

Supplementary Material

1 Risk assessment framework

TABLE 1. Risk assessment indicators

Risks	Risk components	Risk drivers	No.	Indicators	Sources
(1) Conflicts and violence	Political instability	<ul style="list-style-type: none"> - Ethnic, linguistic, or religious tensions - Military involvement in politics - Religious influence in politics - Use of coercive measures to maintain the regime - Structure of the political system (e.g., democracy, monarchy, military rule) - Development of political parties - Public participation in the political process - Legitimacy of government (e.g., elections) - Political violence and social unrest - Ideological shifts - ... 	1.1	CIA World factbook Regime type	CIA (2020)
			1.2	Regime Authority Characteristics Lack of democracy	Herre et al. (2013)
			1.3	Worldwide Governance Indicators (WGI) Political Stability and Absence of violence/ terrorism	World Bank (2018)
			1.4	AON Risk Map Terrorism and Political violence risk	AON (2020)
			1.5	Country Reports on Terrorism	United States Department of State Publication & Bureau of Counterterrorism (2018)
			1.6	CIA World factbook Terrorism	CIA (2020)
			1.7	HIK - Heidelberger Institut für Internationale Konfliktforschung Violent conflicts	HIK (2019)
			1.8	Uppsala University - Department of Peace and Conflict Research Fatal events	Hegre et al. (2020)
			1.9	Global Peace Index State of peace	IEP (2020)
			1.10	Early Warning Project Risk Assessment for Mass Killing	EWP (2020)
			1.11	Disaster Risk Management Knowledge Centre Risk of humanitarian crises and disasters	DRMKC (2020)
			1.12	Political Risk Map Country risk index	MARSH (2020)
			1.13	World inequality database Income inequality	WID (2020)
			1.14	ILOSTAT database Unemployment rate	ILOSTAT (2020)
			1.15	ILOSTAT database Share of youth not in employment, education or training	ILOSTAT (2020)
			1.16	UNDP Gender Inequality Index	UNDP (2020)
			1.17	Worldwide Governance Indicators (WGI) - Voice and accountability	World Bank (2018)
			1.18	World Bank data Population growth	World Bank (2020a)
			1.19	Human Rights Watch Qualitative Report	Human Rights Watch. (2018)
-	-	1.20	Human Rights Human Rights Scores	Herre et al. (2016)	

	Economic stability	<ul style="list-style-type: none"> - GDP development - Level of inflation - Level of debt - Economic development status - ... 	1.21 World Bank data GDP per capita growth	World Bank (2020a)
			1.22 Economist World debt comparison Total debt and debt increase	Economist (2012)
			1.23 IMF DATA Mapper Inflation rate, average consumer prices	IMF (2020)
			1.24 CIA World factbook Economy	CIA (2020)
			1.25 Political Risk Map 2019 Economic risk index	MARSH (2020)
	Geopolitical situation	<ul style="list-style-type: none"> - Existing or pending sanctions - Trade conflicts and barriers - Human rights violations - War or armed conflicts - Dependence on external support - ... 	1.26 Sanction Risks Sanction risk rating	SanctIO (2020)
			1.27 Global Conflict Tracker Conflict status and type	CFR (2020)
			1.28 Literature review Geopolitical situation	n/a
(2) Government intervention	Government actions	<ul style="list-style-type: none"> - History of property or resource nationalization - History of contract repudiation - Unexpected changes in taxation, tariffs, or laws - Resource nationalism - ... 	2.1 Expropriation risk 2.2 AON Risk Map Political Interference Risk	TGE (2020) AON (2020)
(3) Conditions for doing business	Business environment	<ul style="list-style-type: none"> - Counterparty payment track record - Ease to do business - Conditions of starting a business - Socio-cultural differences in doing business - ... 	3.1 World Bank - Doing business Ease of Doing Business Scores overall	World Bank (2020b)
			3.2 World Bank - Doing business Starting a Business	World Bank (2020b)
	Currency risk	<ul style="list-style-type: none"> - Exchange rate volatility and fluctuations - Currency stability over time - Inflation and its impact on currency value - Trade imbalances and their effect on exchange rates - Capital flow restrictions and currency controls - Foreign debt levels affecting currency risk - ... 	3.3 Currency risks Risk of nations currency	CanBack (2015)
			3.4 Transfer risk - Country rankings Currency inconvertibility and transfer risk,	TGE (2020)
			3.5 Global Climatescope Currency variation	Climascope, & Bloomberg NEF. (2019)
			3.6 World Bank - Doing business Trading across Borders Scores	World Bank (2020b)
	Trading across borders	<ul style="list-style-type: none"> - Requirements for imports and exports - Export restrictions - Regulatory standards and compliance measures - Quality standards and customs procedures - ... 	3.7 Export documents The number of documents required for exporting	TGE (2020)
(4) Quality of governance	Corruption	<ul style="list-style-type: none"> - Bribery, trading in influence, abuse of functions etc. - Corruption levels - ... 	4.1 Transparency international Corruption index	Transparency International (2020)
			4.2 Worldwide Governance Indicators (WGI) Control of corruption	World Bank. (2018)
			4.3 The GAN Business Anti-Corruption Portal Country reports	GAN (2020)
	Legal system insufficiencies	<ul style="list-style-type: none"> - Law and order traditions - Legal system - Copyright protection - Enforceability of e.g. property rights, contract rights 	4.4 Worldwide Governance Indicators (WGI) Rule of Law	World Bank. (2018)
			4.5 AON Risk Map Legal and regulatory risk	AON (2020)

		- ...	4.6 World Justice Project (WJP) WJP Rule of Law Index	WJP (2020)
			4.7 Global Lex Descriptions legal systems countries	NYU Law (2020)
			4.8 CIA World factbook Legal System	CIA (2020)
	Resource Management	- Revenue management - Value realization - ...	4.9 Resource Governance Index	NRGI (2021)
			4.10 Literature review Resource management strategies	n/a
(5) Political and trade relations with Germany/ EU	Quality of bilateral and trade relations	- Level of bilateral trade and cooperation agreements - Existing energy partnerships - Absence of institutional and diplomatic relations - Foreign trade relations with the EU/Germany, particularly in energy imports and exports - Existing trade treaties and agreements - Export restrictions due to domestic energy needs - Trade barriers or tariffs impacting energy trade - ...	5.1 Bilateral relations and German missions Country information bilateral relations with Germany	Federal Foreign Office Germany (2020a)
			5.2 Energy partnership with Germany	Federal Foreign Office Germany (2020b)
			5.3 EU EU trade treaty map	European Council (2020)
			5.4 World Integrated Trade solutions (World Bank) Import and Export to Germany and Europe	WITS (2020)
			5.5 Stockholm environmental Institute Trade openness	Benzie et al. (2016)
			5.6 Literature research on bilateral and trade relations	n/a
(6) Unfavourable framework conditions for renewable energies/ hydrogen/ synthetic fuels	Stakeholder attitudes towards RE and synthetic fuels	- Stakeholder positions and attitudes towards RE, hydrogen and synthetic fuels, - Influence of stakeholders on policy and implementation - Interests of stakeholders in the energy transition - Collaboration and alignment among stakeholders regarding PtX initiatives - ...	6.1 Literature review Stakeholder attitudes and public discussions of RE and syn. fuels	n/a
	Political importance of decarbonisation and SDGs	- Commitments to achieving the goals outlined in the Paris Agreement - Ambitions related to the Sustainable Development Goals (SDGs), including specific climate protection targets - ...	6.2 LSE London Number of climate legislation by country	LSE (2020)
			6.3 REN 21 RENEWABLES 2019 GLOBAL STATUS REPORT Renewable energy in INDC or NDC	REN21(2020)
			6.4 Quality and ambitions of NDCs	UNFCCC (2020) Climate action tracker (2020)
			Sustainable Development Report Dashboards 2019 SDG Index	Sachs et al. (2019)
	Strategic role of renewable energies 2030 (2040,2050)	- Energy supply and demand dynamics, including the share of renewable energy (RE) sources - National strategies for renewable energy development, including potential hydrogen and synthetic fuel initiatives - Resource availability studies and assessments of renewable energy potential - Alignment of national energy targets with global climate and sustainability goals - Challenges related to low dispatch priority for renewable energy sources - Infrastructure readiness for integrating renewable energy	6.5 World Bank database Renewable energy consumption	World Bank. (2020a)
			6.6 IEA/IRENA Global Renewable Energy Policies and Measures Database Renewable energy targets	IEA/IRENA (2020)
			6.7 Global Climatescope Gap to target	Climatescope, Bloomberg & NEF (2019)
			6.8 Literature review Resource assessments RE /hydrogen/ synthetic fuels/ desalination potentials,	n/a

	- ...				
Existing economic and industry structure	- Country's economic structure	6.9	CIA World factbook Energy (statistics oil, gas imports/exports, refinery etc.)	CIA (2020)	
	- Adaptability of existing business models to hydrogen/synthetic fuels	6.10	GLOBAL FOSSIL INFRASTRUCTURE TRACKER Information on existing and proposed oil and gas pipelines, LNG terminals, and coal terminals by country	GGON (2020)	
	- Relevant industrial structures	6.11	GAS INFRASTRUCTURE MAP OF THE MEDITERRANEAN REGION Report on gas infrastructure	MedReg. (2018)	
	- Port and transport infrastructures	6.12	World Bank database Industry (including construction), value added	World Bank. (2020a)	
	- ...	6.13	World Port source Port infrastructure	World Port Source (2020)	
		6.14	MENA Fuels Table Economic structure Structure economic sectors	GTAI (2020)	
		6.15	RECREE Renewable Energy Country Profile	RCREEE (2019)	
Regulatory hurdles and uncertainty	- Lack of a comprehensive framework/legislation for concentrated solar power (CSP), photovoltaic (PV), and wind energy and independent power producers (IPPs)	6.16	IEA/IRENA Global Renewable Energy Database · Economic Instrument · Information and Education · Policy Support · Regulatory Instruments	IEA/IRENA (2020)	
	- Insufficient regulations and plans for RE (Missing grid codes and technical specifications, ambiguities regarding grid connection, pricing, volume requirements)	6.17	REN 21 RENEWABLES 2019 GLOBAL STATUS REPORT Regulatory Policies	REN21(2020)	
	- Regulatory frameworks for IPPs and related entities	6.18	Auswärtiges Amt Policy Instruments renewable energy	Federal Foreign Office Germany (2020b)	
	- Grid access regulations and procedures	6.19	Global Climatescope Utility Privatisation	Climascope, Bloomberg & NEF (2019)	
	- Tendering processes for renewable energy projects				
- Track record of project implementation and existing project pipeline					
- Stringent environmental					
	- ...				
Energy efficiency	- Energy intensity	6.20	IEA Energy Intensity	IEA (2020a)	
	- Energy use	6.21	World Bank Energy Use (kgoe/cap)	World Bank. (2020a)	
	- Efficiency measures				
	- ...				
(7) Unfavourable investment conditions	Availability of finance	- Availability of international financial support for renewable energy (RE), hydrogen, and synthetic fuels	7.1	Global Financial Development Report 2017 / 2018 Financial system evaluation	World Bank (2019)
		- Access to investment and operating capital for project development	7.2	World Bank TCdata360 Availability of financial services	World Bank (2020d)
		- Interest rate fluctuations	7.3	World Bank TCdata360 Share of firms identifying access to finance as a major constraint	World Bank (2020d)
		- Factors affecting creditworthiness,	7.4	World Bank TCdata360 Venture capital availability	World Bank (2020d)
		- Liquidity constraints faced by domestic banks impacting financing options	7.5	IRENA Data & Statistics Renewable Energy Finance Flows	IRENA (2020)
		- Limited experience among banks and investors with utility-scale renewable energy, hydrogen, and synthetic fuel projects	7.6	Global Climatescope Availability of Finance	Climascope, Bloomberg & NEF (2019)
			7.7	Global Climatescope Foreign Investment share	Climascope, Bloomberg & NEF (2019)
			7.8	Global Climatescope Offtaker Risk	Climascope, Bloomberg & NEF (2019)
			- ...		

	Financial incentives & Public financing	<ul style="list-style-type: none"> - Ambitions towards Paris Agreement - Ambitions in regard to Sustainable Development Goals (SDGs) (including climate protection targets) - ... 	<p>7.9 REN 21 RENEWABLES 2019 GLOBAL STATUS REPORT Overview Fiscal Incentives and Public Financing</p> <p>7.10 Global Climatescope Average VAT paid by RE</p> <p>7.11 Global Climatescope Import Duties</p>	<p>REN21(2020)</p> <p>Climascope, Bloomberg & NEF (2019)</p> <p>Climascope, Bloomberg & NEF (2019)</p>
	Energy market accessibility	<ul style="list-style-type: none"> - Market distortions (e.g. high subsidies for fossil fuels) - Limitations related to energy market liberalization - ... 	<p>7.12 IEA Fossil Fuel subsidies</p> <p>7.13 Literature review Status market liberalisation</p>	<p>IEA. (2020b)</p> <p>n/a</p>
(8) Unfavourable project approval, licensing and permitting process	Institutional ineffectiveness	<ul style="list-style-type: none"> - Timeframes for obtaining licenses and permits for RE projects, hydrogen, and synthetic fuels - Experience level with international industry tenders, particularly in renewable energy - Limitations in the design of standard Power Purchase Agreements (PPAs) and/or PPA tendering processes - Transparency and accountability of institutions, data management, and procedural practices - Conflicts arising from differing institutional requirements - Unclear or undefined roles and responsibilities of institutional actors - Lack of transparency in the contract award process - Hierarchical structures affecting decision-making - ... 	<p>8.1 World Bank - Doing business Dealing with Construction Permits</p> <p>8.2 World Bank - Enterprise Surveys Share of firms identifying business licensing and permits as a major constraint</p> <p>8.3 World Bank - Enterprise Surveys Days to obtain an operating license</p> <p>8.4 World Bank - Enterprise Surveys Senior management time spent dealing with the requirements of government regulation</p> <p>8.5 Literature review Permitting and licensing process</p>	<p>World Bank (2020b)</p> <p>World Bank (2020c)</p> <p>World Bank (2020c)</p> <p>World Bank (2020c)</p> <p>n/a</p>
(9) Labour and expertise availability	Human resource and expertise availability	<ul style="list-style-type: none"> - Local content requirements - Skilled and experienced workforce in the country - Lack of local firms offering required technology components, construction and maintenance services (e.g. low experience of O&M team, insufficient qualification profile of staff, institutional/organizational shortcomings, disregards of best-practices rules, poor document management, lack of engineering competences, Insufficient site visits, lack of project management skills, insufficient construction supervision) - Locally available, construction, operation, maintenance personal - Lack of relevant education programs in the country - Cultural differences in work organisation - Potential for strikes - Level of organisation of workforce - ... 	<p>9.1 IRENA Renewable Energy Employment by Country</p> <p>9.2 WEF Global Human Capital Index</p> <p>9.3 World Bank - Enterprise Surveys Share of firms identifying an inadequately educated workforce as a major constraint</p> <p>9.4 World Bank - Enterprise Surveys Proportion of skilled workers</p> <p>9.5 World Bank - Enterprise Surveys Proportion of workers offered formal training</p>	<p>IRENA (2020)</p> <p>WEF (2017)</p> <p>World Bank (2020c)</p> <p>World Bank (2020c)</p> <p>World Bank (2020c)</p>

(10) Social acceptance	Lack of awareness & acceptance	<ul style="list-style-type: none"> - Limited communication about the project in the planning phase - Limited integration of communities - Local knowledge base, attitude, influence and interest - Education levels - History of social and political resistance against new infrastructure projects - Resource use (water, land etc. for export) - Social/environmental opposition to economic projects - Indigenous opposition to economic projects - Misperceptions - Socio-cultural between project developers and locals - Tribal issues - Health concerns - Conflict of interest - NIMBY - ... 	10	Literature review Indicators of social acceptance of a technology include knowledge/education (what does the public know), perception (what does the public think), and fear (what does the public feel)	n/a
(11) Natural hazards	Extreme weather conditions (sand storms, extreme wind conditions, flooding)	<ul style="list-style-type: none"> - Impact of climate change on the infrastructure or operation of RE/hydrogen or synthetic fuel infrastructures - ... 	11.1	WorldRiskReport World Risk Index	IFHV and Bündnis Entwicklung Hilft (2019).
			11.2	Notre Dame-Global Adaptation ND-GAIN Country Index	ND-GAIN (2020)
			11.3	SEI Transnational Climate Impacts (TCI) Index	Benzie et al. (2016)

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