IRENA
International Renewable Energy Agency

UN environment programme

GLOBAL GEOTHERMAL ALLIANCE

POWERING AGRI-FOOD VALUE CHAINS WITH GEOTHERMAL HEAT

MEASURING SOCIOECONOMIC IMPACTS AND ASSESSING SOCIOECONOMIC BENEFITS

CAPACITY BUILDING EVENT – AFRICA WEBINAR

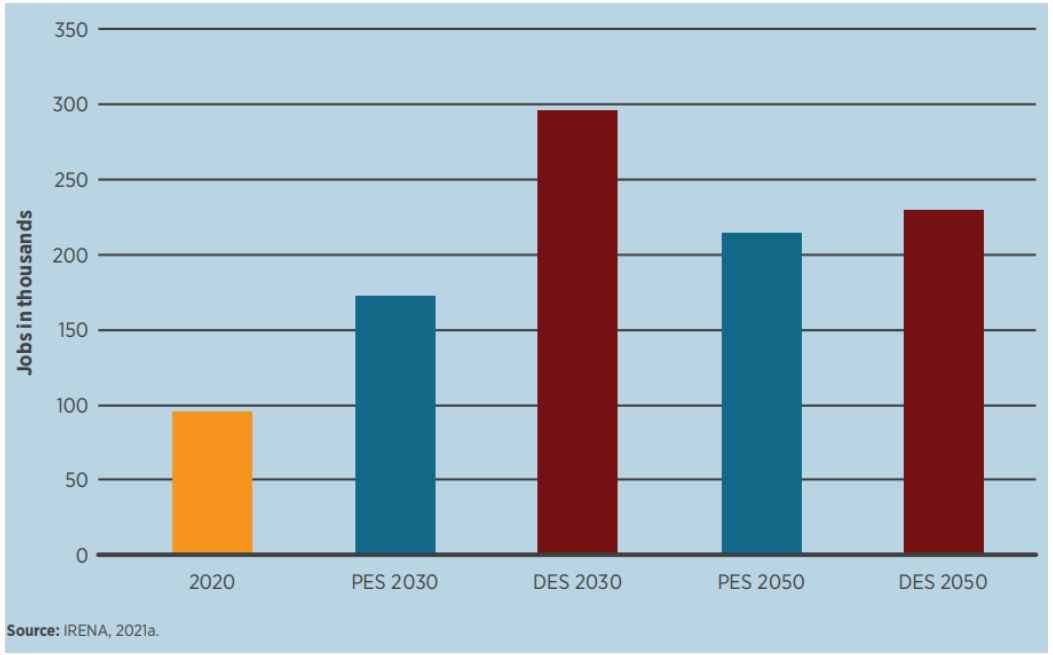
JULY 19, 2022

GreenMax Capital Advisors

Assessing socioeconomic impacts of geothermal direct use in agri-food value chains

- ✓ Incorporation of geothermal direct use into an agri-food application impacts a diverse group of stakeholders along the agri-food value chain, encompassing investors, developers, farmers, local authorities, local communities, households and individuals.
- ✓ **Semi-quantitative methodology** to incorporate socio-economic factors into business cases.
- ✓ Inform policy makers of non-financial benefits from integrating geothermal energy in agri-food value chains.
- ✓ Determine net impact of monetised and non-monetised socio-economic indicators of benefits and costs of implementing geothermal direct use projects in the agri-food sector.
- ✓ Useful tool for businesses to measure non-financial metrics such as social and environmental aspects (e.g., job creation).

Geothermal jobs growth projections to 2030 and 2050



Source: IRENA, 2021a.

Methodology for assessing the socio-economic benefits of geothermal applications in the agri-food sector

INVESTA Cost-benefit Analysis Methodology

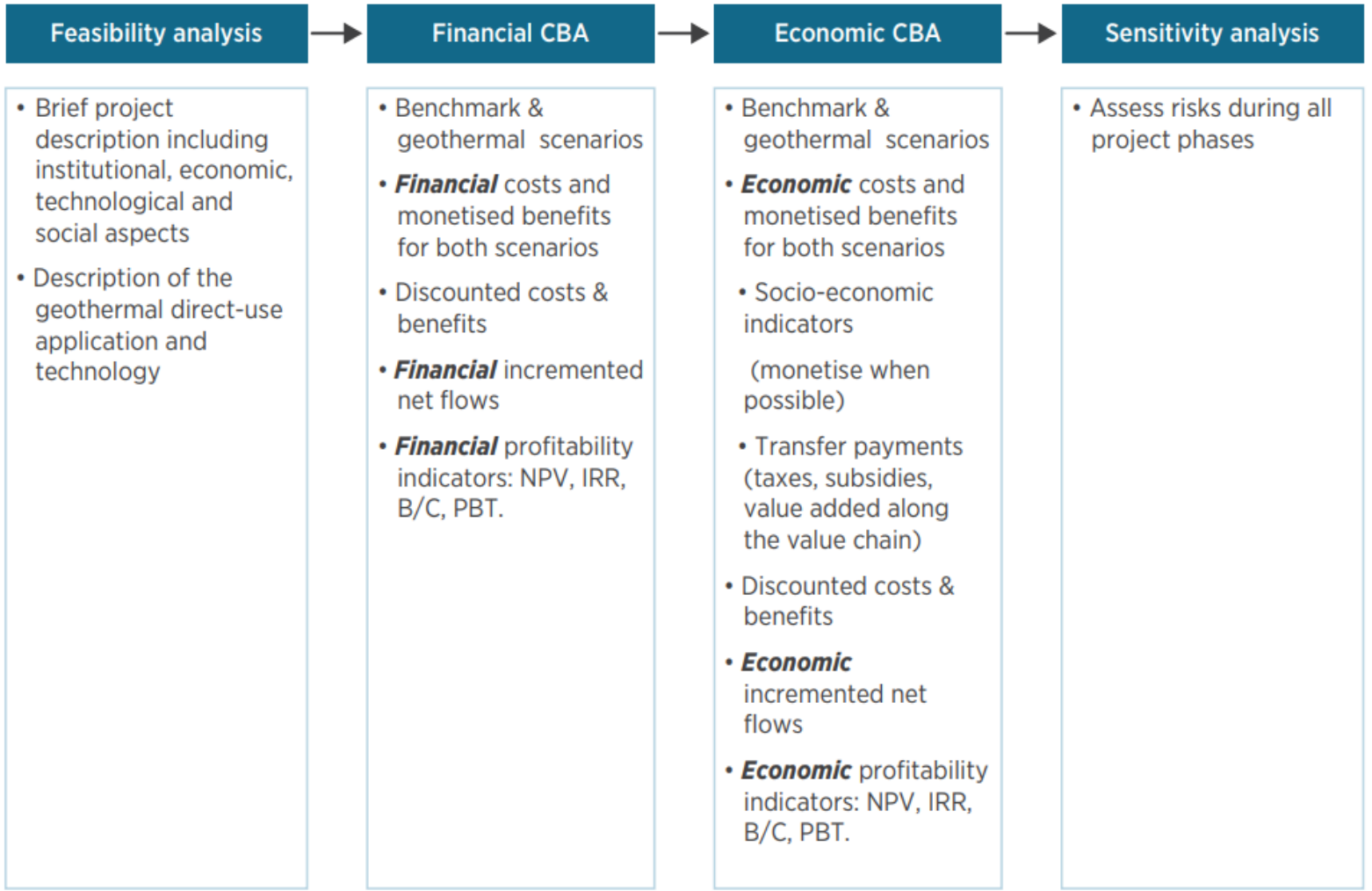
- ✓ Feasibility analysis of the renewable energy technology
- ✓ Financial analysis to assess financial profitability
- ✓ Economic analysis that monetises socio-economic benefits and costs to assess economic profitability
- ✓ Sensitivity analysis of project risks and uncertainties

Cost-benefit analysis (CBA) methodology developed by the FAO and GIZ through the project Investing in Sustainable Energy Technologies in the Agri-food Sector (INVESTA) provides a framework that is adapted and applied to geothermal direct-use technologies in agri-food value chains

- ✓ Feasibility, financial, economic and sensitivity analysis
- ✓ 5-step financial and economic CBA
- ✓ Identify socioeconomic indicators for geothermal direct-use agri-foods projects
- ✓ Evaluate socio-economic impacts to determine costs and benefits

Measuring socioeconomic impacts and assessing socioeconomic benefits

- ✓ Financial and economic CBA are at the centre of the methodology. Both have same steps; however, the economic analysis considers the social impacts of transfer payments and socioeconomic indicators.
- ✓ Whereas the financial analysis focuses on the attractiveness of the investment from the enterprise's perspective, the economic analysis focuses on the attractiveness of the investment from the point of view of society.



Adapted from FAO and GIZ 2018.

Measuring socioeconomic impacts and assessing socioeconomic benefits

The **financial analysis** assesses the **profitability** and **sustainability** of an investment at the project level; project viability is assessed from the perspective of the investor, entrepreneur, farmer or food processor. The objective is to determine the financial returns to project stakeholders.

Financial analysis

Step 1	Step 2	Step 3	Step 4	Step 5
Identify the fossil fuel benchmark scenario and geothermal energy scenario	Identify ***financial*** costs (e.g., CAPEX, OPEX) monetised benefits (e.g., income, tax reductions, subsidies, incentives) for both scenarios	Select an appropriate discount rate to calculate net discounted benefits.	Calculate ***financial*** incremental net flows from discounted costs and benefits of geothermal energy in relation to the benchmark scenario	Calculate ***financial*** profitability indicators to support an investment decision: NPV, IRR, BCR, PBT

The **economic analysis** assesses the **feasibility** of a project from the perspective of a local, regional or national economy. The project is assessed in terms of its contribution to society. The economic analysis provides a means to identify and quantify the impacts of the project on the economy, society and environment.

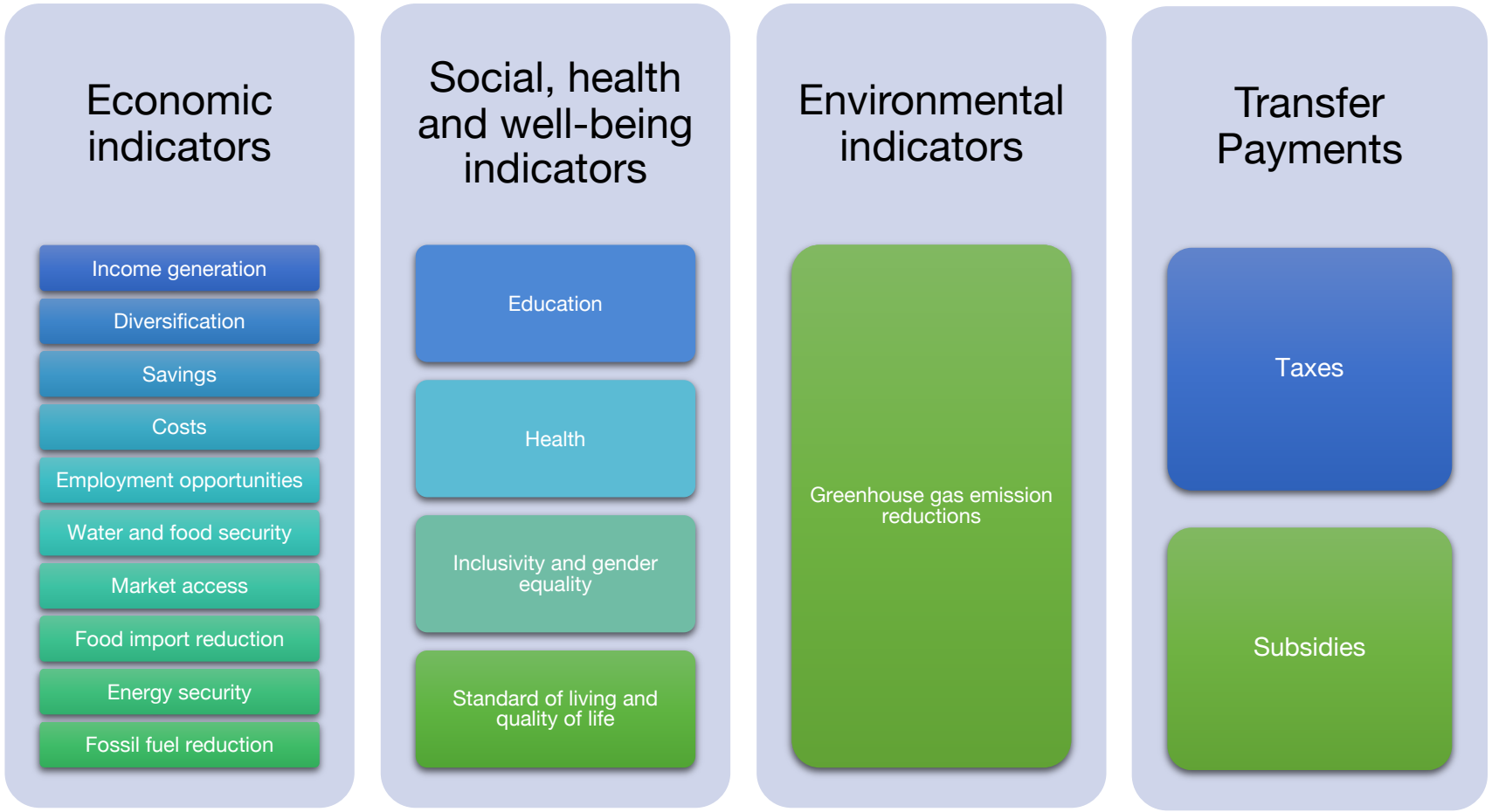
Economic analysis

Step 1	Step 2	Step 3	Step 4	Step 5
Identify the fossil fuel benchmark scenario and geothermal energy scenario	Identify ***economic*** costs and benefits for both scenarios: *- Socio-economic indicators* *- Transfer payments* (e.g., subsidies, taxes)	Select an appropriate discount rate to calculate net discounted benefits.	Calculate ***economic*** incremental net flows from discounted costs and benefits of geothermal energy in relation to the benchmark scenario	Calculate ***economic*** profitability indicators to support an investment decision: NPV, IRR, BCR, PBT

Adapted from FAO and GIZ (2018)

Measuring socioeconomic impacts and assessing socioeconomic benefits

Classification and description of socio-economic indicators & transfer payments



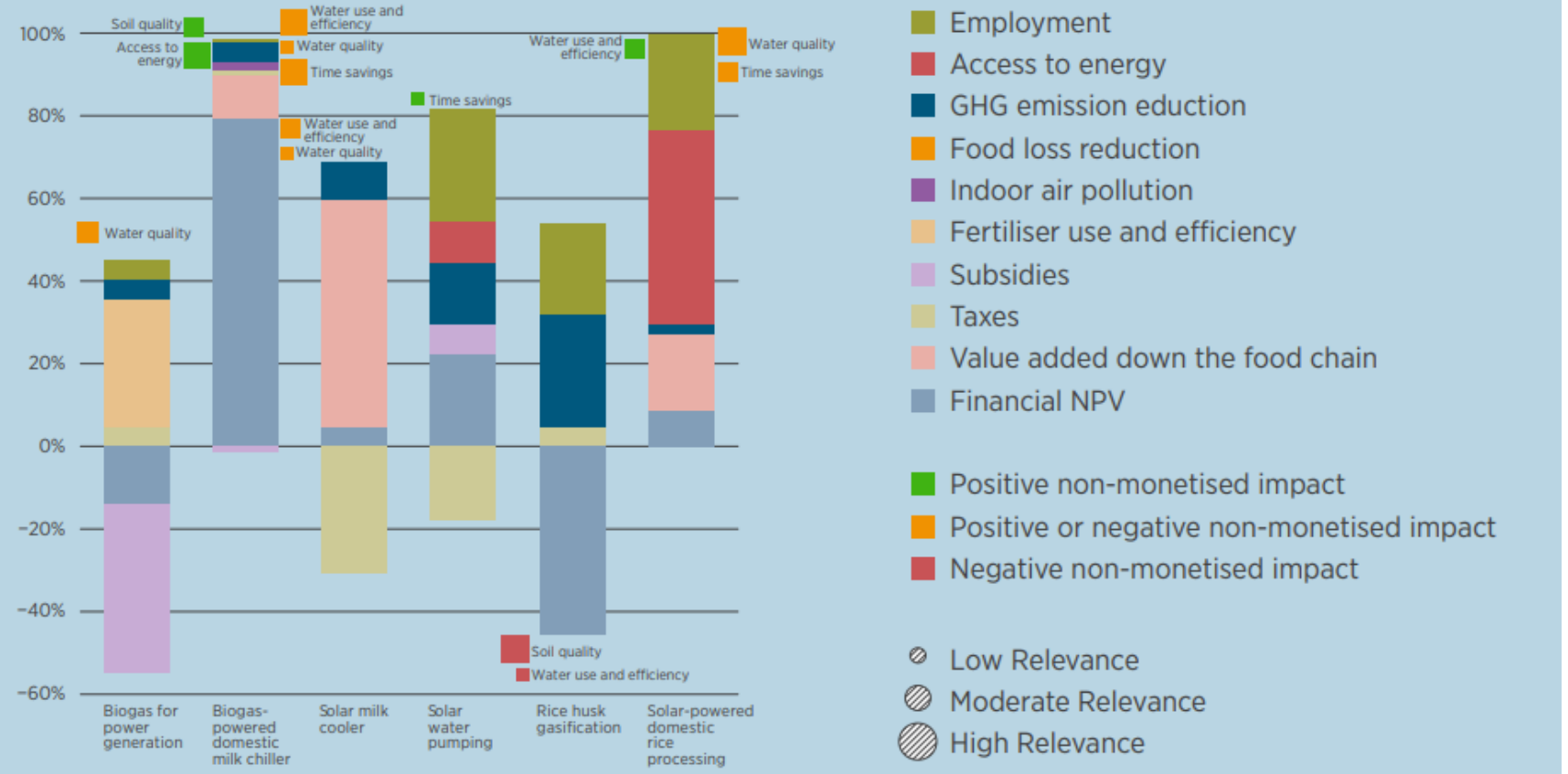
Each geothermal direct-use agri-food project has its own unique combination of **economic**; **social**, **health** and **well-being**; and **environmental** benefits and costs to all project stakeholders: investors, developers, farmers, local authorities, local communities, households and individuals.

Measuring socioeconomic impacts and assessing socioeconomic benefits

Socio-economic indicators must be quantified, wherever possible, to be included in numerical terms in economic

Indicators	Description	Monetisable (Yes/No)	Unit of measurement	Meets SDG
Economic	Revenue: Productivity increase	Yes	Price of a kilogram or litres of food or agricultural products	SDG 1: End Poverty
	Revenue: "Green" branding of produce	Yes	Price difference between "green" products and their market alternatives	SDG 2: End Hunger
	Revenue: Prevention of post-harvest losses	Yes	Price of a kilogram/litre of food saved	SDG 7: Affordable and Clean Energy
	Diversification: New marketable products	Yes	Price of a kilogram or litre of product	
	Diversification: Sale of thermal energy	Yes	Price of a unit of thermal energy	
	Savings: Reduced use of pesticides & fungicides in food production	Yes	Hard or local currency	SDG 8: Sustainable Economic Growth
	Savings: Potentially lower energy cost than fossil fuel	Yes	Difference in cost of geothermal heat and cost of fossil fuel	
	Costs: Wages and salaries	Yes	Hourly wage, monthly or annual salary	
	Costs: Retrofitting	Yes	Hard or local currency	
	Employment opportunities	Yes	Number of jobs created	
	Water and food security: Water for irrigation	Yes	Volume of water generated	
	Water and food security: Increased productivity	Yes	Additional kilograms of food produced	
	Water and food security: Increased efficiency of food production	Yes	Additional kilograms of food produced/area/year	
	Water and food security: Reduced food spoilage	Yes	Kilograms of food saved from spoilage	
	Household income	Yes	Average change in the income of employees	
	Time saving	Yes	Human hours	
	New businesses and expanded market access	Yes	Monetary value generated	
	Reduced import bill for food	Yes	Hard or local currency	
	Energy security	No	Non-monetisable	
	Reduced import bill for fossil fuels	Yes	Hard or local currency	
Social, health and well-being	Education	No	Non-monetisable	SDG 4: Quality Education
	Health	No	Non-monetisable	SDG 3: Health and well-being
	Inclusivity and gender equality	No	Non-monetisable	SDG 5: Gender Equality
	Standard of living and quality of life	No	Non-monetisable	SDG 3: Health and Well-Being
Environmental	Greenhouse gas emissions and pollution reductions	Yes	Kilograms of CO_2 equivalent or kilograms of CO_2 equivalent per kilogram of product	SDG 13: Climate Action

Measuring socioeconomic impacts and assessing socioeconomic benefits



Source: FAO and GIZ, 2018.

INVEST example of net impact of monetised and non-monetised socio-economic indicators of benefits and costs across six renewable energy case studies. In four of the six case studies, the economic benefits outweigh the economic costs, and in two of the case studies the economic benefits and costs are similar, with roughly zero net impact.

Socio-economic indicators with positive impacts = **benefits**.
Socio-economic indicators with negative impacts = **costs**.

Most indicators have positive impacts and are therefore considered benefits; however, some indicators can have either positive or negative impacts

THANK YOU!