ICAT Initiative for Climate Action Transparency

NACAG Nitric Acid Climate Action Group

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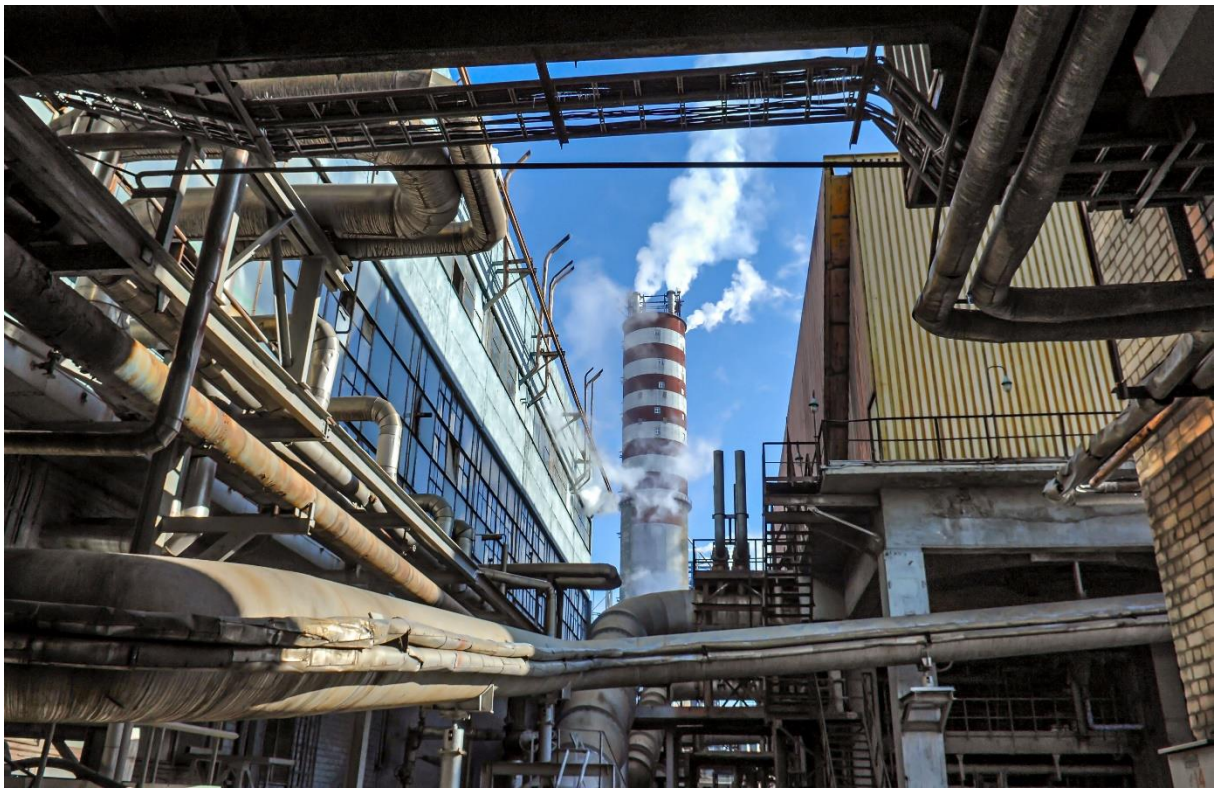
ICAT Transformational Change Pilot Case Study:

Transformational Change

Assessment of the Transformational Potential of the NACAG Initiative



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ICAT Transformational Change Pilot Case Study:

Assessment of the Transformational Potential of the NACAG Initiative

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1. OBJECTIVES OF THE ASSESSMENT

1.1 Defining the Assessment

The following assessment is based on the ICAT Transformational Change Guidance developed by UNEP DTU Partnership and the World Resource Institute. The guidance is meant to "help users assess transformational potential and impacts of policies and actions to reduce greenhouse gas (GHG) emissions" (p.2). According to the guidance, transformational potential is the potential "to drive structural changes in society towards climate change mitigation and SDGs" (p.2). In order to gather information and to develop a better understanding of the NACAG Initiative's transformational potential and to help assess the impact of the funding provided through NACAG, the NACAG Secretariat will carry out an assessment using the ICAT Guidance. The conclusions drawn from the assessment should provide a foundation for an improved project communication, to support the long-term development of the project and to situate the NACAG Initiative in the context of new requirements for projects as laid down in the Paris Agreement and particularly in the funding frameworks of the Green Climate Fund.

The NACAG Secretariat has chosen the ICAT Guidance as a tool for the assessment of its action, as the Initiative fulfills the required criteria outlined in the Guidance (see criteria p.4): 1) The NACAG Initiative is global in scope active in 30 ODA countries. 2) The implementation of policy and technology actions take place at the national level and focus on a transformation of the nitric acid industry, to achieve climate mitigation in all production plants on a global level 3) The Initiative is a planned intervention currently being implemented. 4) It consists in fostering the regulation of a sector with acquainted policy instruments and in introducing proven and effective mitigation technology nationally.

The following assessment is carried out by the NACAG Secretariat. Involvement of stakeholders in the development process of the assessment is not practicable due to time and resource constraints. Yet, the NACAG secretariat wishes to share insights with close partners. These will be informed about the outcomes of the assessment and a review and discussion process could be undertaken. Stakeholders will also be involved more closely, if a monitoring and reporting process is carried out after the initial assessment.

1.2 Description of the NACAG Initiative

The Nitric Acid Climate Action Group (NACAG) is an Initiative commissioned by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). It targets the mitigation of nitrous oxide emissions from the nitric acid industry on a global scale.

Nitrous oxide (N_2O) is a highly potent greenhouse gas, with a global warming potential 265 times that of carbon dioxide (CO_2). The largest source of industrial N_2O emissions is the manufacture of nitric acid, which is mainly used for producing nitrogen-based fertilizer. Although effective abatement technologies are available comparably to other mitigation actions at low cost, N_2O from the production of nitric acid continues to be emitted into the atmosphere in most countries in the world. This is due to the investment and maintenance cost related to the abatement technology, the lack of regulation of chemical industries in developing countries and the price erosion of emissions certificates under the CDM, which previously helped companies overcome the financial barrier to climate protection measures. Therefore, NACAG's vision is to incentivize the installation of appropriate abatement technologies in all nitric acid production plants worldwide in the long-run. The initiative focuses on 30

ODA countries[1] with nitric acid production facilities, which have not yet been equipped with N_2O abatement technology but is in principal available to offer advice and support to all interested countries.

The Initiative provides governments and plant operators with guidance and information on technological and regulatory issues regarding N_2O abatement and the regulation of the nitric acid sector. The support is offered through on site capacity building workshops, information material and technical exchanges. Moreover, NACAG makes available financial support to plant operators for the installation of abatement technology and capacity building for maintenance work. This financial support is subject to the condition that partner countries take full responsibility for the mitigation activities after 2020 – for example in the context of their Nationally Determined Contributions (NDCs). This political commitment by partner countries to take abatement into their own hands ensures the sustainability of the initiated activities and the long-term transformation of the sector. Through the official signature of the NACAG Statement of Undertaking (SoU), the states formalize their commitment and agree to put effective regulation policies and instruments into place. Currently, the funds attributed to the Initiative are sufficient to equip around 15 plants with the necessary abatement technology – in the long-run, the funds will be increased in line with the signature of SoUs.

With regard to the implementation, verification and certification of mitigation activities, the Initiative generally takes a strong orientation on existing standards and procedures of the Kyoto Protocol's Clean Development Mechanism (CDM). However, no Certified Emission Reductions (CERs) or respective certificates will be generated by activities implemented under the NACAG financial support program. All CERs generated and being compensated under the Nitric Acid Climate Auction Program NACAP will be cancelled. Hence no emission reductions nor emission reduction certificates will not be used to fulfil any reduction commitments in countries other than the country of origin. Nevertheless, countries are allowed to use certificates for national carbon accounting purposes within their jurisdiction.

Even though the Initiative is already under implementation, it has not yet reached a point, where an ex-post assessment and monitoring is worthwhile. Therefore, the NACAG secretariat opts for an ex-ante assessment. An ex-post assessment can be conducted at a later point of the implementation process if deemed fruitful. Besides the analysis of the impact on GHG mitigation, the assessment will also examine the project's impact on SDGs. To do so, the ICAT Guidance on Sustainable Development will be used as an additional support.

1.3 Defining transformational change

To assess the transformational change potential of NACAG it is necessary to first outline a clear definition of the term "transformational change". The ICAT Transformational Change Guidance provides the following definition: "A fundamental, sustained change of a system that disrupts established high-carbon practices and contributes to a zero-carbon society in line with the Paris Agreement goals to limit global warming to 1.5-2°C and the Sustainable Development Goals." (p. 13) Transformational change is further characterized by "large-scale outcomes or a multitude of smaller-

[1] Algeria, Argentina, Belarus, Bolivia, Bosnia-Herzegovina, Brasilia, Columbia, Cuba, Egypt, Georgia, India, Indonesia, Iran, Jordan, Kazakhstan, Mexico, Pakistan, Peru, Philippines, Serbia, South Africa, Thailand, Tunisia, Turkmenistan, Turkey, Ukraine, Uzbekistan, Vietnam, Zambia, Zimbabwe.

scale changes coherently leading to large-scale system impacts." AND "Sustained, long-term, irreversible outcomes that reinforce zero-carbon practices." Also, "the term designates a process that challenges general paradigms and existing standards of how to do things and that disrupts old path dependencies." Transformational change therefore clearly describes a purposeful, intended and planned transformation. The NACAG Initiative will be tested against this definition, to work out its actual potential.

Following the guidance, the assessment will help understand NACAG's impact on four key drivers of change: technological development, agents of change, the development of incentive mechanisms and the transformation of behavioral and normative patterns. The main objective of the assessment is to show the scale of outcomes the Initiative expects to generate as well as the processes used to ensure the sustainability of these outcomes. These two components will be analysed to assess the initiative's expected transformational impact.

1.4 Describing the Action and the Vision for Transformational Change

Table 1: Checklist of recommended information to understand the action – Overview

Information	Description
Title	Nitric Acid Climate Action Group Initiative
Type of action	Technology implementation and policy advice
Description of specific interventions	a) Political awareness raising, political consulting and cooperation processes to obtain political commitments b) Technical consulting and cooperation processes to integrate private sector actors c) Funding, capacity development and technical support for the implementation of abatement technology
Status of the policy or action	Currently under implementation
Dates	2016-2025 (provisional timeframe)
Implementing entities	GIZ (NACAG Secretariat) in cooperation with national governments, plant operators and technical partners
Objectives and intended impacts or benefits of the action	**Quantifying the impacts of the NACAG Initiative** Given the Initiative's structure, its impact is twofold: On one hand, the Initiative generates a clear and measurable GHG mitigation impact by transforming production processes in the chemical industry. On the other hand, the Initiative initiates a political transformation by framing the abatement of N_2O in the nitric acid industry low-hanging fruit and cost-effective option in the set of possible mitigation measures for a country. Also, through its specific impacts, NACAG contributes to the achievement of the UN SDGs. Finally, an important objective of the Initiative is to test a new strategy and set up for international climate funding that fits the new framework of the Paris Agreement and the cooperation mechanisms under

Article 6. The impact of the NACAG Initiative can therefore be measured in the following way:

GHG abatement impact (potential)

The NACAG Initiative's vision is to mitigate by mainstreaming effective abatement technology in nitric acid plants in 30 developing countries. Whether this maximum potential will be achieved depends on the cooperation of governments and industry actors and in how far they integrate the necessity to mitigate nitrous oxide emissions into their long-term climate protection targets, (i.e. by integrating the regulation of the sector in their NDCs). Currently, the NACAG Secretariat is engaged in 30 ODA countries, to work towards its target.

The actual abatement achieved by the Initiative will have to be assessed at the end of the project using data from the participating nitric acid plants and the countries' NDCs. The long-term effects of the Initiative will be estimated on the basis of these measured values.

Political impact

The political work of NACAG is an important pillar of the project's structure and is essential for its success. However, the political impact of the Initiative is difficult to measure. Yet, the signature of the SoU can be seen as an indicator for the integration of the transformation process in the regulatory and political mechanisms of participating states. Furthermore, the integration of the regulation of the sector in a state's NDC is an additional indicator. In line with the GHG mitigation objectives the aim is to convince all targeted 30 ODA countries to sign the SoU and longer term to encourage all developing countries to adopt N_2O abatement technology and regulate the nitric acid sector. .

The Initiative aims to have a political impact beyond the 30 ODA countries eligible for support by raising awareness in countries that do not chose to actively participate in the NACAG Initiative.This impact could be considered as a system change, however it is difficult to assess because the Inititiative does not to measure e nor monitor its extended impact, unless there have been direct requests for technical support from non-ODA countries Nonetheless, it could lead to the introduction of independent political strategies for the nitric acid sector, and this impact should not be disregarded.

SDG impact

By working towards significant emission reductions in the production process of nitric acid, the NACAG Initiative contributes to the achievement of the following sustainable development goals: "SDG 13: take urgent action to combat climate change and its impacts". and to "SDG 17: Strengthen the

	means of implementation and revitalize the global partnership for sustainable development". The transformational potential of the Initiative on GHG emissions is thus congruent with its transformational potential towards the achievement of these two goals. **Impact on new climate funding strategies** Besides its immanent impact on GHG mitigation and political strategies, the Initiative was also started as a road test for innovative climate funding cooperation schemes under the Article 6 cooperative approaches currently taking shape in the negotiations of the 'rulebook' to implement the Paris Agreement. The ambition is to test whether the setup for climate cooperation in this Initiative, which consist in binding developing countries through long-term commitments while at the same time helping them to overcome initial investments and structural barriers, can serve as an example for other sectors or climate mitigation and adaptation issues. If the Initiative proves to be successful in achieving its visions in the nitric acid sector, it is likely that the NACAG approach could be transferred to other sectors and followed by other developed countries to achieve their climate cooperation objectives. It could then become an example for cooperation mechanisms under Article 6.2. of the Paris Agreement. Whether NACAG can actually have this systemic impact will largely depend on its success and can only be assessed in a few years, by observing how many new climate cooperation projects copy this approach. If NACAG can play a role as a precedent for new climate cooperation, this would be a huge multiplier for its actual structural impact and transformational potential towards a low-carbon future.
Level of the policy or action and geographic coverage	The Initiative has an international scope but is implemented nationally
Sectors targeted	The nitric acid industry and its relevant regulatory entities
Other related actions	NACAP The Nitric Acid Climate Auction Program is the second financing stream initiated by NACAG to support the abatement of N_2O emissions from nitric acid production in plants, which have already been equipped with abatement technology and have issued CERs under the CDM after December 7th 2015 . The auction program is carried out by the World Bank and was initiated to offer a guaranteed price on future emission reductions to plant operators, as a financial incentive for continued maintenance and operation of the abatement technology.
Reference	http://www.nitricacidaction.org/

1.5 The transformational vision of the NACAG Initiative

The NACAG Initiative was started to harness the significant GHG mitigation potential in the nitric acid industry on a global level. Therefore the vision is to achieve a transition from climate-damaging nitric acid production processes to climate protective ones. This vision depends on technological up-dates as well as on a political and regulatory transformation. The stakeholders needed to realize the vision are governmental and private sector actors. The Initiative has a sectoral and technical scope and is solely active at the plant and government level and only affects processes and actors concerned with nitric acid production and the regulation of the chemical industry. The civil society is indirectly affected by NACAG's activities, as it benefits from climate mitigation. Yet, civil society is not involved in the technical implementation of the Initiative apart from an involvement in the context of a possible CDM project certification.

Table 2: Description of the transformational change vision at different levels of society and different time periods

Levels of society and time periods	Description of the vision
Macro level (global society)	**Contribute to global climate protection measures** The NACAG Initiative's vision is to harness the significant GHG mitigation potential in the nitric acid industry in developing countries. The aim is to achieve a transition from climate-damaging nitric acid production processes to climate protective ones. This way the initiative contributes to more climate protective fertilizer production chains and is part of the global efforts for climate protection. Mitigate by mainstreaming effective abatement technology in nitric acid plants in 30 countries or all developing countries? **Contribute to the development of international cooperation schemes for climate protection** The NACAG Initiative was also started to road test a new strategy for international climate cooperation and funding that fits the new global climate regime under the Paris Agreement. The initiative could serve as an exemplary mechanism for international cooperation under the Paris Agreement. The vision is to develop a cooperation scheme that helps developing countries realise their mitigation potential in the long-run and supports their development.
Medium level (national level)	Receive the political commitment to regulate the N_2O emissions from the nitric acid sector from 30 developing countries through the signature of the SoU. Ensure ownership of the transformation process in national regulation authorities (politicians and civil servants).

Micro level (sector and government stakeholders; direct partners)	Introduce abatement technology in 15 nitric acid plants of the countries that join NACAG by signing the SoU. Create sustained awareness for the mitigation potential of effective N_2O abatement technology among the relevant actors. Ensure ownership and in the industry sector (plant operators, owners).
Long-term vision >15 years	In the long run, the Initiative hopes to see the nitric acid production in all developing countries equipped with abatement technology. All governments should be aware of the potential for climate protection in this sector and have integrated it in their NDCs to raise their climate protection ambitions.
Medium-term >5 years	In 2023 the Initiative plans to have gathered SoUs from all 30 ODA countries and to have introduce abatement technology in all nitric acid plants in these countries. This not only requires an extension of the project duration but also further funds.
Short-term <5 years	In the following 3 years, the Initiative works towards mobilizing the political commitment from as many of the 30 ODA countries as possible. Funding is available to introduce abatement technology in at least 15 nitric acid plants, based on a "first come first served" principle. If funds are increased, the project could increase the number of supported plants.

1.6 Defining assessment boundaries

Assessment period: The assessment will preliminarily be limited to the duration of the Initiative, 2016-2030. Nevertheless, the period may well be extended for monitoring purposes to get a more comprehensive understanding of the initiative's impact.

Impacts covered: GHG mitigation, and SDG goals mainly 13 and 17.

Geographical coverage: The assessment will focus on the 30 nitric acid producing ODA countries, which are targeted by the Initiative. The monitoring results will come from those countries that signed the SoU and the plants that have received funding through NACAG.

Sectoral coverage: The assessment will mainly look at the impact of the action in the nitric acid sector.

Transformational change characteristics to be assessed: As described before, the assessment focuses on two aspects to analyse the potential of the NACAG Initiative: outcomes and processes. The following tables will summarize the selection of processes and outcome characteristics that are relevant for the NACAG Initiative. All characteristics will then be assessed in terms of scale and sustainability of their impact.

Table 3: Process characteristics relevant to the NACAG Initiative

Process category	Process characteristics	Description	Relevance	Justification

Technology	Research and Development	-	Not relevant	The abatement technology used in the nitric acid plants is well developed.
	Adoption	-	Not relevant	The abatement technology used in the nitric acid plants is already mainstreamed or at least known in plants in developed and in developing countries. Due to a lack of regulation there is no incentive to install abatement technology.
	Scale up	The action leads to a deployment of well-known and approved abatement technology to nitric acid plants in developing countries	Relevant	Due to financial barriers and a lack of emission regulation, as well as a lack of financial incentives to mitigate GHG emissions, most nitric acid plants in developing countries remain without N_2O abatement technology. The initiatives aims at the introduction of technology in all nitric acid plants.
Agents	Entrepreneurs	-	Not relevant	The Initiative does not target entrepreneurs. It works with established chemical plant operators. Entrepreneurs have no influence on current nitric acid productions.
	Coalition of advocates	The action has the potential to provide the ground for an international network of nitric acid producers to encourage climate-friendly nitric acid production.	Possibly relevant	It is not clear whether this is important to the achievement of the Initiative's planned outcomes and the formation of networks is not a designated objective of the Initiative. Nevertheless, the formation of a network or community among the members of the Initiative might help make it more visible and attractive to other plant operators.
	Beneficiaries	The Initiative directly supports plant operators financially to	Relevant	The plant operators and governments are the key drivers and stakeholders of the

		implement the desired transformation of the sector. The Initiative directly supports governments to support and frame the transformation process.		transformation envisioned by the Initiative.
Incentives	Economic and non-economic	The policy uses financial and non-financial incentives (capacity building, technical support) to enable the scale-up of the N_2O abatement technology.	Relevant	Financial incentives are key to overcome the financial barriers that hinder the installation of costly abatement technology in nitric acid plants.
	Disincentives	-	Possibly relevant	The Initiative does not directly use disincentives, since it has no power over regulations or sanctions for N_2O intensive nitric acid production. Yet, the Initiative tries to create an environment in which the non-mitigation of N_2O in nitric acid plants becomes unthinkable and therefore “social pressure” in the sector could be seen as a disincentive. Also, as a result of the signature of a SoU, states might introduce regulations that use disincentives to make sure that the industry maintains and operates the funded abatement technology.
	Institutional and regulatory	The Initiative ensures that national	Relevant	The development of regulations is key to the sustainability of the

		governments implement effective regulation measures to frame the long term maintenance of introduced N_2O abatement technology. It also encourages the introduction of the control of nitrous oxide emissions from the nitric acid sector in NDCs.		outcomes envisioned by the initiative
Norms	Awareness	The Initiative raises awareness for the potential of the nitric acid sector as low hanging fruits for climate protection among government officials. It raises awareness among plant operators for the importance of climate-friendly production modes.	Relevant	Though the awareness of the necessity to reduce nitrous oxide emissions is present in most countries, few governments are aware of the exact potential of the nitric acid sector and do not know what effective regulation could look like. Raising awareness is therefore a key part of the Initiatives work. The Initiative also raises awareness among plant operators for their responsibility in the global fight against climate change.
	Behaviour	-	Not relevant	The introduction of new abatement technologies and regulations does not trigger relevant behavioral changes.
	Social Norms	-	Not relevant	The Initiative does not target or affect social norms

Table 4: Outcome characteristics relevant to the NACAG Initiative

Outcome category	Outcome characteristics	Description
Scale of outcome GHG	Macro level: GHG mitigation is significant at the international level	Given the huge climate effect of N_2O (265 CO_2eq), the mitigation of those gases contributes significantly to international climate protection efforts. Especially, if the Initiative leads to the long-term regulation of the nitric acid sector, the contribution to climate protection is important.
	Medium level: GHG outcome is large in magnitude at the national and sectoral level	The share of the nitric acid industry in national emissions is usually very high, due to the high climate effect of N_2O, but varies from country to country. The abatement of these emissions therefore has a large impact on most countries' overall emissions, e.g. Tunisian overall emissions of this sector.
	Micro level: GHG outcomes at sub-national and sub-sectoral (plant) level are large.	N_2O emissions are by far the largest share of GHG emissions from the nitric acid production line. The abatement of N_2O emissions therefore makes the production significantly more climate-friendly.
Scale of outcome – sustainable development	Macro level: Sustainable development outcome is net positive in outcome at international level	This level is outside the assessment boundary.
	Medium level: Sustainable development outcome is net positive in outcome at national level	There is no significant scale on development.
	Micro level: : Sustainable development outcome is net positive in outcome at subnational and sectoral level	There is no significant scale on development.
Outcome sustained over time –GHGs	Long term: GHG outcome is achieved and sustained over an uncertain number of years (>15 years)	Through the signature of the SoU the countries commit to an overall regulation of the sector as long as laws are implemented.

	Medium term: GHG outcome is achieved and sustained until the end of the Initiative in 2025 (≤5 and < 15 years) from the starting situation)	Over the medium term, mitigation is sustained with governments putting in place regulation for the sector.
	Short term: (<5 years)	The Initiative aims to achieve its outcome objectives until 2025. If the Initiative is implemented according to the project plans, the GHG outcome will be achieved over the course of the next 5 years.
Outcome sustained over time – SDGs	Long term:	The initiative aims to develop long term mitigation action referring to SDG 13 until 2030 and above.
	Medium term:	The initiative aims to develop long term mitigation action referring to SDG 13 until 2030
	Short term:	In the short term climate action is taken until 2025.

2. ESTIMATION OF TRANSFORMATIONAL IMPACTS EX-ANTE

2.1 Identifying the phase of transformation

Predevelopment

The nitric acid sector in ODA countries is not only regarded as unregulated, but is also underpinned by little information. In many plants the by-product N_2O is emitted without any monitoring. Due to a lack of technology, measuring instruments and methods, there is no data or overview of the annual emissions from this sector, either on the part of the plant operator or on the part of the governments. There are visible signs of unsustainable development, but a lack of collective action to embrace new pathways and having a more climate friendly chemical industry sector regarding the nitric acid production.

2.2 Identifying Barriers to the envisioned transformation

Table 5: Barriers and affected characteristics

Barriers	Explanation	Characteristics affected
Lack of financial incentives to introduce abatement technology	Since the price crash of CDM certificates, there are no financial incentives for chemical plant operators to introduce expensive abatement technology. Apart from initial expenses, plant operators also fear the long term costs for maintenance, monitoring and energy consumption in the long run. The introduction of abatement technology does not increase the value of the product to compensate expenses.	Scale up Beneficiaries Economic and non-economic incentives Institutional and regulatory incentives
Lack of financial capacity	Some plant operators simply do not have the financial capacity to introduce the technology or to train staff adequately.	Scale up Beneficiaries
Lack of regulations at the national level	Due to the financial barriers described above, governments are often reluctant to regulate the sector. Some governments lack the capacities to introduce sensible and effective regulation mechanisms to support the transformation of	Scale up Beneficiaries Economic and non-economic incentives Institutional and regulatory incentives

	the nitric acid sector. A minority of governments are even unaware of the potential of the nitric acid sector for national climate protection	Awareness

2.3 Describing the initial situation for selected process characteristics

Table 6: Starting situation for selected process characteristics

Process category	Process characteristics	Description of the starting situation	Indicators
Technology	Research and Development	Not relevant	
	Adoption	Not relevant	
	Scale up	Relevant: High initial investment costs for abatement technology and a lack of financial incentives or regulations are the reason why most nitric acid plants in developing countries are not yet equipped with N_2O abatement technology.	Ratio: Number of plants with abatement technology and monitoring equipment divided by the total number of plants including those without such equipment, within a country.
Agents	Entrepreneurs	Not relevant	
	Coalition of advocates	Possibly relevant: A network or NACAG community could create a positive environment for knowledge and experience exchanges and support the awareness raising among government officials and plant operators for the shared responsibility to protect the climate. Currently, there is no such community in place, as the initiative has few members.	Number of exchanges or meetings between NACAG members (governmental level or plant operators) Ideas: Include key actors not directly involved in the NACAG initiative, such as the WB carbon market programme, labelling initiatives (disincentives), who could influence all developing country players to take action

	Beneficiaries	Relevant: Generally, all plant operators are aware of the potential of N_2O abatement technology, but costs related to its introduction are a limiting factor. Most governments are aware of the potential of N_2Oabatement for national climate protection targets but are reluctant to regulate the sector due to the costs related to the abatement technology. In some countries, the regulation of the sector is also problematic, because plants are state owned or produce nitric acid for weaponry and the government see its own interests threatened by the regulation of the sector. In each of the 30 ODA countries, the situation is a little different and the NACAG Secretariat approaches actors accordingly, offering targeted support and information. This way, the Initiative points the way for the countries by showing them that the trade-offs for climate protection are relatively low in the nitric acid sector and encourage states to find ways to finance the long term operation of the abatement technology. Also, the cooperation with the NACAP enables the Initiative to not only target plant owners that have never invested in abatement technology, but also offers support to plants equipped with abatement technology under the CDM.	Number of governments that get involved with the initiative and support its vision. (signatories of the declaration or SoU) Number of plants that get involved with the Initiative and support its vision

Incentives	Economic and non-economic	Relevant: Currently there are no economic and non-economic incentives available at the national level to support the transformation of the nitric acid sector in the relevant 30 ODA countries. The NACAG Initiative offers a package of economic and non-economic incentives to encourage cooperation. Also, it ensures that governments put regulations into place that might work with economic or non-economic incentives to encourage the long-term operation of the abatement technology.	Number of economic and non-economic incentives in place at the national level.
	Disincentives	Maybe relevant: Some countries might chose to put disincentives into place to ensure the long-term operation of abatement technology	Number of national policies that create a disincentive for unabated N_2O emissions.
	Institutional and regulatory	Relevant: Currently there are no sectoral regulations in place that support the transformation of the nitric acid production in all relevant 30 ODA countries	Number of regulations or policies in place at the national level.
Norms	Awareness	Relevant: Awareness for the potential of N_2O abatement technology is relatively high in the chemical industry but insufficient among government officials in some countries.	Number of governments that understand the potential of the nitric acid sector for climate protection. Perhaps focus on an indicator for awareness raising activities such as communication material or events held and another indicator to track actions as a result of enhanced awareness among government officials…
	Behaviour	Not relevant	
	Social Norms	Not relevant	

Table 7: Starting situation for selected outcome characteristics

Outcome category	Outcome characteristics	Description of the starting situation	Indicators
Scale of outcome GHG	International level	The N_2O emissions from the nitric acid production in the 30 ODA countries are emitted unabatedly.	CO_2 eq emitted from the nitric acid plants Number of plants equipped with N_2O abatement technology
	National and sectoral level	The N_2O emissions from the nitric acid production in the 30 ODA countries are emitted unabatedly.	CO_2 eq emitted from the nitric acid plants Number of plants equipped with N_2O abatement technology (taking into account the capacity of the plant and the abatement efficiency of the chosen catalyst)
	Subnational and subsectoral level	The N_2O emissions from the nitric acid production in the 30 ODA countries are emitted unabatedly.	CO_2 eq emitted from the nitric acid plants Number of plants equipped with N_2O abatement technology (taking into account the capacity of the plant and the abatement efficiency of the chosen catalyst)
Scale of outcome – sustainable development	International level	Outside the assessment boundary	
	National and sectoral level	No development intended due to mitigation action.	There is no impact on efficiency, etc. in so far there is no sustainable

			development intended in this sector.
	Subnational and subsectoral level	No development intended due to mitigation action.	
Outcome sustained over time – GHGs	Long term: (>15 years)	Difficult to say due to a lack of monitoring action due to plant operators.	CO_2 eq emitted from the nitric acid plants Number of plants equipped with N_2O abatement technology
	Medium term: (≤5 year from the starting situation)	Difficult to say due to a lack of monitoring action due to plant operators.	
	Short term: irrelevant		

Table 8: Reporting on barrier impact

Barrier	Characteristic affected	Score	Rationale	Barrier directly targeted by the policy or action
Lack of financial incentives to introduce abatement technology and lack of financial capacity	Scale up Beneficiaries Economic and non-economic incentives Institutional and regulatory incentives	High	The lack of financial incentives to introduce abatement technology and the high investment costs are the major reason for the creation of the Initiative.	Yes
Lack of regulations at the national level	Scale up Beneficiaries Economic and non-economic incentives Institutional and regulatory incentives Awareness	High	The lack of regulation is linked to the lack of financial incentives, because governments are reluctant to impose costs on the chemical industry.	Yes

Table 9: Describing the ex-ante assessment of process characteristics

Category	Characteristic	Score	Rationale justifying the score	Indicators	Indicator value at starting situation (2018)	Indicator value for expected transformation (December 2030)
Technology	Research and development	NA	NA	NA	NA	NA
	Adoption	NA	NA	NA	NA	NA
	Scale up	3	By offering the funding for the abatement technology and related capacity development in the nitric acid plants, the project directly addresses the lack financial capacities and takes away this important barrier for action in the plants. By ensuring that states regulate the sector, the Initiative makes sure that plants that do not receive NACAG funding are also equipped with the necessary technology.	Number of plants with abatement technology and monitoring equipment.	0	>93 15 plants have signed up within the 30 eligible ODA countries. Possibly in other developing countries/plants can commit too without funding
Agents	Entrepreneurs	NA	NA	NA	NA	NA
	Coalition of advocates	1	The Initiative could be used to build a network of nitric acid producers, to leverage the communication potential of its members. Nevertheless, this is not yet being	Number of exchanges or meetings between NACAG members (governmental level or plant operators)	0	Coalition of advocates established

			planned or implemented			
	Beneficiaries	4	Through direct cooperation with plant operators, the initiative addresses their needs and enables them to support the initiatives vision. Governments are also directly enabled to leverage the potential of the nitric acid sector for their national and global climate commitments.	Number of governments that get involved with the initiative and support its vision. (signatories of the declaration or SoU) Number of plant operators that get involved with the Initiative and support its vision	1 1	15 93
Incentives	Economic and non-economic incentives	4	Through the funding of abatement technology and capacity development as well as technical support, NACAG offers financial incentives to join the initiative. The initiative also makes sure governments put incentives into place to ensure the long term operation of abatement technologies	Number of economic and non-economic incentives put in place by governments at the national level.	0	At least 30 (one in each ODA country)
	Disincentives	1	The initiative encourages governments to also use	Number of national policies that create a	0	No clear target, as they could be used as a back-up or add-up for

			disincentives to ensure the long term operation of abatement technologies in their nitric acid sector. The initiative itself does not work with disincentives to encourage cooperation.	disincentive for unabated N_2O emissions.		incentives or simply replace them.
	Institutional and regulatory	4	The signature of the SoU makes sure that governments are clearly committed to regulate their national nitric acid sector.	Number of regulations or policies in place at the national level.	0	At least 30 (correlates with incentives and disincentives)
Norms	Awareness	4	The Initiative actively approaches key actors and raises awareness for the potential of the sector.	Number of governments that understand the potential of the nitric acid sector for climate protection. (signature of the declaration)	5	At least 30
	Behaviour	NA	NA	NA	NA	NA
	Social norms	NA	NA	NA	NA	NA

Table 10: Describing the ex-ante assessment of outcome characteristics

Category	Characteristic	Score	Rationale justifying the score	Indicators	Indicator value at starting situation (2017)	Indicator value for expected transformation (2030)
	Macro level	2	Given the interest of the governments for our initiative and	Number of plants with	NA due to unknown actual	NA

Scale of outcome-GHG			their overall willingness to contribute to global climate protection efforts, it is very likely, that the project will lead to sustained changes in several countries. Whether the vision of NACAG will be fully achieved remains difficult to predict	mitigation technology	GHG emission	
	Medium level	3	Due to the political commitment of the partner countries and the integration of the sector in the NDCs, the GHG abatement achieved in the partner countries will likely be maintained beyond the project duration. Nevertheless, it cannot be outruled that some countries may choose to give up on their commitment.	Number of plants with mitigation technology of a country	NA	NA
	Micro level	4	At the plant level, the funding for the technology and the training of employees as well as the transformation of national regulatory frameworks should ensure a long term mitigation of GHG emissions.		NA	NA
Scale of outcome-	Macro level	0	There is no actual development of this sector intended.		NA	NA

sustainable development	Medium level	0	There is no actual development of this sector intended.		NA	NA
	Micro level	0	There is no actual development of this sector intended.		NA	NA
Outcome sustained over time-GHG	Long-term	4	In the long run due to SoU´s.		NA due to unknown actual GHG emission	NA
	Medium-term	4	Until 2030		NA	NA
	Short-term	2	In the short run there will no significant GHG reduction		NA	NA

Table 11: Results of the ex-ante analysis at process category level

Category	Score	Rationale for scoring	Relative importance	Rationale for importance
Technology	3	The action will contribute to increase the number of N_2O abatement technologies installed in plants around the world by overcoming existing financial barriers.	40	The implemented abatement technology has the potential to mitigate immediately.
Agents	3	Beneficiaries of the project will be directly affected and benefit from the funding and technical support offered by the Initiative, which will result in a long term transformation of their production process.	20	Without funding there is no incentive for monitoring by the plant operator.
Incentives	2	The Initiative clearly uses economic and non-economic incentives to achieve its objectives. Nevertheless, it is unlikely to use disincentives.	10	In fact disincentives are not implemented.
Norms	3	The Initiative is likely to raise awareness for the potential of the sector. This awareness is key to the	30	The awareness of this sector can increase the ambition of the

		creation of new regulations and the transformation of the nitric acid sector in the long run.		country´s NDC to this sector.

Table 12: Results of the ex-ante analysis at outcome category level

Category	Score	Rationale for scoring
Scale of outcome-GHGs	3	The Initiative is likely to result in sustained GHG emission reductions that relative to the starting situation represent large impacts at sectoral, national and international level
Scale of outcome – sustainable development	0	There is no actual development of this sector intended.
Outcome sustained over time - GHGs	3	The Initiative is likely to ensure that achieved GHG emissions are sustained over many years. Nevertheless, it is uncertain whether all countries will fulfil their commitment to regulate and control the sector.

3. AGGREGATING THE RESULTS

Concluding the assessments, the final result for the analysis of the transformation of the Nitric Acid Sector seems to be ***possible*** at the transformation by the policy level and to be ***moderate*** at the extend level.

Figure 1: Final ex-ante assessment result expressed in terms of extent of transformation expected and likelihood that expected transformation can be realized over the assessment period