Considering the Effects of Linking Emissions Trading Schemes

A Manual on Bilateral Linking of ETS

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Editorial information

This Manual is part of the project „Beurteilung des Linkings von Emissionshandelssystemen – Weiterentwicklung von Kriterien und Methoden zur Beurteilung der Chancen und Risiken eines Linkings des EU-ETS mit anderen Emissionshandelssystemen und Analyse aktueller Entwicklungen“ on behalf of the German Environment Agency (FKZ: 714 41 505 0)

The responsibility for the content of this publication remains with the authors.

Project duration
September 2014–October 2017

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Status: May 2017

Responsible Editor
Section E 2.3 in cooperation with adelphi and Wuppertal Institut für Klima, Umwelt, Energie gGmbH

Cover image: peshkova/fotolia

Content

List of Abbreviations

BAU	Business-as-Usual
CCS	Carbon Capture and Storage
CPM	Carbon Pricing Mechanism
ETS	Emissions Trading Scheme
EU	European Union
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GVA	Gross Value Added
ICAP	International Carbon Action Partnership
LULUCF	Land Use, Land Use Change and Forestry
MAC(C)	Marginal Abatement Cost (Curve)
MRV(A)	Monitoring, Reporting, Verification (Accreditation)
MSR	Market Stability Reserve
PMR	Partnership for Market Readiness
OTC	Over-the-counter
UNFCCC	United Nations Framework Convention on Climate Change

1 About This Manual

Linking of emissions trading schemes (ETS) could lead to a larger, more efficient emission market and to more international cooperation on climate change mitigation. Before linking negotiations are initiated, the range of potential effects needs to be assessed in a limited and manageable time period – and in more detail than general economic literature reviews offer. The effects will depend on the systems and jurisdictions involved.

The manual focuses on assessing direct, bilateral full linking. Assessing indirect or restricted linking might require some adjustments to the assessment process.

Since there are a variety of objectives and risks associated with linking ETS, there is an urgent need to balance the objectives and to consider the potential impacts of linking. What can be said before linking on the effects of linking? This manual aims at providing decision makers interested in linking their jurisdictions' ETS with a partner ETS with both general guidance and hands-on information to back-up assessments on whether linking with a specific ETS would likely be beneficial and should therefore be considered or not.

The manual comprises information for identifying, prioritising and assessing the effects of linking ETS to the extent possible before linking takes place – and for the interested reader it further provides detailed hints for the operationalisation and quantification of appropriate indicators in the annexes. Such an ex-ante assessment is inevitable in the preparatory phase before or during ETS linking negotiations.

The likelihood of linking with a specific ETS generally being beneficial can be investigated through a three-stages procedure comprising 10 steps overall (figure 1):

- Pre-assessment: define reference points for assessment (3 steps).
- Assessment: carry out 6 steps described below.
- Conclusion: linking beneficial yes/no, decide on initiation of negotiations (1 step).

The manual is structured as follows: Section 2 provides an overview on the rationale behind linking ETS. What is the economic reason for it? Why is it an interesting political option? However, as this section illustrates, the map of potential effects of linking is rather complex.

Section 3 outlines the ten steps of the assessment procedure, which is then explored in greater detail in section 4. Section 4 provides guidance on how decision makers can prepare for a decision on linking, as well as describing the political, environmental and economic objectives of linking. The potential risks of linking are also outlined. These objectives and potential risks should also be prioritised before assessing the benefits of linking. You will find a description as to how objectives can be operationalised and which assessment approaches are available. The section then outlines critical design elements that must be addressed during linking negotiations, although adjusting such design elements may also affect the likelihood of achieving certain linking objectives and on minimising potential linking risks. The subsequent sub-sections provide guidance on assessing and interpreting the results in order to come to an informed conclusion whether linking with another ETS might be beneficial or not.

The annex deals with the question how to operationalise and quantify the linking objectives in practice.

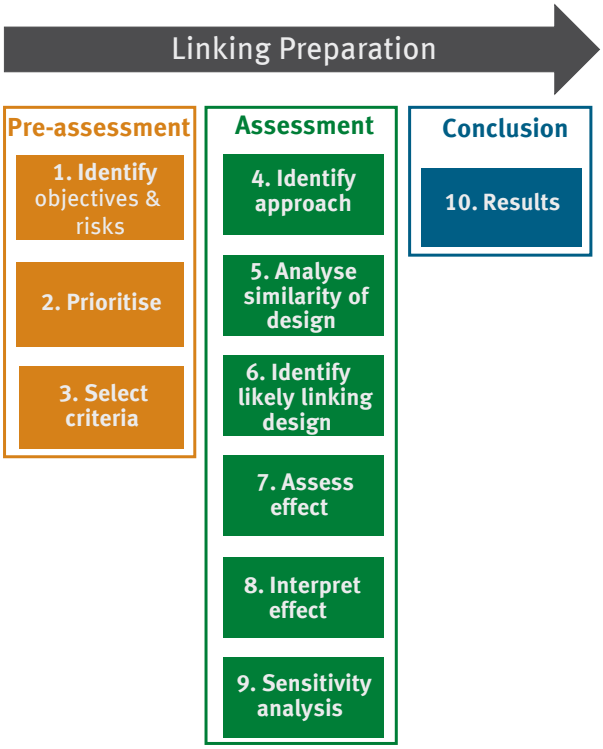


Figure 1: Schematic assessment procedure for linking ETS

2 Introduction to Linking

The main rationale for linking ETS is rooted in economic theory. The expectation is that linking will result in efficiency gains. In practice, there is a broader variety of objectives for and different forms of linking. Furthermore, linking evokes a complex landscape of different economic, political and environmental effects. The following overview provides a first introduction to linking in theory and practice.

2.1 Emissions Trading and the Rationale for Linking ETS

There is no single answer to the question of how to most effectively and efficiently achieve environmental and climate policy goals at the international, national, regional and local level. Yet, with increasing pressure from climate change, the question is becoming even more relevant. "Emissions trading" is one of the market-based instruments that contributes to achieving those goals. The particular idea behind the introduction of market-based instruments is that if an environmentally harmful behaviour like the emission of greenhouse gases (GHG) is priced, ETS stakeholders are incentivised to modify their behaviour and an efficient solution can be reached.

A price on emissions can be realised either via taxes or by limiting the amount of emissions and establishing a trading scheme.

ETS are based on the idea of "cap and trade", being seen as a relatively flexible instrument for achieving emission reductions at least costs. Theory says that the resulting permit price influences economic behaviour in a way that emissions are reduced where it is economically most efficient (see Box 1).

For that reason, emissions trading is also very important in international climate policy. As ambition is rising - in the 2015 Paris Agreement the world community has committed to "holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels" – market mechanisms play an important role in achieving global climate objectives.

Box 1: The Economic Idea behind ETS

The economic idea of trading emission permits is usually referred to as "cap and trade". This means that the total amount of emissions in a jurisdiction is restricted (the cap). This cap is reflected in the limited availability of emission rights, usually referred to as "permits" or "allowances". Regulated actors in an ETS (e.g. power plant owners) are obliged to hold a permit/allowance for each ton of greenhouse gas they emit. Due to the limited availability of permits, firms with comparatively low abatement costs have an incentive to abate emissions and sell their permits to installations with relatively high abatement costs. For those purchasing permits it is economically more efficient than abating themselves.

The economic rationale behind emissions trading is that when parties are equally informed, property rights are allocated and no transaction costs exist as private bargaining among individuals corrects the externality problem (e.g. pollution) and leads to an optimal outcome (Perman et al., 2003). Due to the decentralised pricing on free markets, governmental regulations are not needed. If permits are scarce (through setting caps), the price of permits changes according to the cost structure (marginal abatement costs, MAC). Through the internalisation of external costs, the economic behaviour of the market participants is channelled towards an efficient optimum. Therefore, emissions trading is regarded as an efficient instrument to reduce emissions. For a more detailed overview on economic literature see section 5.3.

Although economic reasoning may be a major motivation for linking, it is not the only reason. Linking can also be motivated by political and environmental objectives that need to be accounted for and balanced when designing the instrument. Simultaneously, impacts and secondary objectives have to be considered (for more on objectives see section 4.1).

The first regional ETS was established in the European Union in 2005. Since then, various ETS have emerged worldwide at the national, regional or local level: by the end of 2017, emissions trading will regulate more than seven billion tons of GHG emissions, with 19 systems operating worldwide. (ICAP, 2017).

This number continues to grow, with many policy makers preparing to introduce an ETS in the coming years. Most notably, the Chinese national scheme will be launched in the near future, forming the world's largest carbon market at almost twice the size of the European carbon market. With the Chinese national scheme, ETS will cover more than 15 % of global emissions (ibid).

The scope of ETS is variable. An ETS might be sectoral, regional or national or may even have a global scale. According to standard neoclassical economic theory, a global carbon market with a uniform price signal would be an optimal instrument to address global mitigation objectives and to minimise or even heal market distortions. Estimates show that the total abatement cost savings from creating a global carbon market with trade across all countries and sectors could halve abatement costs compared to non-trading (Flachsland et al., 2009, based on Russ et al., 2009)

However, a global market does not seem to be politically achievable in the short to midterm. Hence, the bottom-up direct linking of separately developed schemes appears to be the second best, and currently most promising option to create larger and more efficient markets.

The economic literature usually stresses four arguments in favour of linking:

- higher cost-efficiency through a larger number of mitigation options,
- a more robust price signal,
- reduced distortions through converging carbon prices, and
- increased market liquidity through an increased number of market participants.

These and additional linking objectives are considered, together with potential risks, in more detail in section 4.1.

Note: This optimistic view on global carbon markets is not undisputed: An article published in March 2017 in „Nature" (Green, 2017) argues that a „global network of cap-and-trade systems would deliver greater complexity and fewer emissions cuts". „A truly global carbon market would need a central carbon bank to manage allowances and prices. But that approach seems unlikely in today's political climate. In the absence of such a body, national and regional carbon markets should maximize their autonomy, manage their own prices and regularly ratchet down the caps on total emissions. Prices must be kept high and regulatory loopholes avoided for net emissions to fall."

Box 2: ETS Support Structures: ICAP and PMR

ICAP

A regular update on ETS in force, scheduled or considered, can be found at the International Carbon Action Partnership (ICAP) ETS Map or ICAP status reports (ICAP, 2017). Founded in 2007, ICAP is an international forum for governments and public authorities that have implemented or are planning to implement ETS. ICAP facilitates cooperation among countries, sub-national jurisdictions and supranational institutions that have established or are actively pursuing carbon markets through mandatory cap and trade schemes. It aims at sharing best practices and discussing ETS design elements with a view to facilitating and creating a well-functioning global carbon market through linking ETS.

Information on ETS and current developments: https://icapcarbonaction.com/en/about-emissions-trading/introduction

The PMR

The Partnership for Market Readiness (PMR) is a global platform for technical assistance and discussions on carbon pricing policies that was officially launched in Barcelona in 2011. The initiative consists of Contributing Participants, which provide financial support to the PMR Trust Fund, and Implementing Country Participants, which receive funding and technical support. The PMR promotes a broad agenda of market based instruments in several developing and emerging economies and provides long-term and large-scale support in the form of grant funding and technical assistance (PMR Secretariat, 2015b)."

Additional information on ETS and carbon taxes at the PMR: https://www.thepmr.org

ICAP and PMR have published a Handbook on ETS design and implementation that provides useful information for establishing an ETS in English, Spanish, Chinese and Turkish languages.
https://icapcarbonaction.com/en/icap-pmr-ets-handbook

2.2 Different Ways of Linking

Linking ETS basically means that participants in one ETS can use permits of the linked ETS for compliance. This can be done in different ways:

Direct linking:

- A one-way unilateral link: one ETS accepts the emission permits of another ETS for compliance purposes, but not vice versa.
- A two-way bi- or multilateral link: each ETS accepts the compliance instruments of the other ETS for compliance purposes.

Indirect linking:

- Indirect link: an ETS (A) can be indirectly linked with an ETS (C) even if it does not accept compliance instruments from that scheme. This is the case if ETS (A) has a unilateral or bilateral link to another ETS (B) that has a direct link to the third ETS (C).

This manual focuses on the assessment of full direct bilateral linking.

In the case of a direct link between at least two ETS, the permits are mutually accepted to fulfil the regulated entities' surrender obligations. An indirect link of several ETS can work, for example, by an accounting system such as the Clean Development Mechanism (CDM) in which states accept carbon credits (offsets) generated elsewhere in their ETS. In a unilateral link, emission permits of one system are accepted in the other, but not vice versa (as it was planned for the first phase of linking between the EU ETS and the Australian CPM before the latter was abolished).

With the 2015 Paris Agreement the role of linking ETS is likely to gain new momentum – especially when it comes to the operationalisation of Art. 6 of the agreement. However, main provisions still require further specifications.

Note: Parallel to assessing the possible effects of linking, the involved jurisdictions also have to consider **governance questions:** institutions, structures and mechanisms for routine operations, dispute settlement, change management and amendment, expansion of or withdrawal from the linking arrangement have to be developed (DEHSt, 2015).

2.3 Mapping the Effects of Linking

Linking ETS first of all may lead to changes in the permit price. The permit price is often used as a proxy to determine firms' costs of compliance with the (linked) ETS. The compliance costs result from using (opportunity costs of not selling), buying (permit costs) or selling/not buying (abatement costs) the permits.

However, linking ETS is associated with a variety of further effects and complex relationships. This especially holds true for the economic effects: Changes in the permit price as a result of linking have a direct and indirect influence on a variety of economic variables that will ultimately also affect other policy objectives and thus need to be accounted for. Figure 2 illustrates these interdependencies exemplarily. The purpose of figure 2 is to visualise the complexity of assessing the effects of linking on key economic indicators. How effects can be assessed is described in the Annex I.

Figure 2 shows that the change of the permit price after linking, being the central element of the figure, is influenced by structural factors of the two linking partners' economies.

The structure (i.e. emission and energy intensity) of the ETS sectors in the respective jurisdictions determines the marginal abatement costs of ETS sectors in both jurisdictions. The permit price of the linked market is not only an indicator for the stringency of the cap, but also reflects the marginal abatement costs of ETS sectors in both jurisdictions. Therefore, it is very important to take the structural aspects of the ETS sectors in both jurisdictions into account when thinking of the potential effects of linking on permit prices.

Linking induced changes in the competitiveness of ETS sectors (here defined as the change in relative production of ETS sectors compared to production in the rest of the world) are usually important to policy makers. Figure 2 clearly shows that the relative production of ETS sectors is influenced by a variety of factors. Firstly, the linking induced change in production costs plays an important role. These costs are, however, not only determined by the change in the permit price after linking. They are also influenced by the level of free allocation and additional jurisdictional support schemes to the ETS sectors (e.g. subsidised energy). The former in turn are usually determined by the degree of trade exposure of the sectors.

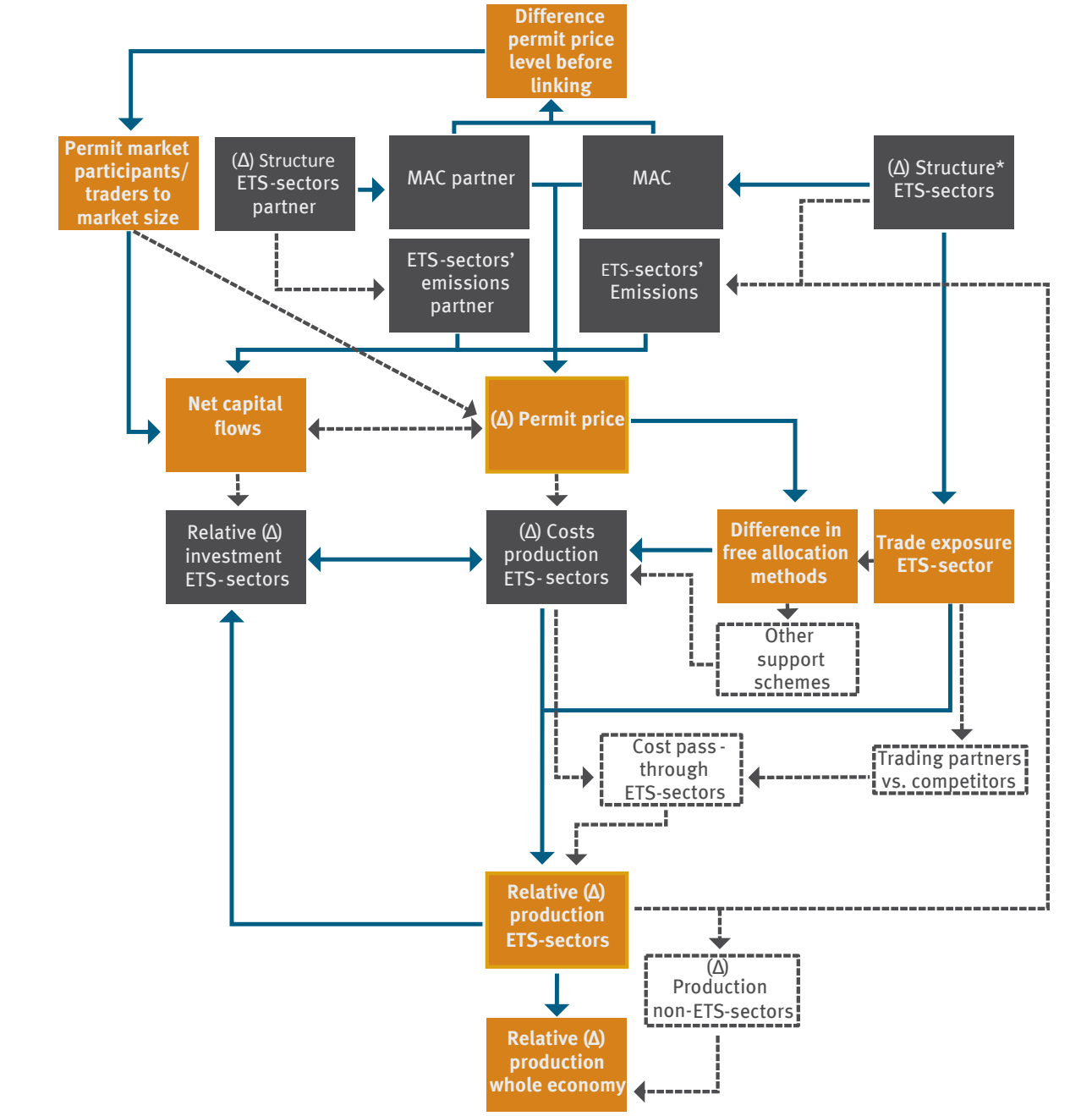


Figure 2: Interdependence of economic criteria

The complexity of figure 2 illustrates **the limits of projecting the effects of linking specific ETS without a complex model at hand.** There should be a clear causal relationship between the criteria and linking. Where this is not the case, conclusions on the effects of linking are difficult to draw. For example, distributional and welfare related effects or carbon leakage concerns (see box 3) might be of strong political interest. Linking might affect these effects. However as these effects have an extremely complex impact chain with many influencing variables, an ex-ante assessment is not recommended in this manual.

In addition, there are a variety of non-economic issues (i.e. the climate policy mix) and regional economic characteristics (i.e. market size), which might bolster or reinforce the effects of linking on ETS sectors in a certain jurisdiction. These need to be considered as well when thinking of the effects of linking.

Box 3: Carbon Leakage

When introducing an ETS or when different ETS have significantly different permit prices, jurisdictions might be concerned about carbon leakage. Carbon leakage means that, due to increased emission regulation in one jurisdiction, production is relocated and emissions increase in another jurisdiction with less strict environmental regulation. Linking ETS is expected to lower the risk of carbon leakage between the two linking jurisdictions as the carbon price induced difference in production costs between the linked jurisdictions decreases.

Carbon leakage can occur in three ways:

a) Production (operational) leakage: relocation of production and loss of market share to products from outside of the jurisdiction
b) Investment leakage
c) Rebound-effect in global energy markets (reduced energy demand in one jurisdiction leads to globally lower demand, prices fall, global energy demand increases with falling energy prices).

Linking systems between major trading partners can help level the playing field, i.e. reduce the risk of carbon leakage *between* the two partners.

In practice, however, assessing the impact of linking on carbon leakage is a rather complex task, and the impact chain is not as straightforward as economic theory suggests.

Carbon leakage is closely related to competitiveness concerns. In this context, it needs to be kept in mind that competitiveness occurs at different levels: at the firm level, sectoral and aggregate competitiveness of the entire (national or even world-region) economy. Carbon leakage does not refer to the competitiveness of firms, but to the competitiveness of one region (with climate policy) as the location for producing emission intensive products. It may well be the case that a certain firm loses competitiveness, but that another firm within the same economy takes over the market share. However, if the entire sector is at risk of losing its market share to the same sector in another jurisdiction without an ETS, the loss of sectoral competitiveness may lead to carbon leakage. If this is the case, in the long run, decision makers may want to impose structural changes in the economy in order to preserve future competitiveness. In such a scenario, sectoral losses in competitiveness might be accounted for shifting the economy over the long-run into a low-carbon direction.

These considerations show the difficulty of assessing whether ETS cause carbon leakage at all, and, equally, whether linking two ETS decreases carbon leakage between the two linked systems.

3 The ETS Linking Manual Procedure – Overview

Considering the linking of ETS requires a systematic assessment framework, which can be used to understand the potential opportunities and risks of linking. The procedure presented below presumes that potential linking partners have already been selected. It is designed for assessing full, bilateral direct links.

The likelihood of linking with a specific ETS generally being beneficial can be investigated in a three-stage procedure:

- Pre-assessment: define reference points for assessment (three steps)
- Assessment: carry out six steps described below
- Conclusion: linking beneficial yes/no (one step)

The procedure is illustrated in figure 3 and described here with links to the following explanatory sections.

Templates will be provided in the subsequent sections in line with the description of the specific assessment steps. They are designed to help decision makers keep track of the assessment process and to have the most important results at hand.

Pre-assessment:	
1. Identify most important objectives and risks of linking	▸ section 4.1
2. Prioritise most important objectives that are to be achieved and most important risks that are to be avoided/minimised	▸ section 4.2 ▸ template 1
3. Select appropriate criteria for the objectives. Note: If economic modelling is not a possible option, focus on criteria where empirical data is available.	▸ section 4.3 ▸ tables 3 – 5 ▸ annex I ▸ annex II template 2
Assessment:	
4. Identify required assessment approach: analysis of empirical data (where available) or modelling	▸ section 4.4 ▸ annex I
5. Analyse whether the two schemes are already similar or can be easily harmonised in terms of the most critical design elements,	▸ section 4.5
6. Identify the most likely linked ETS design outcome	▸ section 4.6 ▸ annex II template 1
7. Assess the effects of linking on the selected criteria	▸ section 4.7 ▸ annex I ▸ modelling
8. a. Interpret the effects of linking on achieving the objectives (yes/no/unknown) b. Interpret the effects of linking on selected risks (qualitative reasoning)	▸ section 4.8 ▸ annex II template 2
9. Conduct sensitivity analysis: Will the results change when changing certain design elements of the linked ETS?	▸ section 4.9 ▸ section 4.6
Conclusion:	
10. Results: Go for linking negotiations/go for linking with certain design/do not further pursue linking negotiations (at least not for the moment)	▸ section 4.10

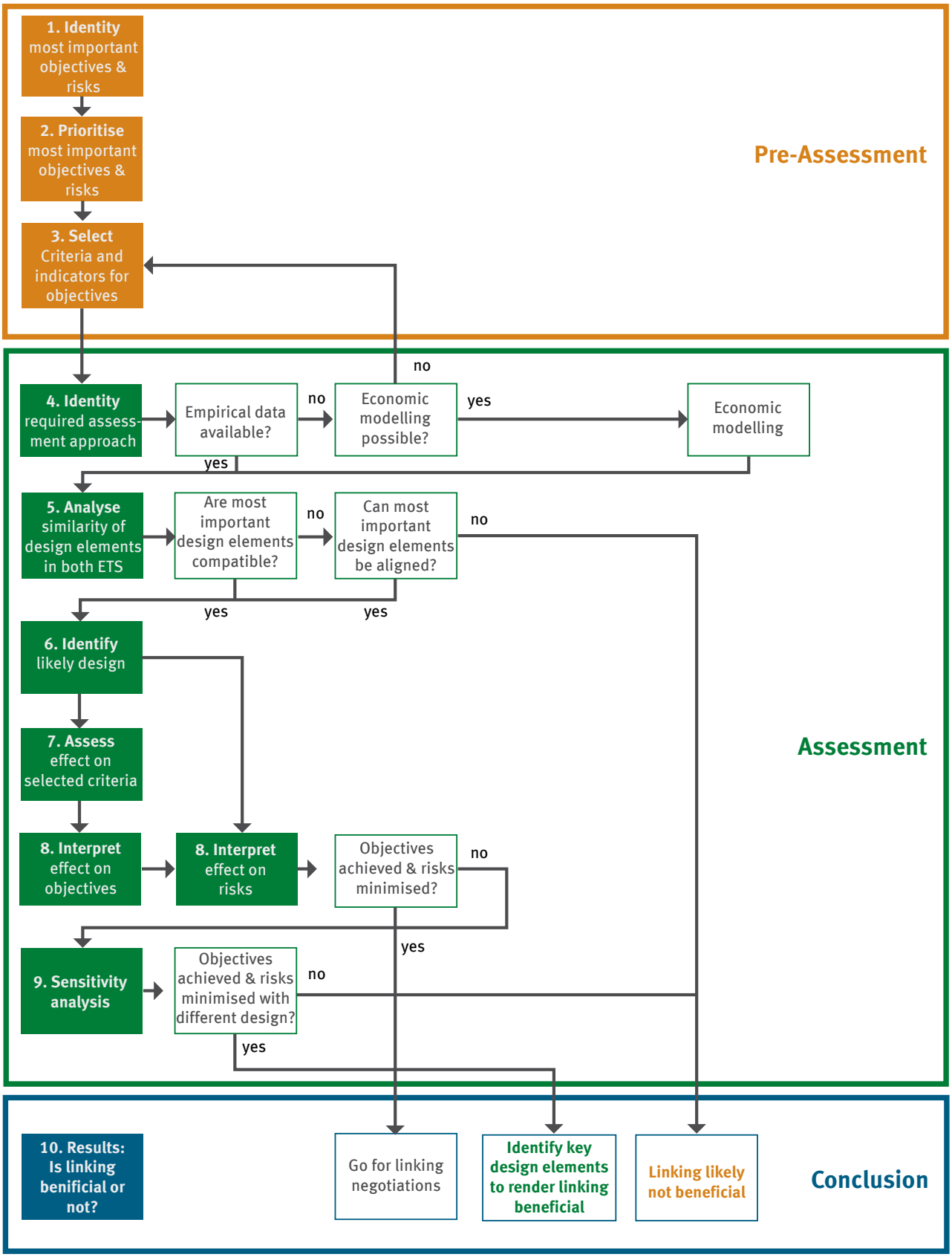


Figure 3: Three stage procedure for linking considerations

4 Ten Steps Towards an Assessment

4.1 Identify Most Important Objectives for and Risks of Linking

There are a variety of environmental, economic and political objectives associated with linking ETS. At the same time, linking ETS may involve certain risks as well. Furthermore, since there might be trade-offs between different objectives or between achieving a certain objective and minimising potential risks, the prioritisation of risks and objectives will be discussed.

After having selected (step 1) and prioritised (step 2) the most important linking objectives and risks, the results can be documented in summary template 2 in section 4.7 (step 7) and annex 5.2.

Objectives for Linking

Decision makers can have a number of reasons and expectations when considering linking. Apart from economic rationales, environmental and political objectives play a major role as empirical observations suggest. Box 4 summarises some specific arguments that are put forward for linking by several jurisdictions, which have considered linking in the past.

The selection and prioritisation of the different objectives of linking is a key component when assessing the effects of linking.

Box 4: Jurisdictions' Rationale for Linking

The **European Union (EU)** is economically and politically motivated to link with other ETS. It has repeatedly emphasised linking as a means to lower compliance cost (European Commission, 2017: Commission Communication, 2009; Directive, 2003). In this context, the EU has also cited a number of benefits: increasing market liquidity, price stability, supporting global climate change cooperation and creating an even playing field for regulated companies (European Commission, 2017).

Similarly, **Switzerland** was also driven by economic concerns when contemplating a link with the EU ETS. As a small carbon market, linking would increase market liquidity and give regulated entities in Switzerland greater flexibility (and more abatement options) in meeting their reduction targets. A larger carbon market would encourage trade and price formation and linking with the EU would also address any competitiveness concerns between the two jurisdictions (FOEN, 2016). **New Zealand** flagged the same economic motivations, as well as strengthening economic ties, as the major drivers for linking preparations with Australia (Ministry for the Environment, 2007).

Australia's official government documents have framed linking as a long-term strategic option (Department of Climate Change, 2008). At the linking announcement with the EU, Australia also emphasised economic reasons for the link, such as reduced compliance costs, greater flexibility and the increased cost effectiveness of a larger carbon market (European Commission, 2012). Due to a change in government in Australia at a crucial point of time, the establishment of an ETS and its link to the EU ETS did not materialise.

Finally, **California's** cap-and-trade program was designed to link with other Western Climate Initiative programs from the outset. Linking was specifically envisaged between California and other North American, subnational programs. California sees coordinating such subnational efforts as a means for it to reach its own mitigation targets, as well as maximise emissions reductions through cooperation (ARB, 2012). From an economics perspective, California also sees linking as offering greater market liquidity and providing more flexibility for Californian companies under the cap-and-trade program. Linking may also have a positive impact on the Californian economy (ibid).

The general categorisation of environmental, economic and political objectives can be differentiated as summarised below (Table 1) and described thereafter.

However, this is a non-exhaustive list that can be adapted to the domestic needs of the respective linking partner. In that case, complementary indicators have to be developed.

Table 1: General categories and specific linking objectives

Category	Linking objective
Environmental	1. Ensure environmental integrity 2. Achieve long-term abatement targets
Economic	3. Reduce mitigation cost 4. Reduce competitive distortions 5. Increase market stability and liquidity
Political	6. Maintain/increase acceptance of ETS and of linked market 7. Support global cooperation on climate change

Environmental objectives

Several environmental objectives are associated with linking ETS. The two most important objectives are to ensure environmental integrity, and to achieve long-term abatement targets.

1. Ensure environmental integrity

Environmental integrity relates to the reliability of actual abatement ("a tonne is a tonne"). This implies, for instance, that all targeted emissions are reported, that for each tonne of greenhouse gas emitted, a permit is submitted and cancelled, that a tonne in one scheme is equal to a tonne in the other scheme and that there is no double counting. Theoretically, linking only shifts where the reductions take place and the total level of emissions under the linked system should stay the same. However, deficits in environmental integrity can undermine the effectiveness of the entire linked system, lead to emissions above the cap, and, accordingly, to lower carbon prices.

2. Achieve long-term abatement targets

In a linked market, achieving long-term, domestic, abatement targets for the ETS regulated sectors in each jurisdiction is not guaranteed. Sufficient abatement incentives have to be provided by the linked market in order to achieve the joint long-term abatement target agreed upon by both partners.

Note: Linking ETS means that a certain level of mitigation will not take place within the jurisdiction with higher abatement costs. Even if not explicitly expressed, this might be an argument against linking for some political parties with a strong preference for domestic emissions reductions.

Economic objectives

Linking evokes high hopes in terms of improved economics, usually stemming from standard economic theory. The most important economic objectives of linking are reducing mitigation costs, reducing competitive distortions and increasing market stability and liquidity.

3. Reduce mitigation costs

Reducing mitigation costs is a major economic objective of linking ETS. With more and cheaper abatement options available, the linked market is expected to increase the overall abatement efficiency. The greater the difference in carbon price between the potential linking partners, the greater the overall cost savings from linking will be.

4. Reduce competitive distortions

Reducing competitive distortions by levelling the carbon price playing field is an important economic objective for linking ETS. Competitiveness effects of linking differ between the region with the relatively lower carbon prices and the region with the relatively higher carbon price. These effects can occur in relation to the potential linking partner as well as in relation to third countries.

Note: Competitiveness issues can also arise at the sectoral and firm level. Namely, a higher carbon price after linking will give low-emission businesses a competitive advantage. However, the following indicators primarily focus on ETS-wide effects.

5. Increase market stability and liquidity

Linking creates a larger market with more diverse participants. A larger market is assumed to be more liquid, less volatile and less exposed to external risks and shocks. Additionally, with more participants, the market is assumed to become more competitive. This would reduce the market power of larger emitters and their ability to manipulate the market.

Political objectives

There are also political objectives for linking, drawing on political economy considerations and political experience. The two most important objectives are maintaining and increasing the acceptance of the ETS and the linked market, and supporting global cooperation on climate change.

6. Maintain/increase acceptance of ETS and the linked market

Maintaining or increasing domestic support for emissions trading and linking is crucial to the functionality of the scheme. However, linking creates new winners and losers. Therefore, the linking negotiations need to account for overall domestic stakeholder support. This may be especially difficult if previously contested design elements have to be renegotiated in the linking process.

7. Support global cooperation on climate change

A jurisdiction might want to support global cooperation on climate change by linking and expanding its climate protection efforts. Linking may encourage other jurisdictions to act jointly on climate change and can contribute to a global expansion of climate change mitigation regulation.

Potential Risks of Linking

Linking is not only associated with a variety of benefits (pursued as objectives), but also comes with risks. These are mostly related to the risks of not achieving certain side objectives of linking. For example, domestic emission abatement will be reduced in the jurisdiction where the permit price decreases with linking, since emission abatement will be cheaper and thus relocated to the linking partner where prices increase (compared to before linking took place).

Note: Ranson and Stavins (2014) highlight that notions of an 'acceptable' carbon price are an important factor in linking negotiations, if these notions differ significantly, that system may not be seen as an 'acceptable' linking partner.

However, the overall climate policy mix should be taken into consideration as strong climate policies (such as energy efficiency standards or renewable energy support) affect mitigation costs and thus likely lower the carbon price.

Furthermore, linking may also raise distributional issues. For example, the so-called 'allowance (permit) price paradox' appears to apply in the case of linking ETS (Zetterberg 2012): Where the potential for economic cost reduction of a linked system is high due to high price differences in the pre-linked systems, the political incentive for linking might be low. Stakeholders in the high price system may not be willing to pay for emission reductions and accept the associated financial flows to the low price system but argue that abatement has to happen domestically. Equally, stakeholders in the low-price system may oppose rising abatement costs and associated increasing burden to their emitting industries. This indicates trade-offs in the different categories of criteria to assess linking options.

Whether linking offers net advantages depends on the underlying economic structures in both jurisdictions and the design of the respective systems.

The main risks of linking for both participants are as follows:

Environmental risks

Linking with a system whose environmental integrity is not guaranteed or has a lower level of ambition (e.g. less stringent cap) can harm the environmental integrity of the joint market. Selecting an appropriate linking partner should account for these risks.

Furthermore, a bilateral link to a system that accepts credits from offset activities that are not fully "additional" over-counts offsets can increase the total emissions under the linked market.

Linking may also incentivise systems to make smaller cap reductions over time.

Economic risks

A bilateral link changes the distribution of costs within each scheme. The sellers in the ETS with the lower pre-linking price and the buyers in the ETS with the higher pre-linking price benefit from the price convergence, while other participants lose.

A bilateral link, by changing the permit prices, can affect the competitiveness of firms that produce emission intensive goods or that rely on emissions intensive inputs.

Small markets also "import" economic and market trends from the larger market as a result of linking. If, for example, the larger market faces an economic recession, the demand for emission permits decreases with decreased production. Even if the smaller partner is not in recession, its permit prices would decrease, lowering the incentives for low carbon investments.

If there were significant investments in low carbon/abatement technologies in the higher-price jurisdiction, and linking leads to substantially lower permit prices, this will dampen those incentives and possibly also reduce investments in low carbon technologies.

Political risks

In both schemes, control over the operation of its ETS is lost to some extent (i.e. has to be shared with the linking partner). This may be "positive" (e.g. for self-binding and defending strict targets against domestic lobby groups) or "negative" (e.g. loss of adjustment options, political correction when this needs to be negotiated at higher level).

If politically relevant groups within the jurisdiction aim for increased domestic abatement and/or investments in low carbon technologies at home, linking with a lower price ETS may thus undermine domestic support of the link itself.

Permit price differences: Although the low price jurisdiction benefits from selling permits and associated additional financial inflows, its buyers suffer from higher permit prices and may therefore oppose the linkage. The high price jurisdiction gains access to an increased number of low-price certificates but it also experiences financial outflows. This may be a domestically undesired effect.

Domestic political compromises on free allocation may be questioned when aligning critical design features. For instance, domestic support for the ETS might decrease, if the free allocation compromise is to be altered.

Linking risks may also occur if the underlying systems are 'incompatible'. Incompatibility relates to differences in critical design features of the individual pre-linked systems. Examples are price caps, non-compliance penalties, borrowing, banking, permit life, nature of the emissions caps (absolute or intensity-based), and length of the compliance period (for more see section 4.5).

Box 5: Distributional Effects

Linking ETS means that permit prices change. This creates winners and losers of linking, which might potentially lead to political conflicts. The distributional effects of linking involve a variety of different groups. The distributional effects differ for example between:

- Domestic and partner ETS
- Different ETS sectors (and within sectors)
- ETS versus non-ETS sectors
- Income groups
- Incumbents versus new market entrants
- Size of firms

The distributional effects are hard to quantify when assessing the effects of linking. However, the distributional implications for the different groups should at least be borne in mind when thinking of the domestic implications of linking.

Stakeholder consultations might be a first step to assess the variety of distributional implications of linking; however, it is very likely that winners and losers both overstate the effect.

4.2 Prioritise Most Important Objectives and Risks

Section 4.1 has shown that several objectives for and risks of linking exist. Achieving a certain linking objective and minimising specific risks might be more important for some jurisdictions than for others. Prioritising objectives and risks is necessary because these may compete against each other. In such a case, a clear prioritisation enables policy makers to reach aconclusion as to whether linking would likely be beneficial or not.

Trade-off: achieving competing objectives

Prioritising objectives is necessary as not all objectives may be equally important or can be achieved at the same time.

For example, there is an inherent trade-off between environmental (achieving emissions reductions in both jurisdictions) and economic (reducing mitigation cost) objectives. From an economic perspective, the greater the difference in permit prices between systems before linking, the greater the efficiency gains from linking for the overall system, at least from a static, short-term perspective. From an (domestic) environmental perspective, the greater the difference in permit prices, the larger the shift in abatement activities from the high price jurisdiction to the low price jurisdiction.

Trade-off: achieving objectives versus minimising risks

Furthermore, risk minimisation may compete with achieving a certain objective. In this case, policy makers need to prioritise whether achieving the objective or minimising the risk is more important.

For example, there is an inherent trade-off between larger international carbon markets (reducing mitigation costs, reducing competitive distortions) and domestic political control over the market.

Design features and trade-offs

Design features can have a decisive influence on achieving a certain objective or minimising risks. Policy makers who find it difficult to identify a straightforward prioritisation of objectives and risks, might want to explore the effects of different design features. When prioritisation is difficult, it would be interesting to check whether a certain trade-off where could be solved through adjusting design features.

For example, a jurisdiction might want to reduce their offset quota when linking in order to limit the risk of a large scale relocation of emission abatement activities abroad.

When the harmonisation of certain design features is required for linking, but specific design features are decisive for achieving the linking objectives, this may render linking negotiations more difficult.

In the offset-case, reduced offset quota are only effective if the partner jurisdiction proceeds accordingly. Otherwise, domestic ETS firms may simply recur on the partners' offsets for compliance.

4.3 Select Criteria for Assessing the Objectives

Looking at arguments generally put forward in favour of linking and at climate and other policy goals, seven main linking objectives have been differentiated in section 4.1. These were grouped into three dimensions: environmental, economic and political objectives.

These seven objectives are of a very general nature. In order to assess the effect of linking two real and existing ETS, more specific criteria are needed. The suggested specifications are described in tables 3-5.

In order to address the effects as concrete as possible, each criterion is then operationalised (indicators). These indicators can help quantify or qualitatively assess the potential linking effects with regard to the specific objective concerned. The specific quantification for each criterion is explained in detail in Annex I. As can be seen in tables 2-4, there is sometimes more than one criterion for one objective. This fact will be relevant later on when thinking of the required methods and data for assessing the effects.

After having considered step 4, the selected criteria can be recorded in the summary template 2 (see section 4.7 (step 7)).

Table 2: Differentiating Environmental Objectives of Linking

Environmental Objective	Criteria	Indicators	Influencing factors
1. Ensure environmental integrity	**Environmental integrity**	[Mutually accepted]* MRV standards/thoroughness	
		[Mutually accepted] offset standards (qualitative)	
		[High/sufficient] stringency of enforcement	▸ Administrative and enforcement capacities
2. Achieve long-term abatement targets	**Incentives for low-carbon investments**	[Sufficiently high] historic carbon price level	▸ Role of ETS in domestic climate policy mix
		[Equal/comparable] cap stringency/cap reduction factor as measured by degree of divergence from Business as Usual emissions/ No-ETS- pathway (including quantitative offset limits)	▸ Role of ETS in domestic climate policy mix ▸ Scope of ETS ▸ Abatement potentials and costs ▸ Degree of divergence from Business as Usual emissions/No-ETS pathway
		Availability of [ambitious, fair] long term mitigation targets and commitments	▸ Stage of development of economy of linking partner
		Availability and compatibility of safeguards against oversupply (e.g. price based or volume based supply control)	▸ Level of auction reserve price/price floor ▸ Market Stability Reserve Provisions ▸ Ad-hoc supply interventions
		Availability of [ambitious, fair] long-term mitigation targets and commitments	
	Stability of the political / regulatory environment	[High] political support of ETS [across all major political parties/in government and opposition]	▸ General political stability
		[High] acceptance of the ETS with stakeholders and the broader public	

* The contents in the brackets are an example of the data or benchmark of the indicator, which depends on the subjective weighting and assessment of the policy maker in a linking decision process.

Table 3: Differentiating Economic Objectives of Linking

Economic Objective	Criteria	Indicators	Influencing factors
3. Reduce mitigation costs	**Mitigation costs (short-term, static)**	Expected change [decrease] of carbon price (before and after linking)	▸ Relative abatement potentials and costs (difference between linked systems)
		Expected change [increase] in economy-wide production (GDP)	▸ multitude of possible factors, e.g. reduced mitigation expenses allowing for additional investment

Economic Objective	Criteria	Indicators	Influencing factors
4. Reduce competitive distortions	Competitiveness in relation to linking partner	[High] trade exposure of ETS sectors	▸ Trade intensity, importance of linking partner as trading partner or competitor ▸ Other state measures influencing competition e.g. subsidies, access to finance
		[Significant] differences in free allocation methods	
		[Significant] difference of carbon price level before linking	
		[Large] net capital flows	
	Competitiveness in relation to third countries	[High] trade exposure of ETS sectors	▸ Trade intensity, importance of third countries as trading partner or competitor
		[Significant] expected relocation of production and investment (after linking)	
		Expected change [increase] of carbon price (before and after linking) [Large] net capital flows	
5. Increase market stability	Market liquidity and stability	[Large] number of market participants (before and after linking) relative to market size and number of trades	
		Stable permit price (before linking)	
		Availability and compatibility of safeguards against oversupply	

Table 4: Differentiating Political Objectives of Linking

Political Objective	Criteria	Indicators	Influencing factors
6. Maintain / increase acceptance of ETS and of linked market	Domestic support of ETS and linking	[High] relevance of changes to ETS designs required for linking	▸ Important design features e.g. allocation methods ▸ Access to offsets ▸ Supply control measures
		[High] political, stakeholder and public support of estimated impacts of linking (balance of "winners and losers")	
7. Support global cooperation on climate change	Signal for international climate policy	[High] reliability as [ambitious] climate policy partner	▸ Relative size of the system ▸ Relative abatement potentials and costs
	Vehicle for international carbon finance	[Large] expected net capital flows	

4.4 Identify the Required Assessment Approach

What can be said before linking on the effects of linking? With ex-ante assessments, there is only a limited amount of quantitative and qualitative data available for the variables that describe specific effects. That means where no empirical data is available, a rough estimate is not possible. If such a specific effect is highly relevant for making a linking decision, economic modelling may be a solution. However, that involves significant effort.

Tables 2, 3, and 4 have shown that there are usually several indicators for each criterion or objective. For the economic criteria, one may eventually choose among quantitative indicators with empirical data, qualitative assessments or economic modelling.

For example, if economic modelling is not a viable option, it would be necessary to restrict the assessment to criteria where modelling is not required. The same holds true if there is no access to meaningful empirical data. In such cases, it might be necessary to draw on indicators that can be quantified with economic modelling.

Tables 5, 6 and 7 provide an overview of which approach can be used for assessing effects. More details on how to estimate and quantify each individual criterion are given in Annex I.

Table 5: Empirical quantitative data assessment

[High] trade exposure of ETS sectors in relation to linking partner
[Significant] difference of permit price level before linking
[Sufficiently high] historic carbon price level
[High] trade exposure of ETS sectors in relation to similar sectors in all third countries together
Stable permit price (before linking)
Degree of compliance with [ambitious, fair] share of global carbon budget

Green = environmental objectives, Blue = economic objectives,

Table 6: Qualitative data assessment where quantitative assessment is not possible)

[Significant] differences in free allocation methods
Availability and compatibility of safeguards against oversupply Availability and compatibility of safeguards against oversupply
[Mutually accepted] MRV standards/thoroughness
[Mutually accepted] qualitative offset standards
[High/sufficient] stringency of enforcement
[Equal/comparable] cap stringency/ cap reduction factor
Availability of [ambitious, fair] long term share of global carbon budget, resulting mitigation targets and commitments
[High] political support of ETS [across all major political parties/in government and opposition]
[High] acceptance of the ETS with stakeholders and the broader public
[High] relevance of changes to ETS Designs required for linking
[High] political, stakeholder and public support of estimated impacts of linking (balance of “winners and losers”)
[High] reliability as [ambitious] climate policy partner

Green = environmental objectives, Blue = economic objectives, Orange = political objectives

Once the prioritised objectives and related criteria have been selected and the assessment approaches have been identified, policy makers should consider the following questions if quantitative indicators are considered:

- Is the required empirical data available?
- Is economic modelling feasible?

If the answer to one of these questions is no, the selected criteria and thus the linking effect of interest can probably not be estimated. In that case policy makers should select alternative indicators, or, if this is not possible, alternative criteria (step 3, section 4.3).

For instance, if modelling is not possible, the expected direction of change in the permit price (increase or decrease) might be assessed by using empirical data for the actual permit prices in each individual scheme. The permit price from the linked system should lie in between both systems, with a tendency towards the price of the larger system.

Table 7: Quantitative assessment using economic modelling

Expected change [decrease or increase] of permit price (before and after linking) second best: qualitative reasoning about the trend of change using empirical data on the permit price in both jurisdictions
[Equal/comparable] cap stringency/ cap reduction factor (compared to BAU emissions)
Expected change [increase] in economy-wide production (GDP) (before and after linking)
[Large] net capital flows (from seller to buyer) [Large] net capital (out- or in-) flows
[Significant] expected relocation of production and investment (after linking)
[Large] number of market participants (before and after linking) relative to market size and number of trades second best: empirical quantification

Green = environmental objectives, Blue = economic objectives, Orange = political objectives

Most economic criteria cannot be measured empirically, but require economic modelling, especially for an ex-ante assessment before linking. There are various economic models that can be used, however, they vary in the economic foci and level of detail (see box 6).

After selecting criteria, indicators and approach for the assessment, results can be inserted in the summary template, which can be found in section 4.7 (step 7).

Box 6: Economic Modelling Approaches

Optimisation models versus econometric models

Two main economic modelling approaches can be used for the linking analysis: Optimisation and econometric models. They differ in economic backgrounds, and especially in their treatment of behavioural relationships. Whilst many optimisation models assume behaviour in line with economic optimisation theory, e.g. perfect knowledge or that markets are completely cleared, econometric models allow for the possibility of unused resources and sub-optimal behaviour. Yet, an issue with macroeconomic modelling approaches is the extensive need for comparable data across time and space. The more disaggregated the model, the more difficult it is to collect the necessary data.

Bottom-up approach versus Top-down approach

Models differ between top-down versus technology-specific bottom-up approaches, which roughly corresponds to the dichotomy between partial- versus full market coverage. Macro-econometric models belong to the type of top-down models. Within the group of optimisation models, there exist both approaches.

Partial equilibrium models estimate the effects of changes, i.e. in energy prices, on changes in partial areas of the economy, i.e. the energy system. The limited sectoral scope of these models allows for a detailed coverage of for instance different energy-consuming technologies. The representative agent chooses the profit- or utility-maximising production technology from a set of represented technologies. Linking inputs and outputs of the bottom-up technology choices yields the overall market outcome. Thus, in contrast to pre-defined production functions in the top-down approach, production functions and marginal abatement cost curves are implicitly constructed in the bottom-up approach. A major limitation of using partial equilibrium models is that overall economic indicators like GDP are usually exogenous model inputs.

(Computable) general equilibrium (CGE) models estimate the effects of changes in some parts of the economy (e.g. in energy prices) on all sectors and general welfare, by aid of aggregated functions and values. Instead of a detailed technological representation, the top down approach uses pre-defined production functions and marginal abatement cost curves. The production function simulates the potential substitutability between the production factors, which are themselves usually highly aggregated (such as “labour”, “energy”, “capital”). A limitation of using these models for the present purpose is the usage of pre-defined production functions and the resulting lack of a detailed and empirically grounded technology representation in each sector, which might yield significantly different results regarding competitiveness and leakage effects.

Recently, modellers increasingly combine the advantages of partial equilibrium and general equilibrium models in so-called hybrid models. Several top-down models represent an increasingly differentiated energy sector, which is very useful to get a broad and realistic impression of the effects of linking on economic criteria. Some bottom-up models have started to include the effects of changes in the energy system on the entire economy, like changes in end use demand, or are linked to macroeconomic models.

Driving solution principle for optimisation models

By solving a set of pre-defined equations under certain constraints, optimisation models try to find either the welfare maximising (usually in partial equilibrium models), or the cost minimising solution (usually in CGE models). There are three main time-dynamic approaches to optimisation: Myopic, perfect foresight and limited foresight.

Myopic optimisation is done at each point in time without knowing or by ignoring the state of the future system. Perfect foresight (rational expectations) optimisation is done under full consideration of all future states of the system (prices, constraints etc.). Limited foresight optimisation is done under perfect foresight for a limited period of time without knowing the state of the future system beyond the considered period.

For assessing the effects of linking on selected economic criteria, limited foresight seems to be the most appropriate approach. This approach is used to model a rather realistic behaviour of economic agents and impacts of non-optimal decisions in a rather inflexible world due to behavioural routines or inertias in the capital stock in the short run.

Limitations of economic modelling

Regardless of how well a model is designed and set-up, modelling never replicates reality and always has shortcomings that have to be kept in mind when working with modelling output. To ensure computability, global models usually use highly aggregated data, which limits the validity and meaningfulness of results. A fact that is very important in the context of linking, since it influences the permit price via the marginal abatement costs, are assumptions about learning curves, especially in low-carbon technologies. These assumptions often lack behind the real developments, since updating and re-calibrating the models takes time and is costly. Therefore, modelled costs for low carbon technologies (i.e. renewable energies and energy efficiency technologies) tend to be higher in models than in reality. Further, some models assume a widespread employment of technologies like Carbon Capture and Storage (CCS), nuclear energy and the large-scale use of biomass, which, due to their relatively high (perceived) risks and societal opposition, are in reality highly debated.

Model requirements

Models differ in the coverage and level of detail in different aspects. For the present analysis, the coverage of economic areas, sectors, regions, time horizons and GHG gases is relevant for the model selection. For example, the required sectoral coverage is given by the sectors covered in the ETS and the partner ETS.

4.5 Analyse the Similarity of the Design Elements in Both ETS

Generally, once policy makers have identified their own linking objectives, this will allow them to prioritise certain issues and design elements before commencing an analysis of their potential linking partner's system. Mutual trust and transparency between the linking partners are required for this analysis, as well as for the linking negotiations. Potential partners should start with a consideration of the compatibility of their linking objectives as they may not necessarily be the same. On this basis, a decision can be made as to whether linking would be in the joint interest of both parties. If so, policy makers need to discuss the extent to which design elements from their respective systems need to be harmonised. This not only depends on the linking objectives, but the alignment of certain design elements will be vital to a well-functioning joint carbon market.

The results of the analysis can be stored in the design template (section 4.6.) This will ease the identification of the most likely linking design (step 6).

Differentiation of Design Harmonisation

Technically, two schemes could immediately link without negotiating or amending any design features, however, this would likely not lead to a robust carbon market.

Certain design features need to be aligned in order to create a functioning joint market with a minimum of trade distortions and in which a 'tonne is a tonne' of emissions reduced across the whole system. Additionally, policy makers must also pay close attention to design features that would automatically be imported into the other scheme as a result of linking. Such automatic propagation may come with significant environmental, political and economic implications that could undermine the goals and policy preferences of the respective linking partners.

This section looks at the degree of ETS design harmonisation necessary for linking to take place. Potential linking partners need to consider a number of design features of the schemes to be linked.

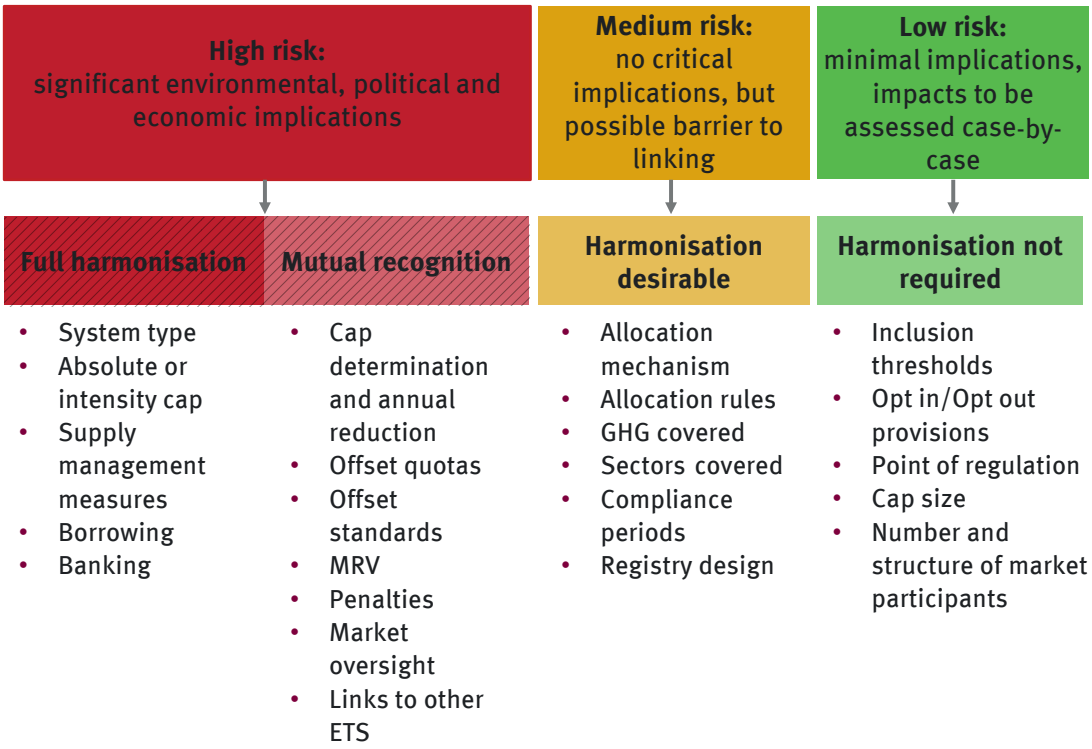
The design features of an ETS are the result of many different influences at play and may have been implemented for a number of reasons:

- they may be a means of delivering policy goals, such as driving a certain level of domestic emissions reductions or generating sufficient funding for other government programmes;
- they may have been implemented to appease or gain support from key stakeholders, such as businesses, NGOs or address the policy concerns of other ministries;
- they reflect the local conditions in which the ETS operates, for instance, in some jurisdictions a certain sector might be excluded from the ETS due to its high marginal abatement costs or indirect emissions may be included in cases where there are price controls in the electricity sector.

Thus, any amendments to the ETS design will also affect these underlying policy goals and political compromises. Policy makers must bear this trade-off or "risk" in mind when entering into linking negotiations.

To avoid or minimise risks for the linked market different levels of harmonisation may be needed. Potential risks to the functioning of the joint market may be categorised as high, medium or low (table 7). To address the high risks of the most critical design elements the partners need to agree on a design that is more or less identical. However, if this is not possible or desirable, policy makers can have a linked system with differing ‚high risk' design elements provided they mutually recognise, understand and accept the effects this could have on the linked market.

Table 8: Risk level and harmonisation needs of ETS design elements in case of linking



High Risk

Critical design elements of an ETS that have significant environmental, political and / or economic implications might pose a potential barrier to linking if not aligned. These critical elements can jeopardise environmental targets or undermine the political goals of the linking partners. Ideally, these design features should be identical. Linking partners need to agree which level of alignment is necessary and possible:

Full harmonisation necessary

Some design features must be harmonised for technical reasons or because a different design would lead to significant environmental, economic and political drawbacks. If not aligned, they will undermine the environmental integrity or effectiveness of the linked system as the link will result in an immediate and automatic propagation. For example, if participation in one scheme is mandatory and voluntary in the other, or if the cap is an absolute figure in one scheme and intensity-based in the other. These features must be identical to ensure a functioning joint carbon market. These elements are, among others:

- System type (i.e. mandatory or voluntary). Linking these different system types is theoretically possible although linking has only occurred between mandatory systems to date.
  The relatively weak nature of a voluntary ETS (weak targets, no mandatory compliance) may raise some concerns with a linking partner.
- Banking and borrowing provisions. Temporal flexibility mechanisms in one system will become automatically available in the linked system. Unaligned banking provisions could affect the environmental integrity of the system, although effective caps can help minimise the impact on the joint market (Sterk & Schüle, 2009; Jaffe & Stavins, 2007). Most systems do not allow (substantial) borrowing and it has therefore not been an issue in linking negotiations. However, systems with generous borrowing provisions could also hurt the environmental integrity of the joint market.
- Supply management instruments, such as the Market Stability Reserve (MSR) in the EU ETS, price ceilings or floors. Although incompatible measures may have an immediate effect on the joint market, their alignment is controversial and challenging as they reflect the political compromises and priorities of a jurisdiction.
  There are also a number of different ways as to how these measures can be implemented. In addition, as supply management measures are relatively new in most systems, there is little research on their impact on and alignment in a linked market.

Mutual recognition necessary

Where the harmonisation of such critical design features is not possible, policy makers must be able to accept the differing design feature in the linking partner's scheme and trust that it is sufficiently stringent and reliable.

- For example, a robust MRV framework is crucial to the functioning of linked ETS, but full harmonisation of two different MRV systems is often not possible because the detailed provisions usually reflect the jurisdiction's emissions profile, legal system, administrative procedures and cultural background etc. As long as the MRV systems are comparable in their stringency and mutually recognised by the linking partners, they can remain different and the environmental integrity of the linked system will not be undermined.
- Cap stringency (or the determination and annual reduction of the cap) is difficult to measure and align. For the robust functioning of the joint carbon market, cap stringencies can differ as long as both linking partners recognise and accept them. Additionally, harmonising some aspects relating to the policy milestones, like the focus and timing of planned reviews and the establishment of long-term reduction pathways, could be harmonised.
- Offset provisions may have significant implications for the environmental integrity and permit price in the joint carbon market. Not only will offsets be available for use by all regulated entities, it will also have an indirect effect on the joint carbon market. The use of offsets in one system "frees up" additional domestic allowances that would otherwise have been used for compliance. This increases the overall supply of allowances in the linked system. (Hawkins & Jegou, 2014; Burtraw et al., 2013; Zetterberg, 2012). Offset provisions are also difficult to negotiate as they reflect domestic priorities and political compromises. However, these provisions can remain unaligned as long as the linking partners accept the integrity of their respective provisions.

All these critical design elements represent the environmental policy objectives of the respective jurisdictions and **require a joint vision and level of ambition** for a successful link to be established.

Medium Risk

This group includes design elements that do not have critical implications, i.e. they will not undermine the environmental integrity and / or achievement of long-term abatement targets. However, they can still pose a barrier to linking and the differences should be carefully investigated by the linking partners.

Harmonisation desirable

Medium risk design features reflect the jurisdictions' economic and emissions profile, such as sector and GHG coverage, as well as technical features such as registry design and compliance periods. They do not require (full) harmonisation but their alignment may be desirable for other reasons, such as reducing competitive distortions, ensuring political acceptance of the link, facilitating the linking process or reducing the administrative burden of operating a joint carbon market. For example:

- Allocation mechanism and rules do not necessarily have to be harmonised. At the same time, if one scheme allocates its permits for free, and the other scheme uses auctioning, compliance entities in the second scheme will be more sensitive to price changes resulting from linking. This will raise fairness and competitiveness concerns so harmonisation would be desirable.
- Auctioning: if both schemes use auctioning, a harmonised approach improves transparency and ensures equal access and market conditions (although the frequency of auctions may remain different). However, if both systems have robust auctioning procedures, full alignment is not necessary.
- Scope and coverage (gas coverage and sector coverage) do not necessarily need to be harmonised for an effective, functioning market (DEHSt, 2013; Burtraw et al., 2013). Alignment may also be challenging as coverage is determined by, among others, the jurisdiction's emissions profile, monitoring ability, mitigation costs etc. Differences can actually increase the economic efficiency of the linked system by providing a wider array of abatement options (Burtraw et al., 2013; Sterk et al., 2006).

Low Risk

Design elements in this group normally have minimal environmental, political or economic implications. Linking partners should assess potential impacts and whether there is a need for alignment on a case-by case basis.

Harmonisation not necessary

Aligning and adjusting these design elements are not necessary in order to establish a functioning joint carbon market. In most cases, there would be no significant impact if they were not aligned. Examples are:

- Inclusion thresholds: Unless the differences are large, inclusion thresholds do not form a barrier to linking. They are formed based on domestic considerations of the linking jurisdictions. Lowering the threshold to include smaller emitters may impose high transaction costs on these entities or increase the administrative burden on the regulator.
- Opt-in and opt-out provisions: This is generally not a significant concern during linking negotiations as it represents a small share of the total ETS. However, differences in opt-out provisions may affect the cost- and environmental effectiveness of the joint market (Sterk et al., 2006).
- Point of regulation: Where reporting and compliance obligations are placed along the supply chain and whether direct and/or indirect emissions are included in the ETS do not tend to be a high priority topic for linking. A clear understanding of the point of regulation will be necessary for negotiations on other design elements such as allocation but differences can remain as long as a robust MRV and accounting regimen is in place to avoid double and/or the undercounting of allowances (DEHSt, 2013; Sterk et al., 2006; Haites, 2003).
- Cap size: While the size of the cap cannot be harmonised, it is a relevant factor to be considered during the linking negotiations (see next paragraph).
- The number of entities: Differences in the number and structure of market participants do not pose an issue for linking. This also depends on other design elements, such as inclusion thresholds, as well as the size and structure of the overall economy.

Adapt Categorisation to Jurisdiction Specifics

The categorisation may change depending on, among other things, the jurisdiction's linking goals and the size of the linking partners. The motivation for linking would elevate or reduce the importance of certain design elements to ensure their policy priorities are met. Multiple linking goals also imply trade-offs and compromises. For instance, while a government may focus on having an environmentally ambitious scheme, it may also wish to offer its regulated entities more (and potentially cheaper) means of emissions reductions. Another example would be linking with a scheme that has a significantly lower carbon price. Such a link would deliver the greatest cost efficiency gains but at the same time it also risks undermining the environmental effectiveness of the joint carbon market or missing domestic mitigation targets.

Secondly, the degree of harmonisation depends on the relative sizes of the carbon markets to be linked. A scheme that links to a significantly smaller ETS may not be as concerned about the impact of some unaligned design features. Developments and design elements in the smaller scheme will still affect the larger scheme but not to the same degree as developments in the larger carbon market will determine conditions in the smaller ETS. Finally, other issues, such as the history of cooperation between the linking partners, the acceptability and availability of compromise options, institutional structures and wider climate change framework will also all have a bearing on the relative importance of these issues.

4.6 Identify the Most Likely Outcome for Adjusting Design Elements

In general, harmonisation of all the high risk design elements seems to be the most likely option for linking (either full harmonisation or mutual recognition of differences). Therefore differences in design elements of the high risk category need to be identified. In order to assess the effects of linking, the most likely adjustments to be adopted by both linking partners need to be identified or determined. In particular, concrete assumptions on the final design are required for economic modelling.

Both parties have to find a (compromise) solution on the differing high risk design elements during linking negotiations.

How Different Design Elements Influence Achieving the Objectives

The importance of reaching an agreement on the final linked ETS design depends on the jurisdiction's emphasis given to these linking objectives.

For instance, if a system puts high emphasis on ensuring the environmental integrity of the ETS then the robustness of the MRV standards and the stringency of the enforcement mechanisms become even more important. Also, standards for offsets would need to be sufficiently stringent to minimise the risk of importing credits of questionable environmental integrity into the system.

If achieving long-term abatement targets is important, the existence and design of safeguard mechanisms within the joint system will be an important issue as this can help ensure a more stable carbon price.

For an illustration of relevant design elements, see the grey marked sections in the tables 2-1, 3-1, and 4-1 below.

Table 2-1: Selected environmental objectives and relevant design elements

Objective	Criteria	Indicator	Influencing factors
1. **Ensure environmental integrity**	**Environmental integrity**	[Mutually accepted] **MRV** standards/thoroughness	
		[Mutually accepted] **offset** standards (qualitative)	
		[High/sufficient] stringency of **enforcement**	
2. **Achieve long-term abatement targets**	**Incentives for low-carbon investments**	[Equal/comparable] **Cap stringency / cap reduction factor** as measured by degree of divergence from BAU emissions/No-ETS- pathway (incl. quantitative offset limits)	
		Availability and compatibility of **safeguards against oversupply** (e.g. price based or volume based supply control)	**Level of auction reserve price/price floor, market stability reserve provisions, ad-hoc supply interventions**

Table 3-1: Selected economic objectives and relevant design elements

Objective	Criteria	Indicator	Influencing factors
3. Reduce competitive distortions	**Competitiveness in relation to linking partner**	[Significant] differences in **free allocation methods**	
4. Increase market stability	**Market liquidity and stability**	Availability and compatibility of **safeguards against oversupply**	

Table 4-1: Selected political objectives and relevant design elements

Objective	Criteria	Indicator	Influencing factors
5. Maintain / increase acceptance of ETS and of linked market	**Domestic support of ETS and linking**		Important design features e.g. **allocation methods, access to offsets, supply control measures**

Template1 (table 9 and annex II) can be used to document the original designs before linking in both systems and to write down the results of the most likely linking design. This will help policy makers to keep track of key design assumptions when conducting the indicator assessment (step 7).

Furthermore, re-using the template in step 9 for alternative design assumptions will help policy makers to remember and compare different design assumptions when doing the sensitivity analysis (step 9).

Table 9: Template 1 - Documentation of ETS design

Design element	ETS design home ▸ step 5	ETS design partner ▸ step 5	Likely linking design ▸ step 6	Alternative linking design1 ▸ step 9
System type	Mandatory	Voluntary	Mandatory as linking has only occurred between mandatory sytems	Probably no alternative as voluntary systems are weak in nature and may raise environmental integrity concerns.
Borrowing	Not allowed	Generous borrowing provision	Not allowed	Probably no alternative as environmental integrity of joint market could be hurt
MRV	Robust framework	Different framework reflecting jurisdictions‘ emissions profile etc.	Harmonisation where possible	Mutual recognition where harmonisation is not possible is sufficient as long as both frameworks are comparably stringent

4.7 Assess the Effects of Linking on the Selected Criteria

The previous steps 1 to 6 have prepared policy makers for an assessment (i.e. quantification or qualitative definition) of the selected criteria:

In step 2, the most important objectives for and potential risks of linking were prioritised based on the overview given in step 1. Based on these priorities, the appropriate criteria was selected in step 3. Following this, in step 4, the assessment approachs for the selected criteria was decided upon from the use of empirical quantitative or qualitative data or the use of economic modelling. As the effects are closely linked to the specification of design elements, the similarity of the design elements in both ETS were reviewed in step 5. The most likely outcome of adjustments to design elements that entail a high risk and therefore should be harmonised or mutually recognised were identified in step 6.

The selected criteria must now be quantified or qualitatively defined (as described in Annex I). The information in Annex I is presented as follows:

A definition of the criteria is followed by a description of one or more indicators. For example, for the criterion “mitigation cost”, the appropriate indicator is the “change in the permit price”. The annex also provides a description of the indicator, why it has been selected, how it can be assessed, as well as recommendations as to the type of data that will be required.

If, for example, economic modelling is necessary but not a feasible option (due to costs, time and data required), another operationalised criterion might be selected to address a prioritised objective. For instance, one might have selected the indicator “expected net capital flows” to assess the criterion “reduce competitive distortions”. This, however, requires modelling. In order to circumvent modelling, one could instead choose “differences in free allocation methods”, where qualitative empirical data is required. However, in some cases, economic modelling is necessary. This is the case when not only the direction of change, but the specific amount of the permit price after linking must be calculated.

When it comes to assessing the risks of linking, qualitative reasoning is required due to the complexity of effects.

The results of the assessment can be recorded in the summary template 2 (see below table 10 for one example and annex II). This will help with the interpretation of results in the next step.

Table 10: Template 2 - Summary assessment and interpretation results (example)

Prioritised objectives ▸ step 1,2	**Selected Criteria ▸ step 3**	**Selected indicators ▸ step 3**	**Required assessment approach ▸ step 4**	**Assessment results ▸ step 7**	**Interpretation: Objective achieved? ▸ step 8**	**If necessary: Design element for achieving objective ▸ step 9**
Objectives	*Selected criteria for objectives*	*Selected indicators for selected criteria*	*Required assessment approach for selected indicators*	*Assessment results for selected indicators*	*Interpretation of results for selected indicators regarding achieving the respective objectives*	*Required design element for achieving respective objectives*
Example (fictitious, EU ETS +scheme x)						
Ensure environmental integrity	Environmental integrity	High/sufficient] stringency of enforcement	Qualitative	Although both systems impose penalties for entities that fail to surrender the required number of allowances, the penalty is higher in the EU ETS. The EU will likely demand a harmonised penalty regime in scheme x prior to linking. A pressing issue arises if in scheme x a requirement to surrender missing allowances is not imposed, whereas the EU does. If unaligned, the penalty in the linked market will act as a maximum price.	The lack of surrender requirements in the scheme x penalty regime and the lower penalty price can also undermine the environmental integrity of the EU ETS.	Penalties: monetary penalties and allowance surrender requirements should be negotiated and aligned.
Increase market stability and liquidity	Market liquidity and stability	Availability and compatibility of safeguards against oversupply	Qualitative	At a first step, both jurisdictions should consider the impact of their instruments (e.g. MSR and Auction Reserve Price) on a linked carbon market before deciding what level of harmonization and cooperation would be required. There has been little research on the impact of (and aligning) a quantity-based mechanism like the EU ETS' MSR in a linked market. This issue is to be dealt with in the linking negotiations between both jurisdictions.	Impact unclear	Will require an exchange of information on the potential impact on the respective oversupply safeguard instruments on the linked market.

Prioritised risks of linking ▸ step 1,2	**Qualitative reasoning**	**Reasoning results**	**Interpretation: Risk minimised? (yes/no/unknown) ▸ step 8**	**If necessary: Design element for minimising risk ▸ step 9**
Risks	*Most important arguments regarding risks of linking*	*Reasoning results for risks*	*Interpretation of results regarding minimising risks*	*Required design element for minimising risks*
Undermine environmental integrity	The EU Commission states a condition for linking with other ETS is that they need to have the same basic environmental integrity.	There are no indications of major discrepancies between both partners when it comes to MRV standards, enforcement and related capacities. However, the litmus test may be the treatment of offsets where different approaches of the partners can be observed.	Issue of offsets and penalties pose an issue for environmental integrity.	Require design alignment on: type of offsets, offset limits, penalties and surrender requirements.

4.8 Interpret the Effects of Linking for Objectives and Potential Risks

After having assessed the effects of linking on the selected criteria, the results need to be interpreted. Summary template 2 (table 10) may help policy makers list the prioritised objectives and to document whether the objectives will likely be achieved or not. The same could be done for risks of linking. The most important risk that should be avoided or minimised should be listed first.

Tables 11-13 (below) could be helpful in interpreting the assessment results as they show the connection between indicators, objectives and risks. A "+" suggests a positive connection, a "-" would imply a potential risk to achieving the objective.

In table 12, for example, the economic objective "Reduce competitive distortions" has been aligned with the indicator "[High] trade intensity of ETS sectors with linking partner". The connection between indicator and objective can be positive or negative: The effect would be more beneficial to the linking partner whose carbon price is reduced as a result of linking. Companies in the jurisdiction with a lower/no pre-linking carbon price will be challenged with the higher carbon price. If these companies have a high trade exposure, the extent to which they can pass-through the carbon price to the consumers is limited. If the increased permit price leads to higher product prices than the (linking partner based) competitors' product prices and/or permit cost increases are significant, their competitiveness deteriorates.

Table 11: Connections between environmental objectives and indicators

Environmental objective	Influenced pos./neg. by	Indicator	Assessment of effect
1. Ensure environmental integrity	+	[Mutually accepted] MRV standards/thoroughness	▸ Annex section 1.1.1
	+	[Mutually accepted] offset standards (qualitative)	▸ Annex section 1.1.2
	+	[High/sufficient] stringency of enforcement	▸ Annex section 1.1.3
2. Achieve long-term abatement targets	+	[Sufficiently high] historic carbon price level	▸ Annex section 1.2.1
	+	[Equal/comparable] cap stringency / cap reduction factor as measured by degree of divergence from BAU emissions/No-ETS- pathway (including quantitative offset limits)	▸ Annex section 1.2.2
	+	Availability of [ambitious, fair] long term mitigation targets and commitments	▸ Annex section 1.2.3, 1.2.5
	+	Availability and compatibility of safeguards against oversupply (e.g. price-based or volume-based supply control)	▸ Annex section 1.2.4
	+	[High] political support of ETS [across all major political parties/in government and opposition]	▸ Annex section 1.2.6
	+	[High] acceptance of the ETS with stakeholders and the broader public	▸ Annex section 1.2.7

Table 12: Connections between economic objectives and indicators

Environmental objective	Influenced pos./neg. by	Indicator	Assessment of effect
3. Reduce mitigation costs	+ (but selling certificates becomes less beneficial)	Expected change [decrease] of carbon price (before and after linking)	▸ Annex section 1.3.1
	+	Expected change [increase] in economy-wide production (GDP)	▸ Annex section 1.3.2
4. Reduce competitive distortions	+	[High] trade intensity of ETS sectors with linking partner	▸ Annex section 1.4.1
	-	[Significant] differences in free allocation methods	▸ Annex section 1.4.2
	+	[Significant] difference of carbon price level before linking	▸ Annex section 1.4.3
	-	Expected [large] net capital flows	▸ Annex section 1.4.4
	-	[High] trade intensity of ETS sectors with third countries	▸ Annex section 1.5.1
	-	[Significant] expected relocation of production and investment (after linking)	▸ Annex section 1.5.2
	-	Expected change [increase] of carbon price (comparing pre/post linking)	▸ Annex section 1.5.3
5. Increase market stability	+	[Large] number of market participants (before and after linking) relative to market size and number of trades	▸ Annex section 1.6.1
	+	Stable permit price (before linking)	▸ Annex section 1.6.2
	+	Availability and compatibility of safeguards against oversupply	▸ Annex section 1.6.3

Table 13: Connections between political objectives and indicators

Political objective	Influenced pos./neg. by	Indicator	Assessment effect
6. Maintain/ increase acceptance of ETS and of linked market	-	[High] relevance of changes to ETS designs required for linking	▸ Annex section 1.7.1
	+	[High] political, stakeholder and public support of estimated impacts of linking (balance of "winners and losers")	▸ Annex section 1.7.2
7. Support global cooperation on climate change	+	[High] reliability as [ambitious] climate policy partner	▸ Annex section 1.8.1
	+	Expected [large] net capital flows	▸ Annex section 1.8.2

4.9 Sensitivity Analysis

If the assessment shows that the most important selected objectives cannot be achieved or the potential risks cannot be minimised, a sensitivity analysis could be conducted to check the extent to which the impact on the objectives and potential risks would change with a different linking design (reapplication of step 6). It might also be interesting to conduct a sensitivity analysis if the assessment yields positive results. This allows policy makers to identify critical design elements that may render linking beneficial or not.

In order to keep track of the alternative assumed linking designs, the design template 1 of section 4.6 (step 6) can be used.

If the achievement of certain objectives or the minimisation of certain risks depends on specific design elements, this can be recorded in the summary template 2 of section 4.7 (step 7). This table should yield a list of the most important linking design elements for achieving domestic objectives and implicitly tells policy makers where concessions to the linking partner in terms of linking design might be feasible. This information can be used in the linking negotiations.

4.10 Results: Is Linking Beneficial or Not?

While the previous steps have analysed the effect of linking on the individual objectives and risks, step 10 serves to assess whether in total, linking is likely beneficial (i.e. most important objectives will likely be achieved and most important risks will likely be minimised) or not.

This may yield three possible recommendations:

- linking is likely beneficial - go for linking negotiations
- linking is likely only beneficial under a certain linking design - go for linking negotiations with a list of crucial design elements
- do not further pursue linking negotiations (at least not for the moment).

Note: Another approach to answer the challenges of linking is the introduction of restrictions on the flow of permits between the involved jurisdictions. ICAP has investigated different options for **restricted linking** such as quotas, exchange rates, discount rates or one-way linking. (ICAP 2015)

The recommendations mirror the fact that beneficial linking depends on the specific linking design. Therefore, the focus lies on whether linking is likely beneficial or not, and thus, whether going for linking negotiations might be worthwhile.

The following aspects should be considered:

Firstly, there is an implicit prioritisation between achieving objectives and minimising risks. Linking is first about achieving objectives, and if it turns out that certain prioritised objectives might be achieved, one should afterwards check whether prioritised risks might be limited. That means that linking does not really make sense if it turns out that the risks of linking are minimised, but the most important objectives are not achieved.

Secondly, it is possible that the most important objective will not be achieved through linking, even with an alternative linking design, but that the other selected objectives will be achieved. In such situations, it is up to the policy makers to decide how important it is to not achieve the most important objective, compared to achieving the other objectives.

Therefore, even if this manual provides a structural approach to assessing the effects of linking on selected objectives, the final decision and how the assessment is used remains in the hands of the policy makers.

1 ANNEX I: Operationalisation and Quantification of Criteria

1.1 Environmental Objective: Ensure Environmental Integrity

Criterion	Indicators	Assessment approach
Ensure environmental integrity	[Mutually accepted] MRV standards/ thoroughness	Qualitative reasoning
	[Mutually accepted] qualitative offset standards	Qualitative reasoning
	[High/sufficient] stringency of enforcement	Qualitative reasoning

Criterion: Ensure environmental integrity

If linking partners are interested in preserving the environmental integrity of their ETS (and of the linking partner's ETS), certain design features must either be harmonised, perceived as equally trustful or put under joint regulatory supervision.

1.1.1 Indicator 1: [Mutually accepted] MRV standards/ thoroughness.

MRV standards need to be robust, credible and enforceable. Although complete harmonisation is not essential to linking, it needs to be ensured that the appropriate amount of permits is cleared for each tonne of emissions released ("a tonne is a tonne" principle).

Assessment approach: Qualitative reasoning. Policy makers need to agree on the harmonisation or mutual recognition of MRV standards. Given the complex arrangements of the MRV regimes, as a first step, partners should transparently share information about their MRV arrangements. A detailed assessment by the respective MRV experts can help ensure the linking partner's MRV system is sufficiently robust and credible.

1.1.2 Indicator 2: [Mutually accepted] qualitative offset standards.

Different qualitative offset standards and quotas can pose a significant obstacle to linking. When linking, offsets of both schemes are available to companies for compliance, even if a partner does not accept a certain project type, freeing up permits that companies in the more restrictive jurisdiction would otherwise have bought on the market.

Example: The EU does not accept offset credits from land use, land-use change and forestry (LULUCF) projects due to concerns about the permanency of the emissions reductions. The EU's refusal to accept such credits has played a major role in its linking negotiations. Switzerland, which is currently negotiating a link with the EU, has modified its offset regulations to exclude LULUCF offsets. This may have also been an issue for a link between the EU and Australia (had the latter not abolished its ETS), as the Australian system accepted land-use and agricultural offsets. Going forward, the EU also does not foresee the use of international credits for compliance in its system after 2020, which may further complicate linking discussions.

Assessment approach: Qualitative reasoning. Policy makers need to agree on the harmonisation or mutual recognition of offset standards, as well as the specific offset design.

1.1.3 Indicator 3: [High/sufficient] stringency of enforcement.

The linking partners should credibly enforce compliance and treat companies in both jurisdictions equally. Enforcement stringency is strongly influenced by the administrative enforcement capacities of each jurisdiction and the level of penalties. If penalties for non-compliance in one scheme are lower than the overall carbon price (or if non-compliance is not sufficiently sanctioned), entities in the scheme will have an incentive to sell their permits and pay the penalty (or take the risk of not being persecuted), thus jeopardising the environmental effectiveness of the linked system.

Example: In past linking negotiations, stringency of enforcement was an important issue. For instance, under the planned EU-Australia link, Australia was prepared to amend its original penalty for non-compliance from a fine of 1.3 times the fixed permit price to double the average auction price of permits for that year, mirroring the EU's penalty regime. Switzerland also amended its penalties to match the fines in the EU ETS.

Assessment approach: Qualitative reasoning. Policy makers need to agree on the harmonisation or mutual recognition of enforcement provisions and structures, as well as the specific design of the enforcement regime. For instance, in a hypothetical link between EU and South Korea, the EUR 100/t CO_2e penalty in the EU ETS is higher than in the Korean system, the latter of which is capped at a maximum of EUR 70/t CO_2e. If both systems were to link without some level of alignment, the Korean penalty would act as a maximum price in the joint market. Additionally, South Korea does not impose a requirement for companies to surrender missing allowances, whereas the EU does. This would undermine the environmental integrity of the system as companies are not required to account for these additional emissions.

1.2 Environmental Objective: Achieve Long-term Abatement Targets

Criteria	Indicators	Assessment approach
Incentives for low-carbon investments	[Sufficiently high] historic carbon price level	Empirical data
	[Equal/comparable] cap stringency/cap reduction factor	Qualitative empirical data
	Availability of [ambitious, fair] long term mitigation targets and commitments	Qualitative empirical data
	Availability/compatibility of safeguards against oversupply (e.g. price-based/ volume-based supply control)	Qualitative empirical data
Stability of the political/ regulatory environment	Availability of [ambitious, fair] long-term mitigation targets and commitments	Qualitative empirical data
	[High] political support of ETS [across all major political parties/in government and opposition]	Qualitative empirical data
	[High] acceptance of the ETS with stakeholders and the broader public	Qualitative empirical data

Criterion: Incentives for low-carbon investments

Most jurisdictions see their ETS as a vehicle for driving low carbon investments. When the permit price decreases for both schemes, financial incentives for low carbon investments can deteriorate. This is a threat to the dynamic efficiency of the system.[1]

1 Dynamic efficiency implies that the transition towards long term targets is met at least cost. For example, it might be statically efficienct if companies decide to reduce production in order to meet their ETS obligations, but not dynamically efficient.

1.2.1 Indicator 1: [Sufficiently high] historic carbon price level.

A potential linking partner might have a considerably low carbon price level, which does not adequately reflect the jurisdictions' abatement cost. In such a case, linking might lower the high-price jurisdiction's carbon price more than would be statically efficient. In any case, since linking reduces the carbon prices in the ETS with a higher pre-linking price, a jurisdiction's domestic decarbonisation goal might be undermined as low carbon investments are less beneficial. This might make the jurisdiction generally reluctant to link.

Example: **California has pointed to the EU's low carbon price as one reason for not pursuing a transatlantic link.** More broadly, Ranson and Stavins (2014) highlight that notions of an 'acceptable' carbon price are an important factor in linking negotiations, if these notions differ significantly, that system may not be seen as an 'acceptable' linking partner.

Note: Influencing factors like the overall policy mix should be taken into consideration. Complementary strong climate change polices (i.e. energy efficiency standards or renewable energy deployment support) also affect the mitigation cost and are thus likely to lower the carbon price.

Assessment approach: Empirical data.

1.2.2 Indicator 2: [Equal/comparable] cap stringency/ cap reduction factor.

Generally, if a scheme is linked with an ETS that has a relatively loose pre-linking cap relative to "business-as-usual" (i.e. an oversupplied market with a low carbon price), a large amount of cheap permits would be introduced into the linked system, undermining abatement incentives. If domestic emissions reductions are considered a political priority, linking with a less ambitious scheme would undermine the achievement of such domestic policy goals.

Notes:

- Depending on the relative size of the systems, aggregate emissions may even rise as a result of linking: When the oversupply in one system is imported into the linked system, the price signal is reduced and overall abatement efforts decrease. Such "hot air" may also reduce long-term abatement efforts if installations bank cheap permits for future compliance, undermining the environmental effectiveness of the system in the future.
- Theory suggests that a link could also give a system an incentive to be less ambitious: it could increase the amount of permits to be supplied to the linked system in order to generate additional revenues for domestic firms after schemes are linked.
- Offsets deserve particular attention in the discussion of cap stringency. If the price of offsets is lower than the carbon price on the linked market, participants will be incentivised to rely on the cheaper offsets for compliance purposes.

Examples:

- California can only link with systems that are equally or more ambitious than its own program. Prior to linking with Québec, California lawmakers considered, among other issues: (1) the jurisdiction's emissions reduction goal; (2) the role of the cap-and-trade program; and (3) the rules and requirements of the program. This may provide a helpful starting point for policy makers about to start their own assessment of cap stringency and ambition.
- Some jurisdictions' political prioritisation of domestic emissions reductions is also reflected in the UNFCCC/ Kyoto principle of supplementarity, where the use of flexibility mechanisms must be "supplemental" to domestic actions to limit or reduce their emissions, which some parties have defined to be less than 50 % of the overall goal.

Assessment approach: Qualitative empirical data. Taking a potential link between the EU and South Korea as an example, assessment is problematic as information about the cap-setting process and the institutions involved is hardly available. When assessing the cap, as a first step, policy makers should assess the relative ambition of their potential linking partner's ETS, although this may be challenging given differing national circumstances and baselines. Broader assessments may provide a useful starting point, such as the UNFCCC global stocktake or NGO efforts like the Climate Action Tracker. Although it is unlikely that partners will be able to completely align the cap-setting process, given this is largely determined by the goals and individual characteristics of the jurisdiction, an exchange on broader issues like how the cap is set and long-term targets can be a good starting point.

1.2.3 Indicator 3: Availability of [Ambitious, Fair] Long-Term Mitigation Targets and Commitments.

The existence of long-term targets in both systems can help shore up investor confidence in the linked carbon market. Stringent, credible, continuous ETS cap reduction provisions can be evidence of policy makers' commitment to long-term mitigation targets and reduce investment risks. Assessing the degree of "fairness" in relation to the remaining global carbon budget can be challenging.

Assessment approach: Qualitative (and quantitative) empirical data. However, comparing targets may be challenging without first accounting for the differing circumstances of the linking partners (e.g. economy size, state of development, marginal abatement costs) and the fact that jurisdictions may not use the same baselines, timelines and assumptions.

1.2.4 Indicator 4: Availability/ compatibility of safeguards against oversupply.

Many ETS have introduced price- or quantity-based measures to ensure a minimum carbon price signal or minimum scarcity and to protect the scheme from an oversupply of permits. Depending on the availability and design of supply management measures in a potential partner scheme, the effectiveness of these measures may be reduced after linking.

Example:

In linking negotiations with the EU, Australia agreed to abolish the AUD 15 (EUR 10.49) price floor.

If two schemes were to link and one scheme had a minimum auction price, entities would be incentivised to purchase emissions in the other scheme until the minimum price level is reached.

For quantity-based instruments like a MSR to be effective, it must apply to the whole linked market. It must account for (cumulative) demand and supply in both ETS.

Assessment approach: Qualitative empirical data. The alignment of quantity-based supply management provisions like the European MSR could be particularly challenging. The EU will operate the MSR from 2019, which withdraws and injects allowances into the European carbon market to control fluctuations in supply and demand. However, the final rules have not yet been agreed upon. Not only is the exact function and effectiveness of the MSR in the European carbon market unclear, but also how it would work in a linked system. For instance, the EU has recently finalised technical negotiations on linking with the Swiss ETS (although an actual link is still subject to ratification of the agreement) and it is unclear the extent to which the MSR would affect the Swiss market. Another example, South Korea, has an allocation committee with considerable scope for market intervention including removing/injecting allowances into the system, adjusting borrowing and offset limits, as well as establishing a temporary price ceiling or floor. The impact of these mechanisms on the linked market is unclear, as well as how and to what extent such mechanisms should (and need to) be aligned.

Criterion: Stability of the political/regulatory environment

If an ETS has a low level of domestic support, linking could lead to policy uncertainty in both jurisdictions. However, a link with a scheme that has a relatively stable, reliable climate policy with broad public support might also import stability to the domestic system.

Example: Jurisdictions may be motivated to link to stabilise their own system. Linking negotiations with the EU might have further entrenched the Australian ETS by binding it to an international commitment. (Campbell & Voros, 2012; Lake, 2013). Strengthening support for the CPM within the private sector in particular may have played a role in linking, with then Environment Minister Greg Combet frequently emphasising the boost to market confidence and certainty that the planned link would provide (AAP, 2012).

1.2.5 Indicator 1: Availability of [ambitious, fair] long-term mitigation targets and commitments (see also 1.2.3).

The existence of formal, credible long-term mitigation (and cap reduction) targets and road maps in the partner jurisdiction can be an indicator of a relatively stable and reliable climate policy (see section 1.2.3 for more).

1.2.6 Indicator 2: [High] political support of ETS [across all major political parties/in government and opposition].

If most of the relevant political actors in the government and the opposition party support the ETS in the linking partner's jurisdiction, there is less risk that it may be abolished in case of a change in government, making the link more stable.

Note: Linking ETS means that a certain level of mitigation will not take place within the jurisdiction with higher abatement costs. Even if not explicitly expressed, this might be an argument against linking for some political parties with a strong preference for domestic emissions reductions.

Assessment approach: Qualitative empirical data. This can be gauged by looking at the speeches and policies of the major parties on ETS and linking or, where not available, on climate change more broadly. Voting patterns and the level of cooperation in crafting and operating the ETS can also be indicators of the level of political support. For instance, in Australia, the Labour party had passed the Carbon Pricing Mechanism holding a slim majority in government. At the same time, the opposition party (the Liberal government) was strongly opposed to the ETS and crafted their election campaign policy and rhetoric around the abolition of the policy.

1.2.7 Indicator 3: [High] acceptance of the ETS with stakeholders and the broader public.

If governments of both jurisdictions have a strong level of support from the general public and key stakeholders for its domestic ETS and linking, the ETS is more likely to be maintained and the linking process will be much easier. If the governments have a low level of public support for their domestic ETS, linking may increase the stability of the ETS, if the governments can show that substantial advantages would be derived from linking. Yet, if linking undermines political compromises made in the initial design of the individual domestic ETS, the level of support from stakeholder groups affected by linking is likely to drop. However, such changes can only be estimated once the design of the joint carbon market is clear. Governments must ensure that they take key stakeholders into consideration, as they can be a powerful force to drum up support for or opposition against the link.

Assessment approach: Qualitative empirical data. Various sources can be used, ranging from public opinion polls, reviewing stakeholder submissions, holding public workshops or otherwise arranging meetings with stakeholders and reviewing any position papers or media articles. The general level of cooperation among stakeholders and policy makers can also be a proxy for acceptance levels.

1.3 Economic Objective: Reduce Mitigation Cost

Criterion	Indicators	Assessment approach
Mitigation costs (short-term, static)	Expected change [decrease] of permit price	Economic modelling
	Expected change [increase] in economy-wide production (GDP)	Economic modelling

Criterion: Reduction of mitigation costs

The reduction of mitigation costs is an objective that can be directly used as criterion.

1.3.1 Indicator 1: Expected change [decrease] of permit price.

The larger the expected change in the permit price, the greater the overall cost savings from linking. The price is determined by the cap and the marginal abatement cost (price and number of various abatement options). With a similarly ambitious cap, a scheme with many cheap abatement opportunities (low hanging fruit) will have a lower price, whereas a scheme with few cheap or much more expensive abatement opportunities will have a higher permit price. The jurisdiction with the relatively high carbon price will reduce mitigation costs by buying permits from the partner scheme where mitigation is cheaper due to differences in the abatement potential and costs. The jurisdiction with the relatively low carbon price will have more opportunities to sell emission permits at higher price, which makes abatement activities more beneficial. If the pre-linking prices in both systems are the same, the post-linking price would not change and there would be no cost savings.

Assessment approach: The expected change in the permit price (price before linking compared to expected price after linking) should ideally be calculated with data gathered by economic modelling. The empirically observable or modelled carbon price in a region before linking needs to be subtracted from the modelled joint carbon price in the linked permit market.

If modelling is not possible, the expected direction of change of the permit price (increase or decrease) might be assessed by using the actual permit prices in each individual scheme. The permit price from the linked system should lie in-between both systems, with a tendency towards the price of the larger system.

1.3.2 Indicator 2: Expected change [increase] in economy-wide production (GDP).

Due to the complex interdependencies between the ETS sectors' and the non-ETS sectors' production, it is worthwhile considering changes in the overall GDP in addition to changes in mitigation costs for the ETS sectors from linking. There are three ways in which non-ETS sectors may be affected from linking. Firstly, if linking leads to less domestic emission reductions in the ETS sectors, the non-ETS sectors might have to reduce more in order to achieve certain domestic abatement targets. This implies a higher abatement cost burden for non-ETS sectors, which might affect their competitiveness. Secondly, if linking leads to more domestic abatement as a result of rising permit prices, and certain ETS sector products are used as inputs to production from non-ETS sectors, the prices for non-ETS sector products may also increase. Again, this might affect the competitiveness of export-oriented, non-ETS sectors. Thirdly, if permit prices increase with linking and thereby the production costs for ETS sectors, non-ETS sectors might shift from purchasing products from domestic ETS sectors to cheaper, international alternatives. Overall, the three mechanisms operate via ETS- and non-ETS sectors' competitiveness and total production. Therefore, any impact should be visible in changes in the domestic GDP.

Assessment approach: The expected change in economy-wide production (GDP) can be calculated with data from economic modelling. In order to obtain the change in GDP, the jurisdictions' modelled GDP before linking needs to be subtracted from the jurisdictions' modelled GDP after linking.

1.4 Economic Objective: Reduce Competitive Distortions in Relation to Linking Partner

Criterion	Indicators	Assessment approach
Competitiveness in relation to Linking Partner	[High] trade exposure of ETS sectors in relation to linking partner	Empirical quantitative data Alternative: Economic modelling for future expected trade exposure for ETS sectors after linking
	[Significant] differences in free allocation methods	Empirical qualitative data
	[Significant] difference of permit price level before linking	Empirical quantitative data
	[Large] net capital flows (from seller to buyer)	Economic modelling

Criterion: Competitiveness in relation to the linking partner

Linking would level the carbon playing field between linking partners. However, policy makers, especially in the low-price region, might want to protect domestic ETS sectors from the effects of higher permit prices.

Note: Tariffs, national subsidies and other state measures may alsoinfluence the respective competitiveness situation.

1.4.1 Indicator 1: [High] trade exposure of the ETS sectors in relation to the linking partner.

The greater the trade exposure, the more positive the effect of linking on creating a level playing field, as all ETS companies will face a common carbon price. However, this would be more beneficial to the linking partner whose carbon price is reduced as a result of linking. Companies in the jurisdiction with a lower/no pre-linking carbon price will be challenged with the higher carbon price. If these companies have a high trade exposure, the extent to which they can pass-through the carbon price to the consumers is limited. If the increased permit price leads to higher product prices than the (linking partner based) competitors' product prices and/or permit cost increases are significant, their competitiveness deteriorates.

Assessment approach: The trade exposure of ETS sectors in relation to the linking partner can be quantified by either using empirical data or economic modelling. The trade exposure to the linking partner of a certain sector is the share of sectors' exports from the region to the partner in total production of the sector in the region, usually measured in terms of gross value added (GVA). As an alternative to using empirical data, estimates from economic modelling for the expected trade exposure after linking can be used.

Main Databases:

GTAP (v.9: 1160-5940, v.7 and older: free access), EXIPOL (free access), UN Comtrade (free access)

Further databases with industry or regional focus: Eurostat Structural Business Statistics (free access); Eurostat External Trade Data (free access), AMECO (free access), UN Industrial Commodities Statistics (paid access, cf. http://unstats.un.org/unsd/industry/publications.asp)

1.4.2 Indicator 2: [Significant] differences in (free) allocation provisions.

The larger the share of free allocation relative to the potential linking partner's free allocation, the larger the potential competitive advantage of the domestic ETS sector towards the corresponding partner region's ETS sector due to the lower cost burden.

Assessment approach: A significant difference in free allocation can be observed by qualitatively comparing the respective linking partners' allocation methods before linking. The larger the share of sectoral free allocation, relative to the partner's ETS sector free allocation, the larger the potential competitive advantage of the ETS sector towards the partners' ETS sector.

1.4.3 Indicator 3: [Significant] difference between pre-linking carbon prices.

The greater the difference between pre-linking carbon prices, the larger the potential competitiveness-effects between both regions. A significant increase of the carbon price due to linking in the low price region might challenge companies' competitiveness towards competitor companies in the partner region.

Assessment approach: A significant difference of the permit price level before linking between the linking partners can be identified by using empirical data for regional permit prices before linking for home and partner.

Main Databases:

Databases global coverage: Thompson Reuters/Point Carbon EIKON (Covers global carbon markets: EU-ETS, US markets (WCI and RGGI), China, South Korea, New Zealand and other emerging carbon market as well as CDM and other offset markets, paid access), Bloomberg New Energy Finance Carbon Market Analysis (paid access)

Databases regional coverage: EEX (EU-ETS, paid access), California Carbon Dashboard (California ETS, free access), www.szets.com, www.cbeex.com.cn, www.cneeex.com, www.cnemission.com, www.chinatcx.com.cn/tcxweb/, www.hbets.cn, http://222.178.87.205/index.html (Chinese regional markets)

Data from private market analysts and carbon traders: Argus (paid access), ICIS (paid access), Climate Connect (paid access), Intercontinental Exchange ICE (paid access)

No data from ETS that do not exist to date (Mexico, Turkey, country-level China)

Issue with data from China (and to smaller extent from other ETS): no data on exchange market-distorting OTC-trading

1.4.4 Indicator 4: [Large] net capital flows (from permit buyer to permit seller).

When ETS link, participants in the scheme with an initially higher carbon price will purchase cheaper permits from the other jurisdiction until prices equalise. As a result, the jurisdiction with an initially lower carbon price will see an increase in capital inflows. Depending on how permits are allocated, this could render the jurisdiction more competitive, as it has more capital to invest.

Note: Additional capital flows (possibly in reverse order) may result from changing import/export patterns due to changing competitiveness. Assessing these effects requires modelling.

Assessment approach: The expected net capital flows (from seller to buyer) have to be calculated with estimates from economic modelling, via two equivalent ways. The first way is to subtract the real emissions after linking in the seller region from the (pre-linking) cap in the seller region, to obtain the amount of permits that are unused and could be sold. The resulting amount is then multiplied by the permit price after linking to obtain the capital value and hence the capital flow of the permits being traded between the regions.

Alternatively, data from the buyer region can be used to calculate the capital flows by first subtracting the buyer's regional cap from the buyers' real emissions after linking to obtain the amount of permits demanded by the buyer, and then multiplying the resulting number again with the permit price after linking.

1.5 Economic Objective: Reduce Competitive Distortions in Relation to Third Countries

Criterion	Indicators	Assessment approach
Competitiveness in relation to third countries	[High] trade exposure of ETS sectors in relation to similar sectors in all third countries together	Empirical quantitative data Alternative: Economic modelling for future expected trade exposure
	[Significant] expected relocation of production and investment (after linking)	Economic modelling: i) Change in production by sector and region, relative to change in production by sector in third countries ii) Change in economy-wide production by region, relative to change in production in third countries iii) Change in investment by sector and region, relative to change in investment by sector in third countries
	Expected change [increase] of permit price	Economic Modelling

Criterion: Competitiveness in relation to Third Countries

Competitiveness effects in relation to the rest of the world depend mainly on potential changes of production costs as a result of the different permit price after linking.

1.5.1 Indicator 1: [High] trade exposure of ETS sectors in relation to the rest of the world.

Similar to the indicator on trade exposure in relation to the linking partner, companies in the jurisdiction with a lower/no pre-linking carbon price will be challenged with the higher carbon price. High trade exposure of the linked ETS sectors in relation to third country competitor reduces the extent to which producers can pass through the carbon price to consumers. If the increased permit price leads to higher product prices than the third country competitors' product prices and/or permit cost increases are significant, the competitiveness of linked ETS-sectors deteriorates.

Assessment approach: A high trade exposure of ETS sectors in relation to similar sectors in the rest of the world can be calculated with empirical quantitative data. The calculation is similar to calculating the trade exposure in relation to the linking partner (but using values for all third countries). As an alternative to using empirical data, estimates from economic modelling for the expected trade exposure after linking can be used.

Main Databases:

GTAP (v.9: 1160-5940, v.7 and older: free access), EXIPOL (free access), UN Comtrade (free access)

Further databases with industry- or regional focus: Eurostat Structural Business Statistics (free access); Eurostat External Trade Data (free access), AMECO (free access), UN Industrial Commodities Statistics (paid access, cf. http://unstats.un.org/unsd/industry/publications.asp)

1.5.2 Indicator 2: [Significant] expected relocation of production and investment.

For the low price region, companies facing a significant increase in carbon prices due to linking might decide to relocate production and investments outside the linked carbon market to safeguard competitiveness at the company level. However, for the linked region, production and investments relocation might lead to sectoral and country-level deterioration in their competitiveness.

Assessment approach: The expected relocation of production and investment (after linking) has to be calculated by three different ways since the criterion covers production and investments for sectors and the entire economy. All variants rely on data from economic modelling.

Firstly, the change in sectoral domestic production relative to the change in sectoral production in third countries can be calculated by subtracting the domestic sectoral gross value added before linking from the domestic sectoral gross value added after linking for the nominator. For calculating the denominator, the same applies, using data for the rest of the world instead of domestic data.

Secondly, the change in overall domestic production relative to the change in production in third countries will be calculated by subtracting domestic GDP before linking from domestic GDP after linking for the nominator. Again, for calculating the nominator, the same principle applies, just with data for the rest of the world.

Thirdly, to calculate changes of investment by sector and region relative to changes in investment by sector in third countries, the domestic investments by sector before linking are subtracted from the domestic investments by sector after linking for the nominator. For the denominator, as before, the same applies like for the nominator, using data for the rest of the world.

1.5.3 Indicator 3: Expected change [increase] of carbon price.

For the region that faces a carbon price increase with linking, there is a risk that businesses relocate production and related emissions outside of the linked carbon market. In contrast, the jurisdiction with the initially higher carbon price might become more cost competitive in relation to third countries, as their permit price will drop.

Assessment approach: The expected change in the permit price (price before linking compared to expected price after linking) should ideally be calculated with data gathered by economic modelling. The empirically observable or modelled carbon price in a region before linking needs to be subtracted from the modelled joint carbon price in the linked permit market.

Although there might be empirical data for the carbon price in a region before linking, it is preferable to use the modelled carbon price before linking. Since the carbon price in the linked market has to be estimated in models, it makes more sense to estimate the carbon price before linking and use this to calculate the change.

If modelling is not possible, the expected direction of change of the permit price (increase or decrease) might be assessed by aid of empirical data for the actual permit prices in each individual scheme. The permit price from the linked system should lie in between both systems, with a tendency towards the price of the larger system.

1.6 Economic Objective: Increase Market Stability and Liquidity

Criterion	Indicators	Assessment approach
Market liquidity and market stability	[Large] number of market participants relative to market size and number of trades	Economic Modelling Second-best alternative: empirical quantitative data
	Stable permit price (before linking)	Empirical quantitative data
	Availability and compatibility of safeguards against oversupply	Empirical qualitative data

Criterion: Market liquidity and stability

Market stability and liquidity depend on the number of active market participants. It can be approximated via pre-linking permit price stability in both jurisdictions. Further, the availability of similar safeguards against oversupply can help to assess if an increased market stability and liquidity can be maintained after linking.

1.6.1 Indicator 1: [Large] number of market participants (before and after linking) relative to market size and number of trades.

Linking creates a larger carbon market with more participants. With more active participants, trading activity increases, thereby increasing the trading volume and liquidity of the joint system. This also depends on the kind of players admitted to trade in the linked market (e.g. compliance companies, financial institutions etc.). The effects are larger for the smaller linking partner.

Assessment approach: The number of market participants (relative to market size and number of trades has to be determined by empirical data (number of market participants before linking) and with economic modelling (number of market participants after linking). In economic modelling, there is no formula to obtain a value for this criterion, since it very much depends on the modelling approaches whether at all, and if so, how models provide estimates for this indicator.

Main Databases:

Databases global coverage: Carbon Market Data (paid access), Thompson Reuters/Point Carbon EIKON (Covers global carbon markets: EU-ETS, US markets (WCI and RGGI), China, South Korea, New Zealand and other emerging carbon market as well as CDM and other offset markets, paid access), Bloomberg New Energy Finance Carbon Market Analysis (paid access)

Databases regional coverage: EUTL Dataset Project (EU ETS Phase I, free access)

1.6.2 Indicator 2: Stable permit price (before linking).

A larger, more liquid, linked market usually exhibits lower daily or longer-term carbon price fluctuations. This might be especially important for relatively small carbon markets. However, linking can also increase a system's vulnerability to systematic risk. If a small jurisdiction links with a larger scheme that experienced significant price fluctuations in the past, price volatility may be imported.

Assessment approach: The permit price stability (before linking) can be evaluated using empirical quantitative data. The more volatile the permit price before linking, the more volatile it might be in the linked ETS, if the volatile price occurred in the relatively larger economy. Yet, for the relatively smaller economy, volatile pre-linking prices will become more stable with linking.

Main Databases:

Database global coverage: Thompson Reuters/Point Carbon EIKON (Covers global carbon markets: EU-ETS, US markets (WCI and RGGI), China, South Korea, New Zealand and other emerging carbon market as well as CDM and other offset markets, paid access), Bloomberg New Energy Finance Carbon Market Analysis (paid access)

Databases regional coverage: EEX (EU-ETS, paid access), California Carbon Dashboard (California ETS, free access), www.szets.com, www.cbeex.com.cn, www.cneeex.com, www.cnemission.com, www.chinatcx.com.cn/tcxweb/, www.hbets.cn, http://222.178.87.205/index.html (Chinese regional markets)

Data from private market analysts and carbon traders: Argus (paid access), ICIS (paid access), Climate Connect (paid access), Intercontinental Exchange ICE (paid access)

No data from ETS that do not exist to date (Mexico, Turkey, country-level China)

Issue with data from China (and to smaller extent from other ETS): no data on exchange market-distorting OTC-trading

1.6.3 Indicator 3: Availability and compatibility of safeguards against oversupply.

Safeguards against permit oversupply or other measures to ensure a stable permit price signal exist in many ETS to increase market stability. If these measures are compatible between linking partners in terms of design and political ambition, they would improve stability of the linked market.

Assessment approach: The availability and compatibility of safeguards against oversupply can be evaluated with empirical qualitative data. The process of inducing the safeguards needs to be considered, too. If they are not automatically triggered, but need to be negotiated case by case, the market stability is endangered.

1.7 Political Objective: Maintain/increase acceptance of ETS and of Linked Market

Criterion	Indicators	Assessment approach
Domestic support of ETS and linking	[High] relevance of changes to ETS designs required for linking	Qualitative reasoning, empirical qualitative data
	[High] political, stakeholder and public support of estimated impacts of linking (balance of "winners and losers")	Qualitative reasoning, empirical qualitative data

Criterion: Domestic support of ETS and linking

A specific ETS design might reflect hard-won political compromises in order to ensure domestic stakeholder support. Before linking, certain design features might need to be harmonised. If this means that the former domestic ETS design consensus is called into question, the level of support for the ETS may wane. Governments have to carefully consider the implications of the final linking design on domestic stakeholders.

1.7.1 Indicator 1: [High] relevance of changes to ETS designs required for linking.

The greater the difference in the design elements of schemes, the more challenging it will be for the jurisdictions to negotiate and align their schemes for linking. Adjustments may be necessary for crucial design elements like cap nature and stringency, allocation methods, borrowing provisions, offset provisions or price control mechanisms. This might pose an obstacle for political agreement and domestic support for linking.

Assessment approach: Qualitative reasoning, empirical qualitative data from past ETS design negotiations. This can be assessed by looking at empirical qualitative data from past ETS design negotiations, which can flag particularly sensitive issues.

In particular, amendments that will increase the cost burden on regulated entities (e.g. lowering share of free allocation, an increase in the carbon price) or that threaten the continuation of certain programs (e.g. carbon leakage provisions or programs funded by auction revenue) should be carefully considered. However, stakeholder submissions and a transparent negotiation process will also give these players (and the policy makers) an opportunity to discuss any amendments to the ETS design.

1.7.2 Indicator 2: [High] political, stakeholder and public support of estimated impacts of linking (balance of "winners and losers").

From a political economy point of view, net buyers in the scheme with a higher pre-linking carbon price (e.g. compliance entities who have to buy permits) and net sellers in the scheme with a lower pre-linking price (e.g. governments auctioning permits, compliance entities selling surplus free permits) would likely support linking as they would be the main beneficiaries. Stakeholders, who would have to potentially bear certain losses, will likely oppose it. Governments might want to balance winners and losers of linking.

Note: For the high price scheme, linking might result in a lower level of domestic emission reductions and political control over emissions reductions. This might be an argument against linking for some political parties and civil society organizations with a strong focus on domestic emissions reductions.

Assessment approach: Qualitative reasoning, empirical qualitative data regarding positions of key stakeholders with respect to linking and ETS in general can be gauged through stakeholder submissions, public workshops or meeting with the stakeholders more broadly.

1.8 Political Objective: Support Global Cooperation on Climate Change

Criterion	Indicators	Assessment approach
Signal for international climate policy	[High] reliability as [ambitious] climate policy partner	Qualitative reasoning
Vehicle for international carbon finance	Expected [large] net capital flows	Economic modelling

Criterion: Signal for international climate policy.

Linking can make emissions trading, or more generally, climate policy, more attractive for other jurisdictions by showcasing a collective, cost-effective means of tackling climate change. Theoretically, as linking can deliver significant cost savings by reducing emissions where it is cheapest to do so, this could also encourage policy makers to adopt more ambitious mitigation targets.

1.8.1 Indicator: [High] reliability as [ambitious] climate policy partner.

If a jurisdiction is interested in linking as a means of supporting strong, international climate action, they may want to select a linking partner with an equally (if not more) ambitious and reliable climate policy. By linking with such partners, this can signal the jurisdiction's commitment to climate action to the international community. In addition, linking can signal a jurisdiction's commitment to emissions trading as a key climate instrument for mitigation. The reliability of potential linking partners in terms of their climate change policy may be assessed by the availability of long-term policy targets and commitments the domestic support of emissions trading and climate change action and by their active participation in international partnerships and forums on carbon pricing, and other collaborative climate measures with different jurisdictions.

Assessment approach: Qualitative reasoning. Although linking in and of itself would send a strong signal to building a global carbon market, this also needs to be a credible link. Policy makers can assess the extent to which their linking partner is committed to climate action by looking at past policies, rhetoric, long-term targets and commitments (e.g. NDC and other targets), as well as the broader policy mix.

They can also assess the extent to which they are committed to the ETS, though this may be harder to assess with relatively new systems. However, the existence of long-term targets and the level of domestic support the ETS enjoys can be indicators.

Criterion: Vehicle for international carbon finance.

Implementing an ETS and creating a larger, linked carbon market with developing countries can be a way of directing private capital towards low-carbon investment in developing countries.

Note: If financial resources are mobilised to finance mitigation activities in developing countries instead of developed countries, this may undermine the climate change mitigation architecture under the UNFCCC. Developed countries are obliged to provide financial support for developing countries and achieve ambitious reductions domestically at the same time. Accordingly, clarification is needed how the financial transfers and emissions reductions achieved in a linked carbon market are counted towards the mitigation goals of the linking partners.

1.8.2 Indicator: [Large] net capital flows

The size and direction of capital flows between linked emissions trading schemes is mainly determined by the relative size of the markets to be linked and by abatement potentials and cost. From a climate financing perspective, the outflow of capital may be evaluated as if the capital flows can be counted towards international climate financing commitments. Thus, from the perspective of the buyer-country, there is a trade-off between competitiveness concerns associated with an outflow of capital and international carbon financing.

Assessment approach: Economic modelling (cf. description in Annex I, 1.1.4.)

2 ANNEX II: Linking Templates

Template 1 - Documentation of ETS-design

Design element	ETS design home ▸ step 5	ETS design partner ▸ step 5	**Likely linking design ▸ step 6**	Alternative linking design1 ▸ step 9
System type	...	...	...	...
Cap nature	...	...	...	...
Price management	...	...	...	...
Borrowing	...	...	...	...
Banking	...	...	...	...
Cap determination and annual reduction	...	...	...	...
Offset quotas	...	...	...	...
Offset standards	...	...	...	...
MRV	...	...	...	...
Penalties	...	...	...	...
Market oversight	...	...	...	...
Links to other ETS	...	...	...	...
Further design elements if important for jurisdiction	...	...	...	...

Template 2 - Summary assessment and interpretation of results

Prioritised objectives ▸ step 1,2	Selected Criteria ▸ step 3	Selected indicators ▸ step 3	**Required assessment approach ▸ step 4**	Assessment results ▸ step 7	Interpretation: Objective achieved? (yes/no/ unknown) ▸ step 8	If necessary: Design element for achieving objective ▸ step 9
Objective 1	*Selected criterion 1 for objective 1*	*Selected indicator 1 for selected criterion 1*	*Required assessment approach for selected indicator 1*	*Assessment results for selected indicator 1*	*Interpretation of results for selected indicator 1 regarding achieving objective 1*	*Required design element for achieving objective 1*
Objective 2	...	...	...	...	...	...
Objective 3	...	...	...	...	...	...
...	...	...	...	...	...	...

Prioritised risks of linking ▸ step 1,2	**Qualitative reasoning**	**Reasoning results**	**Interpretation: Risk minimised? (yes/no/ unknown) ▸ step 8**	**If necessary: Design element for minimising risk ▸ step 9**
Risk 1	Most important reasoning arguments regarding risk 1 of linking	Reasoning results for risk 1	Interpretation of results regarding minimising risk 1	Required design element for minimising risk 1
Risk 2	...	...	...	...
Risk 3	...	...	...	...
...	...	...	...	...

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