Gender equality (SDG 5)	Increase in time for activities other than household chores	Decrease in time for fuel collection	0	0	0	2	3

Scoring of literature findings on social and economic impact of access to clean cooking (2/2)

TIER 1: Legacy and Basic Improved Cookstoves



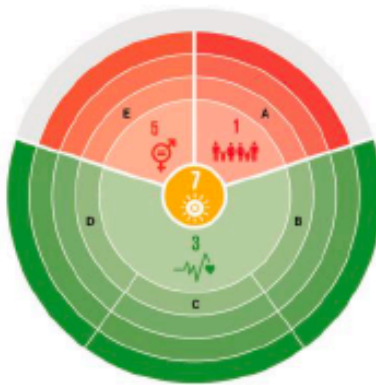
TIER 2: Intermediate Improved Cookstoves



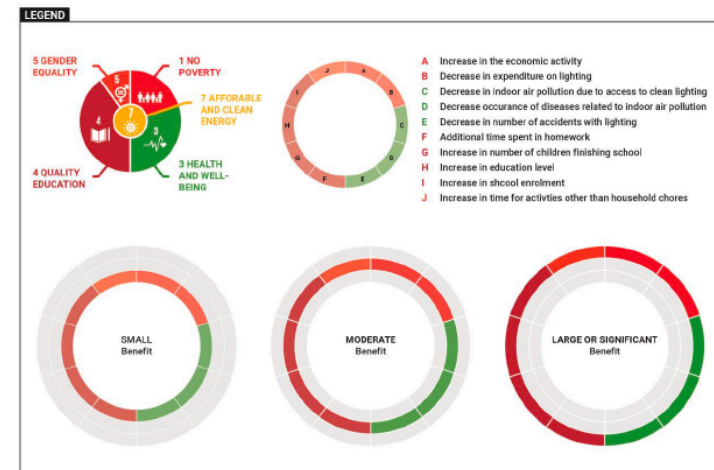
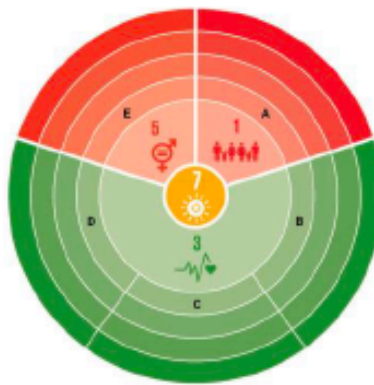
TIER 3: Advanced Improved Cookstoves



TIER 4: Modern Fuel Stoves



TIER 5: Renewable Fuel Stoves



How does this help project managers in monitoring impact of their projects?

- Radar chart offer basis scoring tool for social and economic impacts when level of energy access is know

Approaches	
Simple	<ul style="list-style-type: none"> • Basic scoring: Apply basic scoring—four levels—based on observed social and economic benefits in the academic and grey literature for different levels of access to electricity and clean-cooking solutions.
	<ul style="list-style-type: none"> • Rule of thumb: Combining observed quantified impact factors (resulting from projects executed in divergent circumstances) reported in academic and grey literature with project data.
	<ul style="list-style-type: none"> • Surveys: Gathering data through surveys that can range from basic surveys, with a limited number of questions, to detailed surveys for scoring the baseline situation and project outcomes.
Advanced	<ul style="list-style-type: none"> • Modelling: Apply models to, for example, assess economic or health benefits.
	<ul style="list-style-type: none"> • Measurements: Apply measurements, for example, to determine level of indoor air pollution.

Conclusions

- Literature findings: there is a strong relationship between the level (or “tier”) of access electricity and clean cooking and the expected impact on SDG1, SDG3, SDG4 and SDG5, although the impact will show in different ways.
- Developed basic scoring approach developed is useful in:
 - Identifying the type and size of social and economic benefits associated with energy-access projects and
 - Identifying activities that need to be incorporated into the project plan to gather data to monitor relevant metrics.