

The World Bank Group - Networked Carbon Markets

International Carbon Asset Reserve

Prototyping for instruments reducing risks and linking carbon markets

Final Report

Zurich/ London, 13 April 2016

Juerg Fuessler, Alexander Wunderlich (INFRAS) and Luca Taschini (GRI)

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The World Bank Group - Networked Carbon Markets

Bianca Sylvester

Project management

Juerg Fuessler

Authors

Juerg Fuessler, Alexander Wunderlich (INFRAS) and Luca Taschini (GRI)

INFRAS, Binzstrasse 23, 8045 Zurich

Tel. +41 44 205 95 95

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Executive Summary

Carbon market instruments are evolving in numerous jurisdictions around the world. However, this bottom-up development of domestic instruments has led to regulatory fragmentation and heterogeneity in design and regulation of such instruments across jurisdictions. The Networked Carbon Markets (NCM) initiative seeks to develop the services and institutions needed to enable a connected international carbon market.

The full linking of Emission Trading Systems (ETS) or equivalent market based instruments may provide numerous economic and political benefits. Full linking is costly though: it requires significant efforts in aligning the partnering systems and entails reduced levels of sovereignty for participating jurisdictions. As an alternative to full linking, restricted linking via an International Carbon Asset Reserve (ICAR) may be explored. The ICAR is an instrument in the context of NCM that allows to link different ETS or other market based systems in such a way that the participating jurisdictions can benefit from the linking in terms of increased liquidity in the markets and risk mitigation without the potential cost and loss in sovereignty of full linking.

The study presents ICAR prototypes for three different forms of restricted linking between carbon market schemes represent different options of ICAR design with distinct characteristics that may be used under different circumstances.

- *ICAR Platform*: A platform for restricted trading of emission permits
- *ICAR Central Hub*: A marketplace for emission permits and risk mitigation
- *ICAR Gateway*: A gateway for the transfer of credits and a provider of insurance services

These ICAR permit to reap the benefits of (restricted) linking while mitigating associated economic and political costs.

The preliminary “testing” of three ICAR prototypes in the context of hypothetical case studies that build on existing and proposed ETSs in actual countries allow to illustrate the operation of the prototypes and reveal strengths and weaknesses of the prototypes in different contexts. Also, areas for further development and research for ICAR instruments are identified.

1. Introduction

1.1. Background

Carbon markets have long been an important climate policy tool in driving emission reduction efforts in a cost-effective and flexible way. The Paris Agreement, which was adopted by 195 countries during the 21st Conference of Parties in December 2015 (COP21), recognizes the role of markets. In particular, Article 6 of the agreement contains trading provisions to support the use of “internationally transferred mitigation outcomes”.¹ As of 2016, Emission Trading Systems (ETSs) were operating across four continents in 35 countries, 13 states or provinces, and seven cities, covering 40 percent of global GDP, and additional systems were under development (World Bank (2015)).

The number of planned and proposed emission trading systems at supranational, national and subnational level is increasing. This reveals the importance of an architecture that allows such heterogeneous systems to interact as a significant element of the future global climate change policy framework (European Commission (2015), The Economist (2015), and Financial Times (2015)).² In fact, some programs have already decided to link together, meaning one program recognizes the other’s permits for compliance in its system and vice versa.³

The World Bank Group, through its Networked Carbon Markets (NCM) initiative is currently exploring the policies, market services and institutions needed to enhance the transparency, comparability and fungibility of heterogeneous climate actions for a linked international carbon market. The NCM initiative is comprised of three key components: (i) an independent assessment framework to determine the relative climate change mitigation value of units to be traded internationally, (ii) an international carbon asset reserve (ICAR), (iii) and an international settlement platform.

In this report, we conceptualise three possible ICAR architectures (Fuessler and Herren 2015, Comendant, Fankhauser and Taschini 2015) that facilitate the exchange of allowances from multiple jurisdictions and at the same time offer tools to help jurisdictions to manage carbon risks. The analysis focusses on emission trading schemes and their (partial) linking,

¹ The agreement is available at: <http://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf>

² Heterogeneity stems from the fact that each jurisdiction (country, state or province) independently determines the appropriate level of action and the required level of domestic mitigation actions.

³ There is an active link between the programs in Quebec and California, the so-called Western Climate Initiative (WCI), which four US states (New York, Vermont, Oregon, and Washington) and two Canadian provinces (Ontario and Manitoba) have expressed interest in joining. The Regional Greenhouse Gas Initiative (RGGI) in North-Eastern United States is effectively a multi-lateral link among participating states, see Ranson and Stavins and ICAP (2016). There are also examples of delinking. In May 2011, Governor Chris Christie announced that New Jersey would pull out of RGGI, effective at the end of 2011. At that point New Jersey would delink from the other states and end the compliance obligations for facilities in New Jersey. See Pizer and Yates (2015).

though the concepts may eventually be expanded to other market based instruments in climate change mitigation. Section 2.3 provides an ICAR prototype that may link into jurisdictions with non-ETS market instruments. The term jurisdiction is most appropriate since ETSS can be set up, and linked, at sectoral, subnational, national or regional levels. Therefore, we use jurisdiction in the rest of this report. Although the WBG's vision is very broad and includes any tradable carbon assets (e.g. energy efficiency certificates and renewable energy certificates), the study's focus is limited to emission allowances and credits.

The report is structured as follows. The next section, addresses the question why ETSS should link and how an ICAR can facilitate linking. To answer these questions the economic and political motivation for linking and the advantages of interconnection of ETSS via ICAR are discussed. Further, we offer our perspective on the implications of the Paris Agreement for ICAR. Section 2 reviews three alternative architectures of ICARs describing how they operate and discussing their key elements. In Section 3, we explore the evolution of carbon markets networking and the role of ICAR prototypes in each phase of this possible evolution. Section 4, illustrates case studies. In Section 5, we summarize the findings and offer conclusions on the main roles that an ICAR might play in a post-Paris climate change framework.

1.2. Why linking and how ICAR can facilitate restricted linking

Each ETS is developed under domestic circumstances. Linking, therefore, might require a significant degree of design features alignment to ensure compatibility, especially, if a full link shall be established. Generally, the form of a link between any two jurisdictions will lie along a spectrum that ranges from a very loose alignment of programme elements (restricted link) to a very tight alignment of programme elements (a full link). ETS design elements that might require alignment or another form of system design reconciliation are listed in Box 1 below.⁴ This section does not seek to exhaustively describe the different types and degrees of linking with the respective pros and cons. Rather, we introduce ICAR as mechanism to facilitate trade of carbon assets and help jurisdictions to manage risks and resource commitments associated with linking, at either end of the 'restricted link' and 'full link' spectrum.

There are economic and political motivations that make linking preferable over operating an ETS in isolation. Cost savings, reduced price volatility and increased market liquidity are the main economic motivations to link – whether it is a restricted or full link. There are also important benefits that are not strictly economic but more political or institutional. For example,

⁴ We refer to the recent ICAP publication on 'ETS Handbook' for a comprehensive description of type of link (e.g. one-, two-way or multilateral link) and degree of linkage (e.g. alignment of programme design).

a linking agreement requires the exchange of information on system design and technical aspects. Also, linking provides opportunities to improve the administration and governance of linked permit markets. The alignment of the administration and design of markets streamlines the compliance process and can lead to reduced administrative costs for business operating in those jurisdictions. Moreover, the benefits of linking can have ramifications that go beyond the geographical jurisdiction of the linking partners. Indeed, linking can lead to a levelling of the international playing field and to an improved support of global cooperation for tackling climate change.⁵

Full Linking

One of the key aspects of full linking is that it requires a high degree of consistency between the different program features in order to ensure equivalent environmental integrity of units and a well-functioning emissions market. These include the alignment of technical requirements (e.g. monitoring, reporting and verification (MRV) and tracking systems) and of design features (e.g. level of ambition, mode of allocation, inter-temporal flexibility, price management rules), all of which have to be negotiated.⁶ The harmonization of some design elements may be costly (see Box 1). Thus, the process of full linking can require significant and costly efforts that may discourage linking despite the potential benefits. Because full linking results in inheriting the design choices of the linking partners, the decision to link implies either accepting or reconciling each other's market design differences. There are economic caveats too. Under full linking, abatement cost shocks that affect regulated sectors in participating jurisdictions can be transmitted more easily.⁷

On a regulatory level, full linking (like all international arrangements) may require participating jurisdictions to give up some of their sovereignty and to accept rules that are defined by the linking partners.

⁵ Papers focusing on various aspects of these issues include Flachsland et al. (2009), Ranson and Stavins (2015), Burtraw et al. (2013) and Bodansky et al. (2014).

⁶ An important observation based on existing linked systems is that so far all of them consist of trading programmes with very similar design elements.

⁷ See Flachsland et al. (2009) and Doda and Taschini (2015).

Box 1: Pre-conditions required for full or restricted linking between ETSs

Linking requires a degree of consistency between the different ETSs and their programme features. This table summarizes the design features that need to be aligned to address political concerns and those that need to be harmonized to protect environmental integrity or market operation.

Below we distinguish between the difficulty in aligning programme elements.

- **Relatively easy to reconcile:**

- Technical issues such as monitoring, reporting and verification, compliance incentives and allowance tracking system.

- **Relatively hard to reconcile:**

- Environmental target such as emission cap, scope and timing of coverage, allocation, inter-temporal flexibility provisions and cost management provisions.

A key message here is that establishing a full linking arrangement can be costly, may decrease or increase risks and may lead to some loss of control over domestic priorities such as carbon prices or environmental targets.

Restricted linking through ‘Networking’

Recognizing that aligning ETS’ programme features can be a lengthy and costly process, especially once an ETS is already in place, restricted linking can offer an alternative solution. In this context, the concept of “networking” carbon markets has evolved and has recently been met with increasing interest. Rather than seeking to align systems, ‘networking’ is about facilitating trade of carbon assets by recognizing differences and placing a value on these differences.

Networking builds on an assessment framework to better understand the differences between heterogeneous ETS’, in order to compare the relative “mitigation value” (MV) of carbon units and facilitate their trade⁸. Comparing mitigation values across heterogeneous systems would offer policymakers at least three important benefits. First, policymakers would be able to identify which ETSs have the highest mitigation value and therefore would be able to learn from best practices when designing their own ETSs; this could accelerate the adoption of poli-

⁸ See Marcu (2015) and Macinante (2015) for more details on the different values of carbon units.

cies based on best practice too and might thereby improve the effectiveness of ETSs in general. Second, disclosing the mitigation values of different, heterogeneous ETSs would offer the level of information that is required in the current climate policy regime, and that might lead individual ETSs to enhance their ambition and increase abatement (Aldy 2014). Third, mitigation value assessments for ETSs can facilitate ‘restricted linking’ between ETSs by providing a simplified approach to discern whether a potential linking partner’s ETS has sufficient environmental integrity; this contrasts with how regulators currently make linking decisions, which are typically based on a much less formal consideration of relative mitigation value. These points highlight that networking offers potentially large benefits and could incentivize more abatement and more effective abatement by ETSs.⁹

This paper goes into further detail about ICAR as one institutional component of ‘networking’. ICAR is a mechanism that facilitates interconnection among heterogeneous ETSs and provides jurisdictions worldwide with the possibility to tap into a larger pool of allowances. Depending on the elements that constitute each ICAR, this mechanism can also offer services to mitigate risks of carbon instruments despite programme heterogeneity. As will be explained in section 2, this is because ICAR can facilitate linking at a larger scale. Overall, ICAR provides an opportunity to lower mitigation costs whilst also preserving national sovereignty of member jurisdictions.

Each ICAR described in section 2 has different rules governing allowance transfer and provides various risk mitigation services. The ICAR “prototypes” presented illustrate different potential ICAR approaches that jurisdictions may explore depending on different circumstances and needs.

1.3. Assumptions regarding the Paris Agreement

The recently adopted Paris Agreement (UNFCCC 2015) provides an important new framework for carbon market instruments and therefore is of relevance for the concept of networking and the design of ICARs. According to our analysis, the Paris Agreement may provide the regulatory basis for “cooperative approaches” (articles 6) that may encompass at least two novel market mechanisms:

⁹ Further information on mitigation value and the introduction of an independent assessment framework to evaluate it, can be found at *Networked Carbon Markets – Key Elements of the Mitigation Value Assessment Process*, <http://www.worldbank.org/content/dam/Worldbank/document/Climate/Networked%20Carbon%20Markets%20Key%20Elements%20of%20the%20Mitigation%20Value%20Assessment%20Process.pdf>

- i. a “mechanism to contribute to the mitigation of GHG emissions and support sustainable development” which is to be supervised by a centralized body under the UNFCCC – similar to the CDM, but including not only project based actions but also policies and other aggregated level mitigation interventions (Art. 6.4) and
- ii. a more broadly defined transfer of “internationally transferred mitigation outcomes”, resulting from countries’ domestic mitigation actions (articles 6.2 and 6.3) .

We assume that these “Art 6 – mechanisms” lay an internationally accepted framework for the transfer of “internationally transferred mitigation outcomes” in general. This may lead to the emergence of more compatible carbon systems, i.e. programmes that share common elements and rules, and are more commonly accepted than many observers assumed before the Paris COP and may also facilitate the exploration of restricted linking mechanisms such as ICARs.

Also, we assume that with the implementation of a mechanism that is centrally governed by an UNFCCC body (i) the agreement on and (ii) the issuance of a commonly accepted international unit (below called the “international unit”, IU) is much more likely. More specifically, the existence of a UNFCCC-defined international unit will simplify the functioning of the last two ICAR prototypes.

2. Overview of prototypes of ICARs

In the following, three specific ICAR “prototypes” are presented. They represent different options of ICAR design with distinct characteristics that may be used under different circumstances. These prototypes build the focus of the present analysis. However, other prototypes or combinations of the prototypes are possible and may be analysed in future studies.

Element	1. «Platform»	2. «Central Hub»	3. «Gateway»
Approach	«Hands off»	«Hands on»	«Facilitator»
ICAR Service	Platform for restricted trading of emission permits	Marketplace for emission permits and risk mitigation	Gateway for transfer of credits Insurance services
Units	Local Units	International Units	International Units
Reserve	No	Yes	Yes

The first two prototypes represent two extremes in a range of approaches that could be considered: “Platform” with a hands off approach, leaving a maximum of sovereignty to member jurisdictions versus the “central hub” that shifts more control and functionality to the ICAR. Both prototypes provide a form of restricted linking with varying levels of control and risk taking between member jurisdictions, facilitating the transfer of carbon asset units between market participants.

The third prototype is a more specialized ICAR. It facilitates the transfer of mitigation outcomes or units from a (e.g. developing country) member that uses a type of carbon instrument other than ETS (e.g. project based offset mechanisms, aggregated level instruments or policies) to buying members that have implemented local ETSs.

2.1. ICAR Prototype 1: «Platform»

Description: The primary objectives of ICAR *Platform* prototype is to facilitate inter-connection of ETSs and use the potential of low-cost abatement opportunities that are geographically spread across the participating jurisdictions. The ICAR Platform consists of a decentralised trading platform, a marketplace, where market participants can buy and sell allowances originating from multiple (possibly dissimilar) ETSs.

How ICAR Platform operates: Participation is voluntary (opt-in). Jurisdiction sovereignty and programme independence are paramount. Participating jurisdictions retain control on the domestic market by (i) imposing quantitative restrictions on the outflow of domestic allowances (export impact) and on the inflow of non-domestic allowances (import impact), and also by (ii) imposing qualitative restrictions on the inflow of non-domestic allowances e.g. by inde-

¹⁰ This work builds on earlier work on ICAR. ICAR-M, ICAR-MP and ICAR-R as discussed in Comendant, Fankhauser and Taschini (2015) and on design options for ICARs including insurance functions as discussed in Fuessler and Herren (2015).

pendently deciding on the compliance values¹¹ it would like to assign to them (import impact). In ICAR Platform system a jurisdiction will only allow for the import of an amount of non-domestic allowances equivalent to one unit of domestic compliance value.¹²

On ICAR Platform, each jurisdiction can control the timing, type and volume of export allowances (represented by the valve and the arrow moving from the ETS to ICAR in Figure 1 below). Allowance export mitigates the impact of low domestic prices, whereas export control mitigates the exposure to high foreign demand. Similarly, each jurisdiction can control the timing, type and volume of imported allowances (represented by the valve and the arrow moving from the ETS to ICAR in Figure 1 below). Allowance import mitigates the impact of high prices. Via import quantitative restrictions jurisdictions can control the permit inflows and the geographical location of foreign mitigation activities, whereas via import qualitative restrictions jurisdictions can differentiate between the different compliance values it perceives domestic and non-domestic allowances to carry.

A regulator may choose to assign a non-domestic allowances with different compliance value in order to acknowledge the differences in various elements of the domestic and non-domestic programmes. In particular, such differences may arise with respect to ambition levels of ETS caps, monitoring, reporting and verification (MRV), registry systems, banking and borrowing provisions, compliance periods, and cost containment measures (including offset types and limits). Whereas differences in MRV and allowance tracking systems may be more or less acceptable, a lower (higher) degree of ambition in other programme elements (e.g. cap level, cost management provisions) may be harder to accept (achieve), resulting in lower (higher) compliance values being applied to non-domestic allowances within the domestic market.

Thus, ICAR Platform is a de-centralised system that offers a *pool* of non-domestic allowances available for trading, from which a jurisdiction will import those that have a compliance value equal to or higher than that of domestic allowances.¹³ The participating jurisdictions set their own compliance compatibility criteria, which ICAR aggregates to aid with the matching process and/or uses to screen out jurisdictions that are compatible with the jurisdiction initiating the bid process.

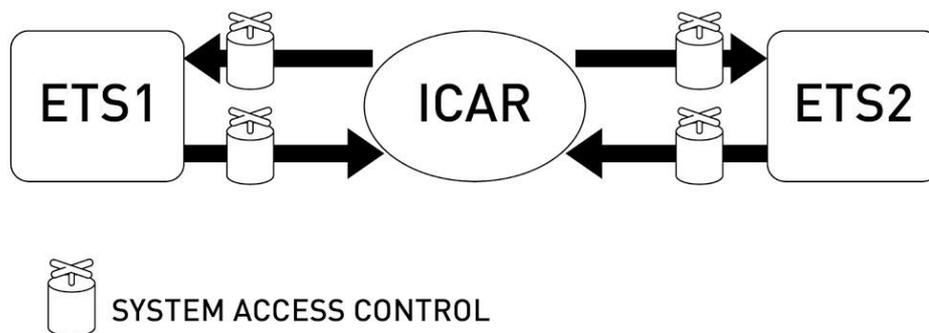
¹¹ A compliance value refers to the carbon value assigned by a regulator to a domestic or a non-domestic allowances. A compliance value equal to 1 means that one allowance only is needed to cover the emission of 1 tCO₂e. A compliance value less (greater) than 1 means that a proportionately greater (lower) number of allowances is needed to cover the same ton of emissions. For a more extensive discussion, see (Austin, 2015), Macinante (2015) and Marcu (2015).

¹² Thus ICAR Platform can exist even in the absence of an international mechanism for determining the mitigation values of allowances from different jurisdictions. In contrast to compliance values, the mitigation values are legally defined by the accepting jurisdiction and are aimed to facilitate the comparison of mitigation values associated with different units of emissions reduction. For more details see Macinante (2015) and Marcu (2015).

¹³ Because each jurisdiction can individually determine the compliance value they'd like to attribute to a non-domestic allowance, a non-domestic allowance can have different compliance values within the ICAR Platform. By contrast, the mitigation value of an allowance is universal (see footnote 10) – for this reason, we selected the compliance value rather than the mitigation value as the allowance exchange factor within the Platform.

Units: The net effect of all jurisdictions' assessment of each other's compliance values will be reflected in the allowance price spreads within ICAR Platform. An allowance price will thus reflect the implicit value of an allowance within ICAR Platform. Thus ICAR Platform does not need to create international units. Allowances will be directly transferred from one ETS to another through the matchmaking platform.¹⁴

Figure 1: ICAR Platform diagram.



Source: Authors.

Membership: Membership is open to any jurisdiction. There are no specific minimum requirements in terms of programme design. A programme's quality will be indirectly assessed via the compliance values that are attributed to new allowances relative to those of the existing members. Membership fees give market participants of member jurisdictions access to the exchange platform and other services, such as programme information and the clearing house.

Institutional and regulatory requirements: The platform requires all of the generic elements (see Box 2 below). As this ICAR type is more "hands-off" with relatively little decision power, the rules leave ample control over the ICAR to participating countries/ jurisdictions and the executive body's oversight is limited to administrative matters.

Process towards setting up an ICAR Platform: Because ICAR Platform allows jurisdictions to control their allowance inflows and outflows, the decision to join the ICAR Platform is politically attractive. This is especially given that, due to the wider marketplace that ICAR offers, the addition-

¹⁴ The Platform architecture can assume the parallel existence of a carbon asset rating although this is not strictly necessary for the operation of this ICAR.

al economic benefits from allowance transfer are higher than the costs. The prospect of these immediate net-benefits justifies the initial development of an ICAR Platform to connect jurisdictions. This is possible even when prospective member jurisdictions do not necessarily satisfy those preconditions required under direct linking (see Box 1). In this way, the ICAR platform can promote an organic growth of the interconnected system through learning by doing and stepwise opting-in of additional ETSs (see Section 3).

Box 2: Generic institutional and regulatory elements of an ICAR

Each type of ICAR requires at least three institutional and regulatory elements:

- An **agreement** between participating countries/ jurisdictions that defines
 - the rules for the operation of the ICAR (e.g. definition of trigger points etc.)
 - the rules regarding the rights and responsibilities of each member state/ jurisdiction (e.g. requirements for participation and opting-in, contribution to finance/ pooling capacity, role and rules for executive body)
- A governing “**executive body**” that supervises the ICAR and decides on the application of the rules. Typically, the executive body is formed by representatives of all participating jurisdictions according to the rules of the agreement.
- An operational “**secretariat**” that operates the ICAR on a day to day basis

2.2. ICAR Prototype 2: «Central Hub»

Description: The primary objectives of ICAR *Central Hub* are (1) to facilitate *the restricted linking*¹⁵ of ETSs so that low-cost abatement opportunities that are geographically spread out can be tapped into; and (2) to provide a tool for mitigating carbon risk via a centralized intermediation service and via the provision of allowance buy and sell services.

The Central Hub considers two main risks: import risk and price risk. The former refers to the risk associated to imported non-domestic allowances, such as over-value and delivery risk (more on this below). The latter refers to the risk associated with domestic allowances. By in-

¹⁵ See Box 1.

intermediating the exchange of allowances among member jurisdictions and by creating International Units (these are discussed later), ICAR Central Hub mitigates the risk that imported allowances are over-valued. At the same time, by providing buy and sell services ICAR Central Hub generates a pool of allowances which can be used by member jurisdictions to address local market imbalances, ultimately mitigating carbon price risk.¹⁶

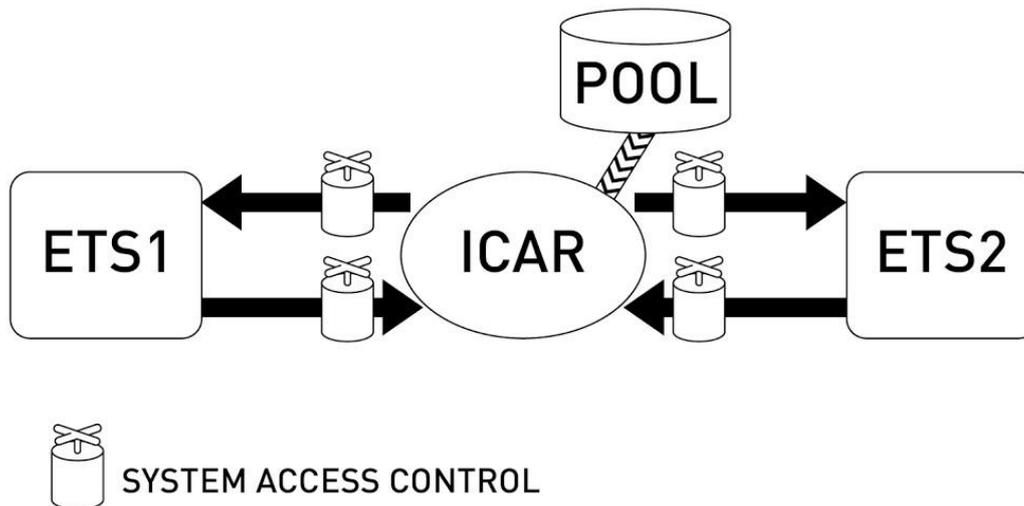
Units: A pool of internationally-fungible allowances (IU) will be available to market participants as part of the Central Hub's mandate to provide supply-side services. The emergence of IUs aligns with the recently adopted Paris Agreement (UNFCCC 2015), which recognises the adoption of cooperative approaches that involve the use of 'internationally transferred mitigation outcomes' (see also section 1.3 Assumptions regarding the Paris Agreement). Because IUs are issued against a basket of allowances previously bought from participating jurisdictions, the sale of IUs by the Central Hub will effectively imply a transfer of mitigation outcomes from the jurisdictions making up the basket to the buying jurisdiction.

Allowances included in a basket are chosen on the basis of their relative mitigation values. Based on their mitigation values, allowances are attributed weights which need to add up to 1 to create an IU. Once an IU is issued, the underlying allowance(s) is (are) cancelled and removed from the Central Hub allowance reserve.

Trading of IUs within the Central Hub can be either restricted or unrestricted. In the first case, IUs are issued directly to a jurisdiction and are only used to meet domestic compliance obligations. By contrast, in the second case IUs can also be openly traded within the domestic market, this will create a secondary IU market so that IUs are traded alongside domestic allowances.

¹⁶ Specifically, price risk refers to carbon asset return variations due to local policy changes and low-carbon technological advances independent of the level of domestic emissions.

Figure 2: ICAR Central Hub diagram.



Source: Authors.

How ICAR Central Hub operates: The market participants' recourse to the Central Hub's services is rule-based (i.e. driven by triggers) – thus predictable – and aims at mitigating market risks on both the permits buy and supply sides. As such, Central Hub's services are contingent and are triggered when member jurisdictions face particular local conditions. The trigger for what constitutes a contingency is pre-agreed with each jurisdiction and requires the approval of all participating jurisdictions.

Operationally, this will be decided by the executive body of ICAR. There are a number of options for the design of a trigger. A natural approach would be to index Central Hub's buy and sell services to changes in the economy, in the allowance price, or in the allowance quantity. The first option requires the identification of a proper economic activity indicator. This is a daunting task: The canonical indicators (GDP, electricity consumption, share of renewables generation, etc.) do not promptly capture relevant changes in the economy.

Allowance price- and quantity-based triggers are more transparent and simple to implement. For instance, the executive body of ICAR and the perspective member could set a price threshold – a maximum price in a participating ETS activates the supply service and a minimum price activates the buy service. Prices are already the indicator used to change allocation of allowances in California and in RGGI.¹⁷ Similarly, the executive body of ICAR and the perspec-

¹⁷ We refer to Hasegawa and Salant (2014) and Gruell and Taschini (2011) for a discussion on price-based triggers.

tive member could set a quantity threshold – a maximum quantity of allowances allocated and unused for compliance activates the buy service and a minimum quantity activates the sell service. As part of the EU ETS reform, the European Commission has approved the implementation of a quantity-based adjustment of allowance allocation, the so-called Market Stability Reserve.¹⁸

Once the trigger is activated – with respect to allowances from a particular participating ETS – the Central Hub can buy allowances and sell international units (see discussion about Units above). It is imperative that market participants are provided with transparency and predictability of the rules by which the jurisdiction’s regulator will assess whether the domestic market requires adjustments and the policy options available to undertake such adjustment, including Central Hub services.¹⁹ To this end, at the time of its membership acceptance, the executive body and the regulator of the perspective member jurisdiction will communicate to the local participants the rules by which the Central Hub will be active on the domestic market. Once the trigger is activated, i.e. the price goes below the price floor, the Central Hub has the obligation to buy allowances (hold an ascending permit-buy auction for the market players where the allowance price trigger levels are pre-agreed with the regulator).

When trading is restricted, market participants are regulators; when trading is unrestricted, market participants are compliance entities. If the price rises above the price ceiling, the Central Hub is again triggered and issues IUs against local allowances and has the obligation to hold a descending IU sell auction for domestic market participants. In order to preserve the control on the environmental target, the max number of IUs that can be sold and other rules are pre-agreed between the executive body of the Central Hub and the regulator as part of the ICAR agreement. These IUs will have to be removed from the local market by the regulator at some point in the future.

Interaction with local policies – ICAR Central Hub can complement or supplement member jurisdictions’ own price containment mechanisms or provide price containment services directly to (private sector) ETS participants. In the case of over-supply, the Central Hub can complement the local supply-side management efforts (the latter absorbing the first layer of risk); or agree with the jurisdiction that the task for removing the excess from the market should be entirely left in the jurisdiction’s hands. This alleviates the financial pressure on the Central Hub.

¹⁸ We refer to Kollenberg and Taschini (2015) for a discussion on quantity-based triggers and the Market Stability Reserve.

¹⁹ For example, the regulator might deem the system in over-supply. In this case, through its mandate ICAR should support the regulator’s decision to remove some of the permits from its system so that the imbalance is rectified.

In the case of under-supply, the release of allowances from local reserves via local auctions can be complemented with the auctions held by the Central Hub.

Alternatively, the Central Hub intervenes once domestic measures are completely deployed. The reasons that a jurisdiction would prefer ICAR's sell-side services rather than create and manage its own local reserve are (i) a local reserve is costly financially and politically; and (ii) because ICAR taps into a wider spectrum of low mitigation options the price of IU's should be lower than that of local allowances and (iii) the pooling of risks can lead to a reduction of risk mitigation costs.²⁰

Membership - Membership to ICAR Central Hub is generally open to any jurisdiction. While 'networking' doesn't advocate for minimum requirements in ETS design and operation, jurisdictions will ultimately have the right to impose minimum requirements in ETS design and operation, if they feel it is necessary pre-condition for (restricted) linking. However, ICARs will only form if member jurisdictions can agree on the form and rules of the ICAR and a level playing field can be established. The rules have to be defined in such a way that participating jurisdiction can be assured that they will not systematically lose money or domestic allowances through participating in the ICAR.

Therefore, in practice the negotiations on an ICAR agreement may lead to implicit membership criteria referring to certain level of compatibility with respect to the ambition of the ETS, MRV, registry systems, banking and borrowing provisions, and cost containment measures (including offset types and limits). In principle, these membership requirements tend to be more stringent than the ones applied by ICAR Platform. Membership fees give member jurisdictions access to the ICAR Central Hub services: wider allowance market and carbon risk mitigation tools.

Institutional and regulatory requirements: The central hub requires all of the generic elements (see Box 2 on p. 10). As this ICAR type is more "hands-on" with relatively larger decision-making power of the executive body on the provision of its services, the legislative framework tends to be more elaborate and requires a comprehensive negotiation process between ICAR members to agree on the rules. These process requires agreeing on key elements such as minimum levels for MRV, transparency, rules for (re-) capitalization of buffer (in carbon units and financially) approach to dynamic cap setting etc.

An illustrative *case study* on the ICAR prototype Central Hub is provided in section 4.1.

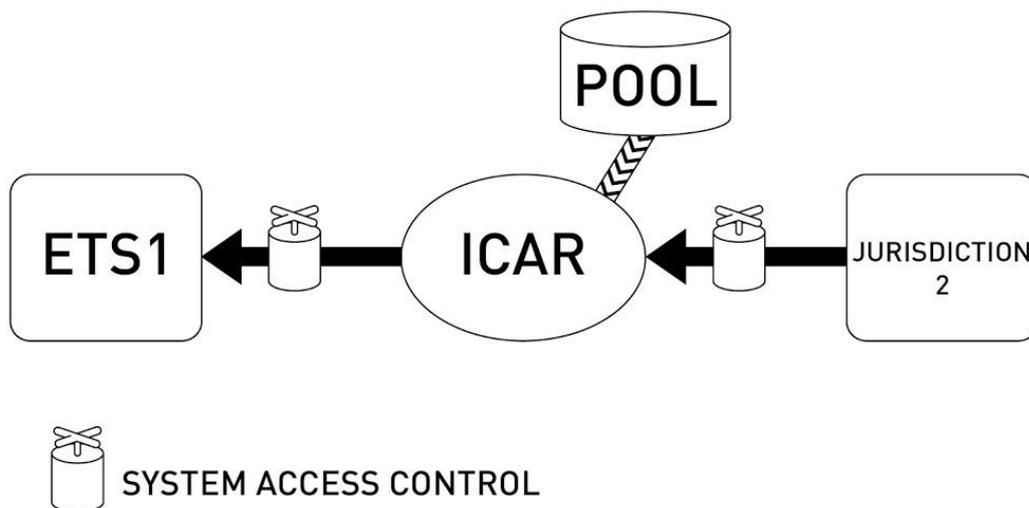
²⁰ On the benefits of pooling see also section 3.1 in Fuessler and Herren (2015).

2.3. ICAR Prototype 3: «Gateway and Insurance»

Description: The primary objectives of the ICAR *Gateway and Insurance* are to facilitate the creation and transfer of units from a jurisdiction (2 in Figure 3) with a carbon instrument other than ETS (including project based offsetting mechanisms, aggregated level instruments or policies etc.) to buying members with demand in units from their ETS (1). The *Gateway* provides also insurance services to both the seller side (e.g. guaranteed minimum uptake, price floor) and buyer side (e.g. delivery guarantee, price ceiling). With this, the ICAR Gateway is practically an exchange that includes also risk mitigation instruments for market risks as well as project risks and may even include specific services to foster mitigation action in the host country by *any* carbon instrument.

The Gateway facilitates the transfer of internationally-fungible allowances (IU).

Figure 3: ICAR Gateway and Insurance diagram.



Source: Authors.

How does ICAR operate: On the side of the jurisdiction/ country hosting the mitigation actions (buy side), the Gateway provides an interface to the local carbon instrument. It pays for MRV'd mitigation outcomes according to pre-defined rules and covering some of the risks. If needed, the Gateway supports the host jurisdiction in translating the measured mitigation outcomes (e.g. kWh of renewable power produced, level of fuel efficiency standard achieved) into international units according to internationally accepted rules and methodologies.

On the sell side, the Gateway ICAR offers international units of guaranteed quality, volume (and price) to buying ETSs. In order to reduce the costs for risk mitigation, the ICAR maintains a pool of international units and capital.

Insurance functions: The Gateway ICAR can also provide numerous insurance functions, depending on the needs of participants, available resources and “risk appetite”.²¹ On both the sell and buy side, the Gateway can provide price floors and ceilings as in the Centralized Hub ICAR.

On the buy side, the Gateway ICAR could provide a wide range of risk mitigation functions. This may include mitigation against risks of non- or underperformance of mitigation activity, risk of non-permanence of agriculture, forestry and other land use units, risk of non-eligibility of units in carbon markets as well as technical risks such as Electricity Price and Outage Solutions (ELPRO), hedging against low solar irradiation for PV etc. As these risks often represent key barriers for the scaling up of mitigation action, the risk mitigation provided by the Gateway may play an important role in unlocking the diffusion of low carbon technologies in host countries.

On the sell side, the Gateway ICAR can provide customized products such as maximum price ceilings as needed by buying entities in member ETSs.²²

Membership - Membership is open to any jurisdiction as long as they are eligible to a commonly accepted international mechanism. An important prerequisite for participation of host country in Gateway are stringent provisions against double counting of units.

Institutional and regulatory requirements – the Gateway ICAR requires all generic institutional and legal elements (see Box 2 on p. 10). On the side of purchasing mitigation outcomes from entities in the host country, various functions are required in the ICAR secretariat, such as specialist staff for due diligence, risk management, MRV methodologies, tracking of units, and potentially capacity building and sourcing of mitigation actions. On the side of selling units to participating ETSs, functions for counterparty and other risk management, pooling/ hedging of units etc. are required.

All functions of the ICAR Gateway secretariat could be carried out by public, semi-public agencies, NGOs, IFIs or private sector entities.

Illustrative *case studies* on the ICAR prototype Gateway is provided in sections 4.2 and 4.3.

²¹ See also discussion of risks and ICAR risk mitigation functions in Fuessler and Herren (2015).

²² As a variant, the Gateway ICAR could also serve as a provider of MRV'd mitigation outcomes for results based finance in the framework of climate finance.

3. Evolution of networking and the role of ICAR prototypes

Achieving globally networked carbon markets is a challenging task and it will likely be a gradual process. Fortunately, there has been growing international support for approaches that can promote the exchange (or transfer) of mitigation efforts worldwide, such as most recently, Article 6 of the Paris Agreement (see section 1.3).

In this context, the case for new regulatory frameworks and policies, market infrastructure and services supporting the emergence of a global carbon market – such as those proposed by an International Carbon Asset Reserve (ICAR) – is strengthened. However, rather than an end result, the scope of ICAR should be seen along a continuum. Although ICAR can ultimately facilitate the exchange of different carbon units among heterogeneous jurisdictions worldwide, it can also provide the benefits of intermediate services as the system matures.

Probably one of the most important aspects that will shape the way in which ICAR evolves relates to the establishment of a universal mechanism that will determine the mitigation values of carbon units (see section 1.2). This is important because having a single valuation system will enable comparability – and thus fungibility – of mitigation outcomes from different jurisdictions.

Given the significance and the difficulty of establishing a mitigation value system, we distinguish between three possible stages in the evolution of (restricted and full) linking agreements: a germination stage, a growth stage, and a consolidation stage. We describe the three stages below.

Restricted linking does not necessarily have to rely on a mitigation value system already being up and running. In fact, some ETS have already decided to link together by mutual accepting of each other's compliance value. Various bilateral agreements can operate while the mitigation value system is being built up (which can be a lengthy process), so as to allow participating jurisdictions to get accustomed with restricted trading of a wider pool of allowances that are compliance compatible with the domestic market (i.e. that are deemed by each jurisdiction to have compliance values comparable to those of domestic allowances). This initial stage allows jurisdictions to gain experiences with a new system of restricted linking with limited political cost (given the compliance compatibility requirement of non-domestic allowances and the high level of control over the flows of units in a restricted linking system) and creates a critical mass of participants that will be better prepared to embrace new ICAR elements as the system matures. ICAR Platform aligns with the requirements above because it allows jurisdictions to trade amongst themselves based on their own assessment of non-domestic allowances (by controlling the compliance values of these allowances in the domestic market). We call this stage the **germination stage** to signify the emergence of linking and network agreements (see

Box 2 in section 2.1) that are easiest to establish, based on an ICAR platform. The ICAR Gateway is the second prototype that could emerge in this early stage. By facilitating the transfer of mitigation outcomes from non-ETS carbon instruments to jurisdictions with ETSs, this ICAR promotes networking with (e.g. developing country) jurisdictions that do not have an ETS. This broadens considerably the range of jurisdictions that can benefit from ICAR solutions.

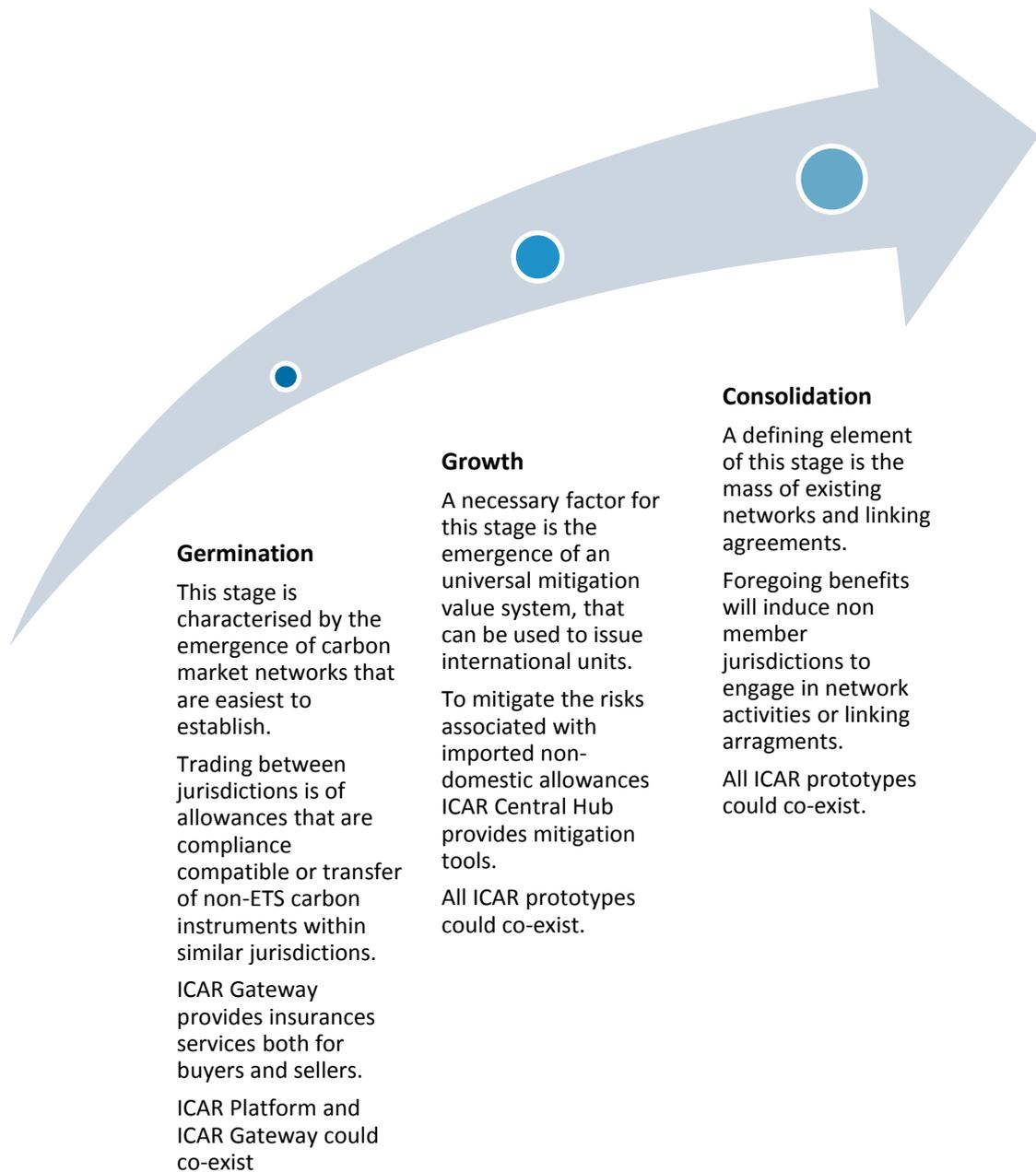
The second stage in the dynamics of linking is the **growth stage**. One of its new key elements is the establishment of the mitigation value system, on which basis ICAR can issue international carbon units, or IUs.²³ This is a significant step because the issuance of IUs facilitates the inter-connection (or networking) of jurisdictions regardless of how heterogeneous they are relative to one another. As a consequence, the breadth of emission allowance exchange is enhanced amongst the participating jurisdictions, largely because mitigation efforts are measured by a universal set of rules that are enforceable. Furthermore, the ICAR offers in the growth stage offers as the second key element an array of risk mitigation tools. In this way, IUs take on the dual purpose of (i) facilitating low-cost mitigation by tapping into a wider pool of allowances and (ii) helping domestic markets address local shocks while mitigating risks associated to imported allowances and restricted linking. During this stage the ICAR Platform and the ICAR Central Hub could co-exist. Also, the availability of international units facilitates the use of ICAR Gateways between jurisdictions with various carbon instruments.

Finally, the last stage in the dynamics of the co-evolution of the NCM and ICAR is the **consolidation stage**. A defining element of this stage is that the networking via ICARs in restricted linking arrangements between different jurisdictions reached such a critical mass and provides visible benefits to its members that they may exert a “gravitational pull” on non-member jurisdictions, especially medium- and small size ones, and induce many of them to engage in networking agreements.

We summarise our discussion of ICAR’s evolution via the diagram below.

²³ Conceptually, IUs are the equivalent of ITMOs. We use IUs in this report, but the naming can change in subsequent versions.

Figure 4. Co-Evolution of Networked Carbon Markets and ICAR Prototypes



4. Testing of ICAR prototypes in case studies

In this section, the second and third ICAR prototypes described in Section 2 are “tested” in the context of hypothetical case studies that build on existing and proposed ETSs in actual countries. We set the assumptions at the outset of the case studies and on that basis develop how the specific ICAR prototypes could work in these cases. This exercise allows us to illustrate the functioning of the prototypes and to identify strengths and weaknesses of these concepts in the context of the constructed case studies.

Please note that the case studies are purely hypothetical and do not suggest that the mentioned countries should actually seek soft-linking through ICARs. The cases should rather stimulate the discussion and provide preliminary insights on what the pros and cons of such ICARs might be for participating jurisdiction.

4.1. Case study: ICAR Central Hub ETS China – ETS South Korea

Background

China implemented seven provincial pilot markets since 2013. A national ETS is planned for 2017. South Korea started its national ETS in 2015 (Korea ETS). Both countries stated that there is no linking foreseen until 2020. But China expressed some interest in exploring options for international linking after 2020. China’s national ETS is expected to cover around 4 billion tonnes of CO₂e, or seven times the size of the existing Korean ETS, which is the world’s second largest ETS today. China’s pilot markets as well as the Korean ETS have different price stabilization mechanisms in place, such as a limited buffer of allowances to sell to the market.

Assumptions

Our case study builds on the following assumptions for a time period after 2020:

- China and South Korea have domestic ETSs on a *national* level. The coverage of sectors, stringency of caps, MRV rules etc. as well as price levels may be different between the two ETSs.
- Both ETSs have price floor and ceiling provisions in place with a limited buffer of allowances.
- China and South Korea agree to become members of the ICAR Central Hub that supplements their domestic risk mitigation instruments. At the moment of membership, the perspective members settle on the ICAR rules, such as buffer size and initial capitalization, rules for risk mitigation (including ICAR and domestic trigger price levels), etc.

How the ICAR Central Hub would work

Let us assume that South Korea experiences a strong economic growth and domestic allowance prices are increasing. In an attempt to reduce the demand pressure on the domestic market, the Korean Emission Permits Allocation Committee activates the domestic instrument: a rules-based price containment mechanism. When Korean allowance prices hit the price ceiling, extra allowances are made available on the domestic market to counteract the increasing price. Let us assume now that domestic measures are not sufficient to mitigate the upward price pressure, e.g. the domestic buffer is completely depleted. As part of the pre-agreed rules of the ICAR Central Hub, IUs are made available to South Korean market participants ultimately reducing the demand pressure and stabilizing domestic prices.



Table 2: Preliminary findings – benefits and costs of ICAR Central Hub for the participants:

Pros – Benefits	Cons – Costs
<ul style="list-style-type: none"> - SK benefits from pooling: The total buffer size required (domestic buffer and contribution to Central Hub) can be of a smaller size to guarantee the same level of price risk mitigation and/or higher risk mitigation service can be provided²⁴ - ICAR supplements domestic policies. As such, it does not require the same level of system design alignment of participating ETS as a full (hard-) linking, especially with respect to price floor and price ceiling - Both jurisdictions may benefit from the negotiation process for the ICAR agreement. This process requires a certain level of comparability between the systems and agreeing on key elements such as minimum levels for MRV, transparency, approach to dynamic cap setting etc. that may help to make the ETSs more robust. - The ICAR central hub may be a test bed for linking and cooperation and may lay the foundation for the eventual full linking of the ETSs. 	<ul style="list-style-type: none"> - Members pay a fee to ICAR. Capitalization of ICAR buffer may be at the expense of the domestic ETS cap. - ICAR agreement partially reduce sovereignty – though less than in full linking - CHN: SK ETS is too small to have a significant impact in risk mitigation for CHN ETS. (However, this is true for any linking with smaller entities and not a specific drawback of the Central Hub).

Source: authors.

²⁴ For benefits of pooling see section 3 in Fuessler and Herren, 2015.

4.2. Case study: ICAR Gateway EU ETS – Feed in Tariff for renewables in Tunisia

Background

There is a large potential for emission reductions from an accelerated use of renewables in Maghreb countries such as Tunisia. However, renewable energy projects in these countries are often not financially viable due to various economic and non-economic risks and resulting high cost of capital. Mitigation of these risks would lead to reduced financing costs and allow a scaling up of investments in renewables in these regions (Waissbein et al. 2013). Networking of the EU ETS to these programmes, e.g. the import of carbon assets generated by renewable energy projects in the Maghreb countries via an ICAR Gateway, could reduce mitigation costs and enhance overall efficiency.

Assumptions

- There is a demand in the EU ETS for foreign mitigation outcomes
- EU ETS and Tunisia join the ICAR Gateway and agree on the transfer of mitigation outcomes from new renewable power plants
- As part of the ICAR agreement, the Tunisian government (potentially supported by international financial institutions) commits itself for the long term financing of the feed-in-tariff (FiT).

How the ICAR Gateway would work

The ICAR Gateway holds auction(s) for long term feed in tariff contracts for new renewable power plants. The guaranteed feed in tariff together with other risk mitigation instruments mitigates entry barriers to investors, reduces cost of capital and facilitates the creation of a new bankable asset: the renewable power plant. This facilitates the scaling up of renewable generation capacity in Tunisia. The Gateway buys the generated electricity from producers and sells to the government (thus protecting generators from payment issues). It exchanges non-marketable *produced renewable electricity* into international units²⁵ representing the equivalent in tonnes of non-emitted CO₂e due to the generated renewable power. The ICAR Gateway translates the mitigation value and sells guaranteed volumes of created IUs into the EU ETS to entities/ installations.

²⁵ E.g. based on an revised version of the CDM's grid tool, taking into account the NDC and ruling out double counting.

Table 3: Preliminary findings – benefits and costs of ICAR Gateway for the participants

Pros – Benefits	Cons – Costs
<ul style="list-style-type: none"> - TN: Model of guaranteed FiT fosters investment and scaling up of renewable power generation. - Both jurisdictions may benefit from the negotiation process for the ICAR agreement. Tunisia may have to remove regulatory barriers and risks for investors. EU ETS has to increase stringency of ETS cap to stimulate demand²⁶. - This process requires agreeing on key issues such as minimum levels for MRV, transparency, approach to cap setting etc. that may help to make the ETSs more robust. - EU can benefit from high renewables potential in Tunisia and lower cost mitigation outcomes. - The ICAR Gateway may be a test bed for soft linking and cooperation and may lay the foundation for the eventual full linking of carbon instruments. 	<ul style="list-style-type: none"> - If not designed adequately, risk coverage of ICAR Gateway may lead to moral hazard on both buy and sell side - Members pay a fee to ICAR. Capitalization of ICAR buffer may require limitation of domestic cap. - ICAR agreement limits sovereignty – though less than in full linking - (Host-) country risk needs to be adequately mitigated, as risk capacity of ICAR Gateway is limited.

Source: authors.

4.3. Historical case study: Prototype Carbon Fund as an early ICAR Gateway

PCF as illustration for ICAR Gateway

Instruments similar to the ICAR Gateway prototype have already existed in the past: An early example of the Gateway ICAR was the World Bank's Prototype Carbon Fund (PCF) in its early days following definition of the CDM in the Kyoto protocol. The PCF entered into emission purchase agreements to buy future units from would be CDM projects at a pre-agreed guaranteed price. The model was very successful in starting a market and building up CDM related capacity in governments and private sector in many countries even though many uncertainties on the emergence of a robust CDM market prevailed.

The PCF responded to this uncertainty by mitigating regulatory risks for project developers. For instance, in the beginning of the PCF, the rules of the CDM and the nature and legal defini-

²⁶ Another options might be for the EU to create demand for IU from the ICAR Gateway e.g from the non-ETS sector.

tion of units (CERs) were not yet well defined. By accepting both CERs but also VER units from the privately operated VCS standard in case the UNFCCC based CDM registration and issuance process would not work, the PCF removed a key risk for project developers and facilitated the emergence of the CDM market.

Findings

Similarly to the situation after the Kyoto-Protocol, potential project developers face numerous uncertainties in the current post-Paris framework, related again primarily to demand and regulation. Here, an ICAR Gateway that removes regulatory, institutional and market risks might again be decisive for the emergence of new markets under Article 6 of the Paris Framework. Alternatively, the ICAR Gateway could serve as an instrument to facilitate results based climate finance.

5. Conclusions and way forward

The full linking of Emission Trading Systems or equivalent market based instruments may provide numerous economic and political benefits. Full linking is costly though: it requires significant efforts and entails reduced levels of sovereignty for participating jurisdictions. The proposed ICAR prototypes represent intermediary mechanisms for different forms of restricted linking between carbon market schemes, also in the context of the Networked Carbon Markets. These ICAR permit to reap the benefits of linking while mitigating associated economic and political costs.

The preliminary “testing” of three ICAR prototypes in the context of hypothetical case studies that build on existing and proposed ETSs in actual countries allow to illustrate the operation of the prototypes and reveal strengths and weaknesses of the prototypes in different contexts.

In order to further develop the ICAR concept, to progress in their understanding and to put the ICAR prototypes into practice, the following tasks may be considered:

- Further development of the three ICAR prototypes, touching on issues including process for building up rules for operation, (re-) capitalization, risk management, regulatory and institutional setting, role of conversion of units (mitigation vs. compliance value), etc.

- Further expanding on hypothetical case studies. Work qualitatively and quantitatively (modelling) on key elements of the prototypes. Further investigate criteria for *suitable* ICAR members, criteria for *optimal* ICAR functioning.
- Engage with governments, industry, stakeholders to get feedback on the concepts, learn more on market needs for ICAR instruments and further optimize the ICAR concepts

Glossary

CDM	Clean Development Mechanism
CER	Certified Emission Reductions
COP21	21 st Conference of Parties
ETS	Emission trading system
ICAR	International Carbon Allowance Reserve
ICAR-MP	International Carbon Allowance Reserve Market Participants
ICAR-R	International Carbon Allowance Reserve Regulators
IFI	International Financial Institutions
IU	International Unit
MRV	Monitoring, reporting and verification
NCM	Networked Carbon Markets
NGO	Non-Governmental Organization
PCF	Prototype Carbon Fund
RGGI	Regional Greenhouse Gas Initiative
VCS	Verified Carbon Units
WCI	Western Climate Initiative

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