



Financing large hydrogen export projects

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December 2023

Challenges associated with H2 sector's development (1)

Development and financing of H2 projects needs to tackle a set of key challenges / constraints associated with industry's still early maturation stage

► Economic challenges

- Save for very specific conditions, there is cost premium attached to green H2 vs. gray H2 and natural gas
- Uses of H2 entail a cost premium (fuel-cell mobility) or retrofit of existing industrial facilities (case of steel mills)
- There is no pre-existing demand for green H2: development of demand must accompany that of supply, so as to encourage the reduction of costs across the entire value chain through massive investments

► Technical challenges

- Deploying large electrolysis capacities requires a huge industrialization of manufacturing capabilities on the side of equipment suppliers and a fairly complex logistics chain for ammonia projects in arid areas: desalination plant, renewable sources, electrolysers & ammonia plant
- Although Alkaline and to some extent PEM technologies are not new, there is limited return on experience on operating units > 10 MW

All in all, large green ammonia projects currently under development need to overcome logistics issues (traditional case of LNG projects) as well as cost premium issues (case of renewable projects 20 years ago) and industry-specific demand issues

Challenges associated with H2 sector's development (2)

From a project financing perspective, current features of the H2 industry amplify the traditional sources of risk for prospective lenders

Sources of risk for debt holders	Risk features	Risk mitigants
Technical risk	<ul style="list-style-type: none"> • Delay in commissioning the asset (construction risk) • Technical fault (s) affecting the performance of the asset after its commissioning (operating risk) 	<ul style="list-style-type: none"> • Guarantees provided by the subcontractor during the construction phase and then the operation of the asset
Credit risk	<ul style="list-style-type: none"> • Insufficient cash flow generation to service the debt (Principal + Interest) during the life of the asset 	<ul style="list-style-type: none"> • Soundness of the underlying contractual / regulatory / economic scheme (price, volume) guaranteeing the stability of cash flows + equivalence between the duration of the scheme and the life of the asset • DSCR (1) > 1.2, so as to create a safety cushion in the event of unforeseen events
Counterparty risk	<ul style="list-style-type: none"> • Default of the purchasing counterparty on its obligations (bankruptcy, legal dispute over the contract terms, etc.) • Default of electricity supplier and equipment supplier 	<ul style="list-style-type: none"> • Credit quality of the buying counterparty of H2 (financial strength, history in the execution of similar contracts, etc.) • Existence of other potential counterparties

Focus on the Neom green ammonia export project (1)

This landmark H2 project offers lessons on the financing of large export projects at this stage of sector's development

A landmark project for the H2 sector globally

Size: \$8.5bn

International reach /
logistics chain

Funding: >70% non
recourse debt

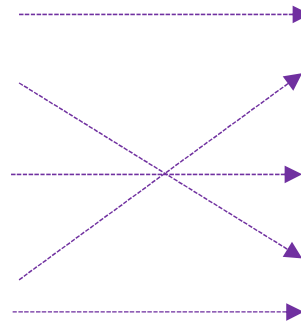
Status: construction in
progress

Three, cumulative supportive factors to tackle the main three project risks

Strong sponsors: Neom, ACWA, Air
Products (AP)

Strong offtake contract: 30Y fixed
price take or pay contrat with AP

Strong lump sum turnkey EPC, with
AP sole counterpart



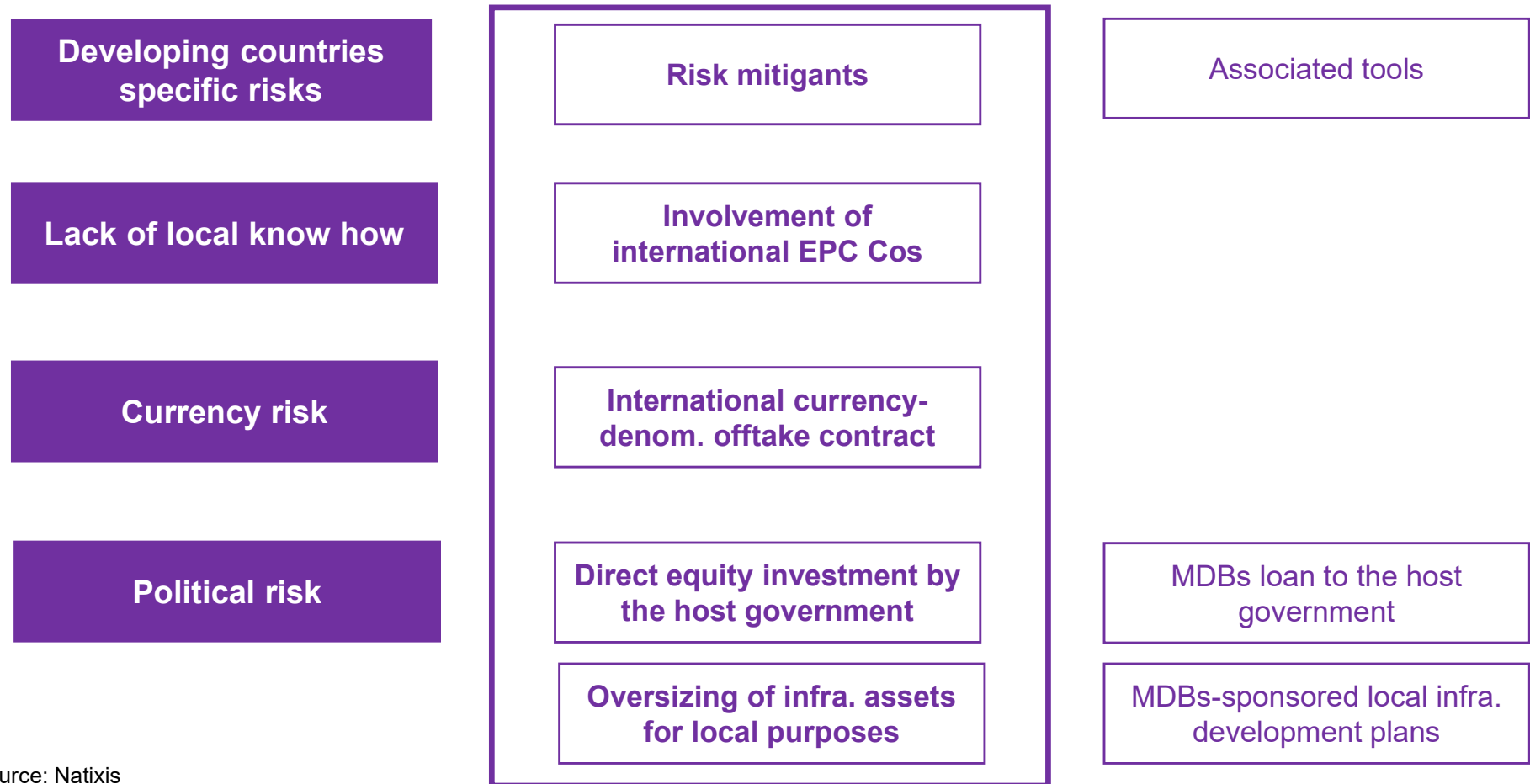
Construction & technical risk

Credit risk (adequacy of project's
cash flows and debt service)

Counterparty risk (EPC / offtake)

Focus on the Neom green ammonia export project (2)

Project features showcase some key political risk mitigants in developing countries



Conclusion: financing of H2 projects remains a work in progress

- ▶ **Structuring of large export projects continues to confront the offtake challenge**
 - Needed for reputable offtakers for long contracting (>10 years) at a cost premium compared with industry projections
 - Global H2 market is still unclear given the current state of demand / logistics chains: H2 vs. ammonia vs. e-kerosene / e-methanol
- ▶ **The international leg recently-launched EU H2 Bank aims to tackle the offtake challenge** (through competitive tenders & CfD-based demand support mechanism) **but its tangible benefits remain uncertain** (funding uncertainties / extent of support provided to export projects)
- ▶ **Direct & indirect public support mechanisms** (potential combination of CfDs and strengthening of the carbon allowance market) **in the EU probably is gradually creating a robust case for pure non-recourse financing of H2 projects, particularly in industrial decarbonization clusters** (case of Dunkirk in France)



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