

Chapter 12

Annex



12.1 Annex 1: Definition of the Tiers of the Multitier Framework (MTF) Initiative

Multitier matrix for access to household electricity

	Tier 0	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5
Power capacity	–	Min 3 W	Min 50 W	Min 200 W	Min 800 W	Min 2 kW
AND daily capacity	–	Min 12 Wh	Min 200 Wh	Min 1 kWh	Min 3.4 kWh	Min 8.2 kWh
Services	–	Task lighting and phone charging	General lighting and phone charging and television and fan (if needed)	Tier 2 and any medium-power appliances	Tier 2 and any high-power appliances	Tier 2 and very high-power appliances
Duration (hours per day)	–	Min 4 h	Min 4 h	Min 8 h	Min 16 h	Min 23 h
Duration (hours per evening)	–	Min 1 h	Min 2 h	Min 3 h	Min 4 h	Min 4 h
Reliability	–	–	–	–	Max 14 disruptions per week	Max 3 disruptions per week of total duration < 2 h

Source Authors' elaboration, based on ESMAP (2015)

Multitier matrix for access to clean cooking solutions

	Tier 0	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5
ISO's performance targets (default ventilation) PM2.5 (mg/MJ d)	>1030	Max 1030	Max 481	Max 218	Max 62	Max 5
ISO's performance targets (default ventilation) CO (g/MJ d)	>18.3	Max 18.3	Max 11.5	Max 7.2	Max 4.4	Max 3
Cookstove efficiency	Max 10%	>10%	>20%	>30%	>40%	>50%
Convenience—fuel acquisition and preparation time (h/week)	–	–	<7	<3	<1.5	<0.5
Convenience—stove preparation time (min/meal)	Min 15	Min 15	<15	<10	<5	<2

Source Authors' elaboration, based on ESMAP (2015)

12.2 Annex 2: Population With Access to Electricity and Clean Cooking In African Countries

Countries	Population with access to electricity (2019) (%)	Population with access to electricity—urban areas (2019) (%)	Population with access to electricity—rural areas (2019) (%)	Population with access to clean cooking (2018) (%)
Algeria	>99	>99	96.7	91.7
Egypt	>99	>99	>99	>95
Libya	>99	>99	>99	>95
Morocco	>99	>99	>99	>95
Tunisia	>99	>99	>99	>95
Cameroon	69.8	98.3	32.2	24.7
Central African Republic	3.1	6.6	<1	<5
Chad	8.5	32.3	1.2	6.6
Congo	71.9	89.1	36.6	26.4
DR Congo	8.7	19.0	<1	<5
Equatorial Guinea	66.7	74.8	45.2	36.5
Gabon	92.4	98.5	38.5	80.2
Burundi	10.9	66.2	2.3	<5
Djibouti	42.2	54.1	<1	12.7

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Countries	Population with access to electricity (2019) (%)	Population with access to electricity—urban areas (2019) (%)	Population with access to electricity—rural areas (2019) (%)	Population with access to clean cooking (2018) (%)
Eritrea	46.5	95.0	13.2	17.6
Ethiopia	46.7	96.0	33.5	7.2
Kenya	84.5	>99	78.6	15.0
Rwanda	52.6	76.0	47.7	<5
Somalia	17.8	34.4	3.9	5.8
South Sudan	1.1	4.4	<1	<5
Sudan	47.3	71.0	34.5	45.5
Uganda	28.9	66.0	16.9	5.9
Nigeria	61.6	91.4	30.4	9.2
Benin	32.7	58.1	9.4	5.4
Côte d'Ivoire	76.0	>99	50.8	29.5
Ghana	85.0	93.0	74.5	24.9
Senegal	70.7	93.6	49.8	29.6
Togo	43.3	76.6	19.0	7.9
Burkina Faso	21.9	68.7	1.9	14.0
Cape Verde	96.1	>99	88.6	82.9
Gambia	48.6	68.9	15.6	10.7
Guinea	45.7	83.9	23.7	<5
Guinea-Bissau	28.2	55.7	6.8	5.1
Liberia	12.0	17.9	5.7	<5
Mali	49.6	78.0	28.0	<5
Mauritania	32.2	55.8	3.8	48.4
Niger	13.6	71.4	2.2	<5
Sao Tome and Principe	70.5	86.7	25.3	16.2
Sierra Leone	25.5	52.2	5.8	<5
Angola	42.5	61.0	6.2	49.9
Botswana	58.7	71.4	28.9	65.6
Comoros	69.5	88.8	61.5	12.1
Lesotho	36.2	62.7	25.6	36.6
Madagascar	38.7	64.4	23.1	<5
Malawi	13.4	54.7	4.8	<5
Mauritius	>99	>99	>99	92.9
Mozambique	34.9	57.0	22.1	6.3
Namibia	57.4	78.1	35.8	43.3

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Countries	Population with access to electricity (2019) (%)	Population with access to electricity—urban areas (2019) (%)	Population with access to electricity—rural areas (2019) (%)	Population with access to clean cooking (2018) (%)
Seychelles	>99	99.0	>99	90.7
Eswatini	89.5	97.6	86.9	52.4
Tanzania	39.5	70.5	23.1	5.5
Zambia	37.2	76.3	6.3	17.1
Zimbabwe	53.1	88.8	36.2	30.7

Source Authors' elaboration, based on IEA (2020)

12.3 Annex 3: Risks Associated With Investment Opportunities and Stakeholders

Solar stand-alone systems

Risk group	Risk category	Sub-category	Description	Stakeholder group
Economic and financial	Currency risk	Exchange rate	Mismatch between revenues (collected in local currency) and financing expenses (paid in hard currency)	Macro risk, public authorities, multilateral agencies
		Currency convertibility	Government's restrictions that limit or remove the exchange of a local currency into other legal tenders	Public authorities
	Inflation	–	Gap between nominal and real financial returns	Macro risk
	Interest rate	–	Unexpected changes in the value of global interest rates	Macro risk

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Risk group	Risk category	Sub-category	Description	Stakeholder group
	Liquidity risk	Default/bankruptcy	Inability to pay financial liabilities due to cash-flow constraints caused by important upfront costs, long negative cash-flow periods and/or bad cash-flow management	Project developers, private investors, public authorities, multilateral agencies
		Access to affordable capital	Capital scarcity, affordability of capital and underdeveloped local financial markets No adequate financial instruments and ticket sizes Limited experience or little willingness to invest in the clean energy sector	Project developers, private investors, public authorities, multilateral agencies
		Refinancing risk	Incapacity to replace a financial obligation by a new capital injection	Project developers, private investors, public authorities, multilateral agencies
		Lack or little exit strategies	In the context of equity-like financing, if no or few exit options are available to investors, they cannot recoup the invested amount neither generate financial returns	Private investors, public authorities, multilateral agencies

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Risk group	Risk category	Sub-category	Description	Stakeholder group
Overall country situation	Political, legal and regulatory risk	Policies and regulations	Changes in policies and regulations affecting off-grid companies, weak procurement laws and lack of availability of technologies from domestic and international suppliers (not available or delays due to specific policies like custom restrictions and tariffs, no tailored technologies), limited access to the market due to specific regulations linked to technical requirements	Public authorities, multilateral agencies
		Political turmoil and instability	Uncertainties related to political instability and conflicts hindering businesses to operate normally	Macro risk, public authorities, multilateral agencies
		Bad governance	Cases of corruption and poor governance preventing proper project assignments and the development of a competitive market Lack of public commitment and uncertain support for the sector development	Public authorities
		Bureaucratic hurdles	Excessive bureaucracy, time-consuming procedures	Public authorities

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Risk group	Risk category	Sub-category	Description	Stakeholder group
		Market distortion	Public financial incentives for alternatives such as fossil fuel subsidies	Public authorities
		State of the infrastructures	In the case of stand-alone systems, the state of roads for instance can affect distribution and after-sales services	Public authorities
	Lack of investment-ready project	–	Lack of high-quality pipeline for investors	Public authorities, multilateral agencies, project developers
Business environment	Customer risk	Lack of information	Limited or no data available regarding energy access, consumption and ability to pay (for energy products or services) of targeted customers	Public authorities, multilateral agencies, project developers
		Low demand	Low consumption of targeted customers preventing the selling of sufficient quantities to achieve financial viability	Project developers
		Affordability and ability to pay	Financial constraints preventing payments related to energy consumption Lack of financial channels (consumer finance, mobile money, microfinance institutions)	Public authorities, multilateral agencies, project developers, business partners

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Risk group	Risk category	Sub-category	Description	Stakeholder group
		Willingness to pay	Dissatisfaction leading customers not to pay for a product or a service, thereby degrading reputation, customer retention and future acquisition	Project developers, public authorities
	Operational risk	Internal operations	Bad operation management causing sub-optimal performances	Project developers
		Workforce	Lack of skilled and qualified (potential) employees leading to low productivity and/or higher costs Financial management under expectations, leading to low creditworthiness affecting the ability to secure affordable financing at scale	Public authorities, multilateral agencies, project developers
		Stakeholder management	Lack of ability to properly manage relationships with directly and indirectly involved parties (public authorities, end-users, local communities), affecting operations	Project developers

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Risk group	Risk category	Sub-category	Description	Stakeholder group
		Complex business model	Distribution and after-sales services can be complex for operators due to long distances and locations difficult to reach Limited product range	Project developers, business partners
		End-of-life cycle management	Management of products and assets sold once their life cycle is over	Project developers
	Counterparty risk	Breach of contract	A business partner performing under contractual expectations	Project developers, business partners
		Unreliable data	Unreliable data leading to the development of unadapted business models	Public authorities
		Delays and bad performance, technological risk	Low quality of hardware Lack of warranties for components Delays impacting the overall performance of the company	Project developers, business partners
	Competitive risk	Direct competition	Decreasing market shares due to direct competitors	Project developers
		Alternatives	Alternatives available on the market used by potential customers (diesel, kerosene, etc.)	Public authorities, multilateral agencies, project developers
		Technological evolution	Company using obsolete technologies affecting the attractiveness of the value proposition	Project developers

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Risk group	Risk category	Sub-category	Description	Stakeholder group
Social and environmental considerations	Climate risk	Climate conditions	Environmental disasters affecting the overall performance and maintenance of stand-alone systems (storms, impracticable roads, floods, etc.)	Macro risk, public authorities, multilateral agencies
	Social acceptance risk	Lack of awareness	Targeted community is unfamiliar with stand-alone systems and not well-informed on the advantages and disadvantages of their functioning	Public authorities, multilateral agencies, project developers, civil society, end-users

Source Authors' elaboration

Mini-grids

Risk group	Risk category	Sub-category	Description	Stakeholder group
Economic and financial	Currency risk	Exchange rate	Mismatch between revenues (collected in local currency) and financing expenses (paid in hard currency)	Macro risk, public authorities, multilateral agencies
		Currency convertibility	Government's restrictions that limit or remove the exchange of a local currency into other legal tenders	Public authorities
	Inflation	–	Gap between nominal and real financial returns	Macro risk
	Interest rate	–	Unexpected changes in the value of global interest rates	Macro risk

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Risk group	Risk category	Sub-category	Description	Stakeholder group
	Liquidity risk	Default/bankruptcy	Inability to pay financial liabilities due to cash-flow constraints caused by important upfront costs, long negative cash-flow periods and/or bad cash-flow management	Project developers, private investors, public authorities, multilateral agencies
		Access to affordable capital	Capital scarcity, affordability of capital and underdeveloped local financial markets No adequate financial instruments and ticket sizes Limited experience or little willingness to invest in the clean energy sector	Project developers, private investors, public authorities, multilateral agencies
		Refinancing risk	Incapacity to replace a financial obligation by a new capital injection	Project developers, private investors, public authorities, multilateral agencies
		Lack or little exit strategies	In the context of equity-like financing, if no or few exit options are available to investors, they cannot recoup the invested amount neither generate financial returns	Private investors, public authorities, multilateral agencies

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Risk group	Risk category	Sub-category	Description	Stakeholder group
Overall country situation	Political, legal and regulatory risk	Policies and regulations	Changes in policies and regulations affecting mini-grid operators, weak procurement laws and lack of availability of technologies from domestic and international suppliers (not available or delays due to specific policies like custom restrictions and tariffs, no tailored technologies), limited access to electrification market due to specific regulations linked to technical requirements and interconnection, asset confiscation legislation	Public authorities, multilateral agencies, grid operator
		Political turmoil and conflicts	Uncertainties related to political instability and conflicts hindering businesses to operate normally	Macro risk, public authorities, multilateral agencies
		Bad governance	Cases of corruption and poor governance preventing proper project assignments and the development of a competitive market Lack of public commitment and uncertain support for mini-grid development	Public authorities

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Risk group	Risk category	Sub-category	Description	Stakeholder group
		Bureaucratic hurdles	Excessive bureaucracy, time-consuming procedures	Public authorities
		Market distortion	Financial incentives for alternatives such as fossil fuel subsidies	Public authorities
		State of the infrastructures	In the case of mini-grids, the state of roads for instance can affect operation management	Public authorities
		Grid arrival	Unexpected and unplanned grid arrival before a complete amortisation of the mini-grid project Unclear energy planning policies	Public authorities
	Lack of investment-ready project	–	Lack of high-quality pipeline for investors	Public authorities, multilateral agencies, project developers
Business environment	Customer risk	Lack of information	Limited or no data available regarding energy access, consumption and ability to pay (for energy products or services) of targeted customers	Public authorities, multilateral agencies, project developers
		Low demand	Low consumption of targeted customers preventing the selling of sufficient quantities to achieve financial viability	Project developers

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Risk group	Risk category	Sub-category	Description	Stakeholder group
		Affordability and ability to pay	Financial constraints preventing payments related to energy consumption Lack of financial channels (consumer finance, mobile money, microfinance institutions)	Public authorities, multilateral agencies, project developers, business partners
		Willingness to pay	Dissatisfaction leading customers not to pay for a service, thereby degrading reputation, customer retention and future acquisition	Project developers, public authorities
	Operational risk	Internal operations	Bad operation management causing sub-optimal performances	Project developers
		Workforce	Lack of skilled and qualified (potential) employees leading to low productivity and/or higher costs Financial management under expectations, leading to low creditworthiness and affecting the ability to secure affordable financing at scale	Public authorities, multilateral agencies, project developers

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Risk group	Risk category	Sub-category	Description	Stakeholder group
		Stakeholder management	Lack of ability to properly manage relationships with directly and indirectly involved parties (public authorities, end-users, local communities), affecting operations	Project developers
		Complex business model	Installation, operations and maintenance can be complicated for mini-grid operators due to long distances and locations difficult to reach	Project developers
		End-of-life cycle management	Management of products and assets sold once their life cycle is over	Project developers
	Counterparty risk	Breach of contract	A business partner performing under contractual expectations	Project developers, business partners
		Unreliable data	Unreliable data leading to the development of unadapted business models	Public authorities
		Delays and bad performance	Low quality of hardware Lack of warranties for components Delays impacting the overall performance of mini-grids (during development, construction and/or operations)	Project developers, business partners
	Competitive risk	Direct competition	Decreasing market shares due to direct competitors	Project developers

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Risk group	Risk category	Sub-category	Description	Stakeholder group
		Alternatives	Alternatives available on the market used by potential customers (diesel, kerosene)	Public authorities, multilateral agencies, project developers
		Technological evolution	Company using obsolete technologies affecting the attractiveness of the value proposition	Project developers
Social and environmental considerations	Climate risk	Climate conditions	Environmental disasters affecting the overall performance and maintenance of mini-grids (storms, impracticable roads, floods, etc.)	Macro risk, public authorities, multilateral agencies
		Resource scarcity	Climate conditions (droughts) can decrease the water flow affecting the overall performance when using hydropower	Macro risk, public authorities, multilateral agencies
	Social acceptance risk	Lack of awareness	Targeted community is unfamiliar with mini-grids' offerings and not well-informed on the advantages and disadvantages of their functioning	Public authorities, multilateral agencies, project developers, civil society, end-users
		Resource competition	When using hydropower, mini-grids can be in competition for the use of water resources with local communities	Public authorities, project developers

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Risk group	Risk category	Sub-category	Description	Stakeholder group
		Vandalism and resistance	External players (users, local communities, competitors, etc.) hindering the development and operations of mini-grids due to negative perceptions	Public authorities, multilateral agencies, project developers, civil society, end-users
		Illegal connections	Users consuming the electricity produced without paying, thereby implying a loss of profit for mini-grid operators	Public authorities, multilateral agencies, project developers, civil society, end-users

Source Authors' elaboration

Medium- and large-scale power generation plants

Risk group	Risk category	Sub-category	Description	Stakeholder group
Economic and financial	Currency risk	Exchange rate	Mismatch between revenues (collected in local currency) and financing expenses (paid in hard currency)	Macro risk, public authorities, multilateral agencies
		Currency convertibility	Government's restrictions that limit or remove the exchange of a local currency into other legal tenders	Public authorities
	Inflation	–	Gap between nominal and real financial returns	Macro risk
	Interest rate	–	Unexpected changes in the value of global interest rates	Macro risk

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Risk group	Risk category	Sub-category	Description	Stakeholder group
	Liquidity risk	Default/bankruptcy	Inability to pay financial liabilities due to cash-flow constraints caused by important upfront costs, long negative cash-flow periods and/or bad cash-flow management	Project developers, private investors, public authorities, multilateral agencies
		Access to capital	Capital scarcity, affordability of capital, underdeveloped local financial markets No adequate financial instruments Limited experience in investing in power generation plants	Project developers, private investors, public authorities, multilateral agencies
		Refinancing risk	Incapacity to replace a financial obligation by a new capital injection	Project developers, private investors, public authorities, multilateral agencies

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Risk group	Risk category	Sub-category	Description	Stakeholder group
Overall country situation	Political, legal and regulatory risk	Policies and regulations	Changes in policies and regulations affecting power generation plants, weak procurement laws and lack of availability of technologies from domestic and international suppliers (not available or delays due to specific policies like custom restrictions and tariffs, no tailored technologies), limited access to the market due to regulations linked to technical requirements, limited liberalisation, asset confiscation legislation	Public authorities, multilateral agencies, grid operator
		Political turmoil and conflicts	Uncertainties related to political instability and conflicts hindering businesses to operate normally	Macro risk, public authorities, multilateral agencies
		Bad governance	Cases of corruption and poor governance preventing proper project assignments and competitive tendering procedures Lack of public commitment and uncertain support	Public authorities
		Bureaucratic hurdles	Excessive bureaucracy, time-consuming procedures	Public authorities

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Risk group	Risk category	Sub-category	Description	Stakeholder group
		Market distortion	Financial incentives for alternatives such as fossil fuel subsidies	Public authorities
		State of the infrastructures	The state of roads but more specifically the national grid (transmission and distribution infrastructures) can affect operations and management Uncertainties in T&D construction planning	Public authorities
		International disputes	International concerns linked to the development of a power generation plant, affecting more than one country	Public authorities, multilateral agencies
		Grid interconnection	Uncertainties related to interconnection with the national grid Lack of standards and new technologies for the integration renewable resources	Public authorities, multilateral agencies, grid operator
	Lack of investment-ready project	–	Lack of high-quality pipeline for investors	Public authorities, multilateral agencies, project developers
Business environment	Operational risk	Internal operations	Bad management causing sub-optimal performances	Project developers

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Risk group	Risk category	Sub-category	Description	Stakeholder group
		Workforce	Lack of skilled and qualified (potential) employees leading to low productivity (during planning, construction and operations) and/or higher costs Financial management under expectations leading to low creditworthiness and affecting the ability to secure affordable financing at scale	Public authorities, multilateral agencies, project developers
		Stakeholder management	Lack of ability to properly manage relationships with directly and indirectly involved parties (public authorities, power off-taker, local communities, ...), affecting operations	Project developers
		System interconnection	Ability to ensure interconnection with the national grid or the power off-taker	Project developers, public authorities, grid operators
		Decommissioning	Risks linked to the management of the decommissioning phase of a power generation plant	Project developers
	Counterparty risk	Breach of contract	Low creditworthiness of power off-taker Business partner performing under contractual expectation	Project developers, business partners, public authorities, multilateral agencies

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Risk group	Risk category	Sub-category	Description	Stakeholder group
		Unreliable data	Unreliable information regarding prefeasibility studies (sun radiation, wind speed, water flow, etc.)	Public authorities, business partners
		Delays and bad performance	Bad governance and management procedures, Low quality of hardware Lack of warranties for components Delays impacting the overall performance (during development, construction and/or operations)	Project developers, business partners
		Fuel supply risk	In the case in which natural gas is used as fuel, lack of fuel stops operations and affects the overall performance Price increase	Project developers, business partners
	Competitive risk	Direct competition	Other developers proposing high-quality project	Project developers
		Alternatives	Alternatives available on the market (coal, oil)	Public authorities, project developers
		Technological evolution	Operator using obsolete technologies affecting the attractiveness of the value proposition	Project developers

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Risk group	Risk category	Sub-category	Description	Stakeholder group
Social and environmental considerations	Climate risk	Climate conditions	Environmental disasters affecting the overall performance and maintenance of the plant (storms, impracticable roads, floods, etc.)	Macro risk, public authorities, multilateral agencies
		Resource scarcity	Climate conditions (droughts) can decrease the water flow affecting the overall performance when using hydropower	Macro risk, public authorities, multilateral agencies
		Pollution (natural gas)	Greenhouse gases emitted during the combustion of natural gas	Project developers
	Social acceptance risk	Lack of awareness	Targeted community is unfamiliar with clean energy resources and not well-informed on the advantages and disadvantages of their utilisation	Public authorities, multilateral agencies, project developers, civil society, end-users
		Resource competition	When using hydropower, power generation plants can be in competition for the use of water resources with communities	Public authorities, project developers
		Vandalism and resistance	External players hindering the development and operations of a power generation plant due to negative perceptions, NIMBY syndrome, special interest group	Public authorities, multilateral agencies, project developers, civil society, end-users

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Risk group	Risk category	Sub-category	Description	Stakeholder group
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Source Authors' elaboration

National grid

Risk group	Risk category	Sub-category	Description	Stakeholder group
Economic and financial	Currency risk	Exchange rate	Mismatch between revenues (collected in local currency) and financing expenses (paid in hard currency)	Macro risk, public authorities, multilateral agencies
		Currency convertibility	Government's restrictions that limit or remove the exchange of a local currency into other legal tenders	Public authorities
	Inflation	–	Gap between nominal and real financial returns	Macro risk
	Interest rate	–	Unexpected changes in the value of global interest rates	Macro risk
	Liquidity risk	Default/bankruptcy	Inability to pay financial liabilities due to cash-flow constraints caused by important upfront costs, long negative cash-flow periods, bad cash-flow management and/or low financial returns	Project developers, private investors, public authorities, multilateral agencies
		Access to capital	Capital scarcity Limited experience in investing in national grid upgrade and expansion	Public authorities, multilateral agencies

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Risk group	Risk category	Sub-category	Description	Stakeholder group
		Refinancing risk	Incapacity to replace a financial obligation by a new capital injection	Project developers, private investors, public authorities, multilateral agencies
Overall country situation	Political, legal and regulatory risk	Policies and regulations	Weak procurement laws and lack of availability of technologies from domestic and international suppliers (not available or delays due to specific policies like custom restrictions and tariffs, no tailored technologies), limited liberalisation, asset confiscation legislation	Public authorities, multilateral agencies, grid operator
		Political turmoil and conflicts	Uncertainties related to political instability hindering normal operations	Macro risk, public authorities, multilateral agencies
		Bad governance	Cases of corruption preventing proper project assignments and competitive tenders Lack of public commitment and uncertain support	Public authorities
Business environment	Customer risk	Lack of information	Limited or no data available regarding energy access, consumption and ability to pay of targeted customer	Public authorities, multilateral agencies, project developers

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Risk group	Risk category	Sub-category	Description	Stakeholder group
		Low demand	Low consumption of targeted customers preventing the selling of sufficient quantities to achieve financial viability	Project developers
		Affordability and ability to pay	Financial constraints preventing payments related to energy consumption	Public authorities, multilateral agencies, project developers
		Willingness to pay	Dissatisfaction leading customers not to pay for a product or a service, thereby degrading reputation, customer retention and future acquisition	Project developers
	Operational risk	Internal operations	Bad management causing sub-optimal performances	Project developers, grid operator
		Workforce	Lack of skilled and qualified (potential) employees leading to low productivity and/or higher costs Financial management under expectations leading to low creditworthiness and affecting the ability to secure affordable financing at scale	Public authorities, multilateral agencies, project developers
		Stakeholder management	Lack of ability to properly manage relationships with directly and indirectly involved parties (power generators, public authorities, local communities, ...), affecting operations	Project developers, grid operator

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Risk group	Risk category	Sub-category	Description	Stakeholder group
		System interconnection	Ability to ensure interconnection with power generators, industries and households	Project developers, public authorities, grid operators
	Counterparty risk	Delays and bad performance	Low quality of hardware Lack of warranties for components Delays impacting the overall performance (during development, construction and/or operations)	Project developers, business partners
Social and environmental considerations	Climate risk	Climate conditions	Environmental disasters affecting the overall performance and maintenance of the grid (storms, floods, etc.)	Macro risk, public authorities, multilateral agencies
	Social acceptance risk	Vandalism and resistance	External players hindering the construction and operations of the national grid due to negative perceptions	Public authorities, multilateral agencies, project developers, civil society, end-users
		Illegal connections	Users consuming the electricity sold without paying, thereby involving a loss of profit for grid operators	Public authorities, multilateral agencies, project developers, civil society, end-users, grid operator

Source Authors' elaboration

Clean cooking systems

Risk group	Risk category	Sub-category	Description	Stakeholder group
Economic and financial	Currency risk	Exchange rate	Mismatch between revenues (collected in local currency) and financing expenses (paid in hard currency)	Macro risk, public authorities, multilateral agencies
		Currency convertibility	Government's restrictions that limit or remove the exchange of a local currency into other legal tenders	Public authorities
	Inflation	–	Gap between nominal and real financial returns	Macro risk
	Interest rate	–	Unexpected changes in the value of global interest rates	Macro risk
	Liquidity risk	Default/bankruptcy	Inability to pay financial liabilities due to cash-flow constraints caused by important upfront costs, long negative cash-flow periods and/or bad cash-flow management	Project developers, private investors, public authorities, multilateral agencies
		Access to affordable capital	Capital scarcity, affordability of capital and underdeveloped local financial markets No adequate financial instruments and ticket sizes Limited experience or little willingness to invest in the sector	Project developers, private investors, public authorities, multilateral agencies

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Risk group	Risk category	Sub-category	Description	Stakeholder group
		Refinancing risk	Incapacity to replace a financial obligation by a new capital injection	Project developers, private investors, public authorities, multilateral agencies
		Lack or little exit strategies	In the context of equity-like financing, if no or few exit options are available to investors, they cannot recoup the invested amount neither generate financial returns	Private investors, public authorities, multilateral agencies
Overall country situation	Political, legal and regulatory risk	Policies and regulations	Changes in policies and regulations affecting clean cooking companies, weak procurement laws and lack of availability of technologies from domestic and international suppliers (not available or delays due to specific policies like custom restrictions and tariffs, no tailored technologies), limited access to the market due to regulations linked to technical requirements	Public authorities, multilateral agencies
		Political turmoil and conflicts	Uncertainties related to political instability hindering normal operations	Macro risk, public authorities, multilateral agencies

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Risk group	Risk category	Sub-category	Description	Stakeholder group
		Bad governance	Cases of corruption poor governance preventing proper project assignments and the development of a competitive market Lack of public commitment and uncertain support	Public authorities
		Bureaucratic hurdles	Excessive bureaucracy, time-consuming procedures	Public authorities
		Market distortion	Financial incentives for alternatives such as fossil fuel subsidies	Public authorities
		State of the infrastructures	In the case of clean cooking systems, the state of roads for instance can affect distribution and after-sales services	Public authorities
	Lack of investment-ready project		Lack of high-quality pipeline for investors	Public authorities, multilateral agencies, project developers
Business environment	Customer risk	Lack of information	Limited or no data available regarding energy access, consumption and ability to pay (for energy products or services) of targeted customers	Public authorities, multilateral agencies, project developers
		Low demand	Low consumption of targeted customers preventing the selling of sufficient quantities to achieve financial viability	Project developers

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Risk group	Risk category	Sub-category	Description	Stakeholder group
		Affordability and ability to pay	Financial constraints preventing payments related to energy consumption Lack of financial channels (consumer finance, mobile money, microfinance institutions)	Public authorities, multilateral agencies, project developers, business partners
		Willingness to pay	Dissatisfaction leading customers not to pay for a product or a service, thereby degrading reputation, customer retention and future acquisition	Project developers, public authorities
	Operational risk	Internal operations	Bad operation management causing sub-optimal performances	Project developers
		Workforce	Lack of skilled and qualified (potential) employees leading to low productivity and/or higher costs Financial management under expectations, leading to low creditworthiness and affecting the ability to secure affordable financing at scale	Public authorities, multilateral agencies, project developers

(continued)

(continued)

Risk group	Risk category	Sub-category	Description	Stakeholder group
		Stakeholder management	Lack of ability to properly manage relationships with directly and indirectly involved parties (public authorities, end-users, local communities), affecting operations	Project developers
		Complex business model	Distribution and after-sales services can be complex for operators due to long distances and locations difficult to reach Limited product range	Project developers, business partners
		End-of-life cycle management	Management of products and assets sold once their life cycle is over	Project developers
	Counterparty risk	Breach of contract	A business partner performing under contractual expectations	Project developers, business partners
		Unreliable data	Unreliable data leading to the development of unadapted business models	Public authorities
		Delays and bad performance	Low quality of hardware Lack of warranties for components Delays impacting the overall performance (during development and/or operations)	Project developers, business partners

(continued)

(continued)

Risk group	Risk category	Sub-category	Description	Stakeholder group
		Fuel supply risk	Lack of fuel, LPG or biomass, making operations difficult and affecting the overall performance Price increase	Project developers, business partners
	Competitive risk	Direct competition	Decreasing market shares due to direct competitors	Project developers
		Alternatives	Alternatives available on the market used by potential customers	Public authorities, multilateral agencies, project developers
		Technological evolution	Company using obsolete technologies affecting the attractiveness of the value proposition	Project developers
Social and environmental considerations	Climate risk	Climate conditions	Environmental disasters affecting the overall performance and maintenance of clean cooking systems (storms, impracticable roads, floods, etc.)	Macro risk, public authorities, multilateral agencies
		Resource scarcity	Climate conditions (droughts) can affect biomass availability	Macro risk, public authorities, multilateral agencies
	Social acceptance risk	Lack of awareness	Targeted community is unfamiliar with clean cooking systems and not well-informed on the advantages and disadvantages of their functioning	Public authorities, multilateral agencies, project developers, civil society, end-users

(continued)

(continued)

Risk group	Risk category	Sub-category	Description	Stakeholder group
		Resource competition	When using biomass, clean cooking systems can be in competition for its use with local communities	Project developers

Source Authors' elaboration

12.4 Annex 4: De-risking Matrix

Part I: Economic and financial risks

	Exchange rate	Currency convertibility	Default/bankruptcy	Access to capital	Refinancing	Lack of exit strategies	Inflation	Interest rate
Governance/management practices		X						
Standardisation/streamlined regulation				X				
Pipeline facilities				X				
Technical assistance/capacity building				X				
Awareness campaigns				X				
Tariff setting			X	X				
International coop. and partnerships		X						
Fiscal incentives			X	X				
Priority sector lending	X			X	X	X		
Direct investments			X	X	X	X		
Alternative fin. instru. and schemes ^a			X	X	X	X		
Subsidies			X	X				
Credit lines/on-lending structures	X		X	X	X	X		
Guarantees and insurance (public)		X	X	X	X		X	X
Hard currency PPAs	X							

(continued)

(continued)

	Exchange rate	Currency convertibility	Default/bankruptcy	Access to capital	Refinancing	Lack of exit strategies	Inflation	Interest rate
Concessional and patient capital			X	X	X			
Structure finance	X			X	X			
Project finance				X				
Loan syndication				X				
Green bonds				X				
Carbon finance				X				
Guarantees and insurance (private)		X	X				X	X
Derivative instruments (hedging)	X							
Internal liquidity facilities			X	X				
Payment defaults management			X					
Strategic agreements, M&A and investors				X				
Good governance and staff training				X				

^aPublic and private

Part II: Country risks

	Policies and regul.	Political turmoil	Bad gov.	Bureaucrat. hurdles	Market distort.	State of infra	Interna. disputes	Grid arrival	Grid access	Lack of invest.-ready projects
Energy strategy and planning	X		X					X		
Governance/management practices		X	X	X						
Market information										X
Standards of quality				X						
Standardisation/streamlined regulation	X		X	X						X
Land rights and concessions	X		X	X				X		
Pipeline facilities										X
Technical assistance/capacity building										X
Awareness campaign	X		X		X					
Rural energy agencies	X		X	X						X
Grid arrival and access provisions								X	X	
Utility reform			X			X			X	
Tariff setting	X									
International coop. and partnerships		X	X				X			
Regional power pools			X			X	X			
Subsidy reform					X					

(continued)

(continued)

	Policies and regul.	Political turmoil	Bad gov.	Bureaucrat. hurdles	Market distort.	State of infra	Interna. disputes	Grid arrival	Grid access	Lack of invest.-ready projects
Guarantees and insurance ^a	X	X								
Stakeholder engagement/market knowledge	X		X							

^aPublic and private

Part III: Business environment (first part)

	Lack of info.	Low demand	Affordability	Willingness to pay	Inter. procedures	Work force	Stakeh. mgmt	Complex business	System intercon.	Decommissioning	End-of-life cycle mgmt
Market information	X										
Standards of quality				X					X		
Technical assistance/capacity building					X	X	X	X	X		
Rural energy agencies	X										
Utility reform			X								
Tariff setting			X								
Regional power pools		X	X								
Fiscal incentives			X								
Alternative financial instruments			X								
Subsidies			X								
Concessional finance and patient capital			X								
Flexible payment methods		X	X	X							
Stakeholder engagement and market knowledge	X			X			X				

(continued)

(continued)

	Lack of info.	Low demand	Affordability	Willingness to pay	Inter. procedures	Work force	Stakeh. mgmt	Complex business	System intercon.	Decommissioning	End-of-life cycle mgmt
Strategic agreements, M&A and investors					X		X	X	X	X	X
Good governance and staff training					X	X		X		X	X
External consulting/technical assistance					X	X	X	X			

Part IV: Business environment (second part)

	Breach of contract	Unreliable data from a third party	Delays and techno. issues	Fuel supply	Direct competition	Alternatives	Technological evolution
Energy strategy and planning						X	X
Governance/management practices	X						
Market information		X			X		X
Standards of quality		X	X				X
Standardisation/streamlined regulations						X	
Land rights and concessions		X			X	X	
Pipeline facilities						X	
Technical assistance/capacity building					X	X	X
Awareness campaign						X	
Rural energy agencies		X					
Grid arrival and access provisions		X				X	
Utility reform	X						
Tariff setting						X	
Regional power pools	X						
Fiscal incentives						X	
Subsidy reform						X	
Priority sector lending						X	

(continued)

(continued)

	Breach of contract	Unreliable data from a third party	Delays and techno. issues	Fuel supply	Direct competition	Alternatives	Technological evolution
Direct investments/special-purpose investment vehicles						X	
Subsidies						X	
Guarantees and insurance (public)	X	X	X				
Concessional finance and patient capital						X	
Project finance	X		X	X			
Green bonds						X	
Carbon finance						X	
Guarantees and insurance (private)	X	X	X	X			
Stakeholder engagement and market knowledge		X					
Strategic agreements, M&A and investors	X	X	X	X	X		
Good governance and staff training					X		

Part V: Social and environmental risks

	Climate conditions	Resource scarcity	Pollution (natural gas)	Opposition and vested interest	Social awareness	Resource competition	Vandalism and resistance	Illegal connections
Energy strategy and planning				X				
Governance/management practices				X				
Market information	X	X				X		
Standards of quality				X	X			
Land rights and concessions				X				
Awareness campaign				X	X	X	X	X
Rural energy agencies						X		
Utility reform								X
Tariff setting				X			X	X
International coop. and partnerships		X		X		X		
Regional power pools	X	X		X				
Guarantees and insurance ^a	X	X						
Stakeholder engagement and market knowledge				X	X	X	X	X
Strategic agreements, M&A and investors				X				

^aPublic and private

Source: Authors' elaboration

12.5 Annex 5: Carbon Tax and Emission Trading Systems (ETS)

Carbon tax	ETS
Price setting	Quantity setting
Estimation of public revenues facilitated	Difficult to estimate public revenues as prices are determined on a secondary market
Unknown emission reduction	Emission reduction determined by public authorities (cap)
Easier implementation ^a	More difficult to implement
Less prone to be manipulated by big market players	Risk of market concentration, price escalation and illiquid markets
Difficult to apply across borders	Can be applied across borders
No countercyclical response	Countercyclical response possible

^aIt can be implemented through existing infrastructures, entities and capacities, and no secondary market is needed. However, a tax can be easily rolled back by the next government as no allowance are hold as opposed to ETS

Source Authors' elaboration

12.6 Annex 6: MSCI Market Classification Framework and Requirements

Criteria	Frontier	Emerging	Developed
Economic development • Sustainability of economic development	No requirement	No requirement	Country GNI per capita 25% above the World Bank high income threshold ^a for 3 consecutive years
<i>Size and liquidity requirements</i>			
• Number of companies meeting the following criteria	2	3	5
• Company size (full market cap) ^b	\$776 million	\$1,551 million	\$3,102 million
• Security size (float market cap) ^b	\$61 million	\$776 million	\$1,551 million
• Security liquidity	2.5% ATVR	15% ATVR	20% ATVR
<i>Market accessibility criteria</i>			
• Openness to foreign ownership	At least some	Significant	Very high

(continued)

(continued)

Criteria	Frontier	Emerging	Developed
• Ease of capital inflows/outflows	At least partial	Significant	Very high
• Efficiency of operational framework	Modest	Good to tested	Very high
• Availability of investment instrument	High	High	Unrestricted
• Stability of the institutional framework	Modest	Modest	Very high

^aHigh income threshold for 2018: GNI per capita of \$12,056

^bMinimum in use for the May 2019 Semi-Annual Index Review, updated on a semi-annual basis
Source Authors' elaboration, based on MSCI (2019)

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