Allocation based on Product Benchmarks: Practical Insights for Emissions Trading in Mexico

MEDIO AMBIENTE
SECRETARÍA DE MEDIO AMBIENTE Y RECURSOS NATURALES

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

On behalf of:

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

of the Federal Republic of Germany

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List of Acronyms

BMU: German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

BOF: Basic Oxygen Furnace process

CANACERO: Cámara Nacional del Acero (Mexican Chamber of the Iron and Steel Industry)

CARB: California Aire Resources Board

EAF: Electric Arc Furnace

EITE: Emissions-intensive trade exposed activities

ETS: Emissions Trading System

EU ETS: European Union Emissions Trading System

GHG: Greenhouse Gases

GIZ: Deutsche Gesellschaft für Internationale Zusammenarbeit

ICAP: International Carbon Action Partnership

IKI: International Climate Initiative

NACE: National Association of Corrosion Engineers

NAICS: North American Industry Classification System

OBA: Output Based Allocation

PMR: Partnership for Market Readiness

RENE: Registro Nacional de Emisiones (Mexican National Emissions Reporting scheme)

RGGI: Regional Greenhouse Gas Initiative

SEMARNAT: Secretaría de Medio Ambiente y Recursos Naturales (Mexican Ministry of Environment and Natural Resources)

SiCEM: Project "Preparation of an Emissions Trading System in Mexico"

Executive summary

The study aims at introducing the instrument of product benchmarks as a possibility to determine free allocation of carbon certificates to facilities covered by a future emissions trading scheme (ETS) in Mexico. The study shall help to illustrate the concept of product benchmarks by discussing it – in a simplified form – with the example of the steel sector. Based on public information and the experience with product benchmarks from established ETS, conclusions are drawn with respect to technical, methodical and procedural aspects of a possible benchmark-based free allocation approach in Mexico.

To this end, a brief overview of allocation methods provides the basis for turning to benchmark-based allocation in more detail in the subsequent chapter. Here, the main principles to be considered when preparing for and determining product based benchmarks are described. Accordingly, five guiding aspects should be kept in mind when preparing a benchmark-based allocation scheme:

1. Choices concerning the level of benchmarks;
2. The rationale for differentiation between different circumstances within one sector when determining benchmarks;
3. Considerations when it comes to the definition of the actual products for which benchmarks shall be developed;
4. Further systematic aspects associated with cross-boundary effects of benchmark-based allocation;
5. Ensuring consistency between reporting of emissions and allocation.

As emphasized in the concluding chapter, these aspects need further studying against the background of the actual policy objective to be achieved with an ETS in general and free allocation in particular. At the same time, such analysis has to consider the interplay of allocation with the other design elements of an ETS and provide the basis for an overally consistent ETS design.

Before coming to these conclusions, however, the concept of benchmark-related considerations is applied to the example of the steel sector with the online available information. This allows for better illustration of the mentioned principles and mechanisms but also unveils the need for more detailed analysis and coverage of the other sectors, too. While discussing a benchmark approach for the steel sector, it is getting obvious that the steel sector is well suited for benchmark-based allocation approaches, due to their size and – at least in part – comparable products and production processes within the sector.

The next steps in the preparation of a benchmark-based allocation scheme should be:

1. Laying the foundation for the complex task of benchmark development by ensuring consistency between ETS design elements and particularly between GHG reporting and allocation ("Step 0") and defining the level of ambition of benchmarks, thereby discussing and substantiating the actual policy goals of an ETS in Mexico ("Step 1").
2. More research is needed in order to do what this study is doing only in a brief and superficial manner: Sector-specific studies should discuss the here-presented benchmarking principles and considerations for each sector and conclude for which products benchmarks are the suitable tool to calculate free allocation ("Step 2").
3. Finally, the data have to be collected to actually determine the benchmarks. The legal basis for such a data collection should be established, confidentiality ensured and third-party-verification considered ("Step 3").

The result of those steps is a set of product-benchmarks for selected products and fall-back approaches for products and processes which will not be covered by benchmarks.

Resumen ejecutivo

El estudio tiene como objetivo introducir el método de asignación gratuita basado en un punto de referencia para una actividad o industria –también llamado asignación por *benchmarks*– como un posible método de asignación de Derechos de Emisión para las instalaciones cubiertas por el Sistema de Comercio de Emisiones (SCE) en México. El estudio ayuda a ilustrar el concepto de asignación por *benchmarks* haciendo una ejemplificación, de forma simplificada, con el sector acerero. Con base en la información pública y la experiencia de otros SCE ya establecidos que utilizan asignación mediante *benchmarks*, se extraen conclusiones con respecto a los aspectos técnicos, metódicos y de procedimiento de una posible asignación mediante *benchmarks* en México.

Con este fin, el documento comienza con una breve descripción general de los métodos de asignación, dando pie a un capítulo subsecuente sobre el uso de *benchmarks* a más a detalle. En éste se incluyen los principios fundamentales que deben ser considerados al preparar y determinar los *benchmarks*. Este capítulo revisa cinco aspectos rectores para preparar un esquema de asignación basado en *benchmarks*:

1. Opciones relativas al nivel de *benchmarks*;
2. La justificación de la diferenciación entre diferentes circunstancias dentro de un sector al determinar los *benchmarks*;
3. Consideraciones cuando se trata de la definición de los productos para los cuales se desarrollarán *benchmarks*;
4. Otros aspectos sistemáticos asociados con el efecto de posibles flujos a través de límites de proceso, en la asignación basada en *benchmarks*;
5. Métodos para garantizar la coherencia entre el informe de emisiones y la asignación.

En el capítulo final se enfatiza que estos aspectos necesitan un mayor estudio y una comparación más profunda con los objetivos de la política pública del SCE en general, y de la asignación gratuita en particular. Al mismo tiempo, dicho análisis debe considerar la interacción de la asignación con los otros elementos de diseño de un SCE y proporcionar la base para un diseño de SCE consistente en todos los sentidos.

El uso de *benchmarks* de productos como método de asignación se ejemplifica con el sector acerero, utilizando la información pública disponible en línea. Esto permite una mejor visualización de los principios y mecanismos mencionados, al mismo tiempo que revela la necesidad de un análisis más detallado para la cobertura de otros sectores. Al utilizar el sector acerero como ejemplo del uso de *benchmarks*, resulta obvio que el sector del acero, debido a su tamaño y a productos y procesos de producción comparables, es óptimo para el uso de *benchmarks* como método de asignación.

Los próximos pasos en la preparación de un esquema de asignación basado en *benchmarks* deben ser:

1. Sentar las bases para la compleja tarea del desarrollo de *benchmarks*, garantizando la coherencia entre los elementos de diseño del SCE, particularmente entre los informes de emisiones de GEI y la asignación de derechos de emisión ("Paso 0"), y definir el nivel de ambición de los *benchmarks*, discutiendo y confirmando los objetivos de política reales del SCE en México ("Paso 1").

2. Se necesita más investigación para hacer lo que este estudio propone de manera breve y sin entrar a un análisis demasiado profundo: los estudios específicos de otros sectores deben discutir los principios y consideraciones de evaluación comparativa presentados aquí para cada uno de ellos y concluir para qué productos los *benchmarks* son la herramienta adecuada para calcular la asignación gratuita ("Paso 2").

3. Finalmente, los datos deben recopilarse para efectivamente determinar los *benchmarks*. Se debe establecer la base legal para dicha recopilación de datos, garantizar la confidencialidad y considerar la verificación por terceros ("Paso 3").

El resultado de estos pasos es un conjunto de *benchmarks* de productos para productos seleccionados, y enfoques alternativos para productos y procesos que no serán cubiertos por estos *benchmarks*.

1

Background: Allocation methods

1. Background: Allocation methods

Free allocation and auctioning are the two primary means of distributing allowances to the market and as such, an important design element of any ETS. Many ETSs utilize a hybrid approach where firms in selected sectors receive (at least partly) free allowances, while other firms in other sectors have to buy allowances at auctions or on an allowance exchange. In general, certain allocation methodologies are more suitable for some sectors as compared to others and there is no one size fits all approach for all sectors.

Four different allocation methods are introduced below.

1. Free allocation – grandfathering

Under grandfathering, firms receive free allowances based on their historical emissions. Over time this baseline is typically reduced by a certain percentage to reflect the ambition to achieve emission reductions and/or increased to reflect expected growth. The amount of free allowances received under this approach is – at least within one trading period – in principle independent of the actual changes in production output (apart from closures and partial closures of installations).

The grandfathering approach is attractive as it reduces the likelihood of initial resistance from firms under the ETS, since all installations receive a free allocation that can be expected to be close to their actual emissions, limiting initial costs and the need to trade a lot in the initial years of an ETS. Also, compared to benchmarking or output based allocation, which are discussed below, the administrative costs are lower and, at least when emissions already monitored in the period on which the allocation is based, the data for the allocation is available. Free allocation through grandfathering maintains the incentive to abate, as firms that reduce emissions can sell their surplus allowances, while firms that increase their emissions to a level higher than their historical baseline must pay for these emissions. Also, as firms receive an amount of free allocation that is equivalent to a financial lump sum that is independent of actual production output, a firms' response to an ETS will be the same as if they had not received free allowances. This means that firms that are not operating in trade exposed sectors will pass on their carbon costs, thereby incentivizing also abatement via product substitution because emission intensive products will become more expensive.

On the downside, grandfathering could potentially provide an incentive for firms to ramp up their emissions in order to receive a higher future free allocation. It is therefore important that the baseline period is sufficiently early, taking into account the constraint that historical data may not be available or may be incomplete. Another drawback is that **repeated grandfathering over several ETS phases penalizes early action as firms that improve their emissions intensity will receive fewer free allowances in the future** (Box 4).

Box 1: Rewarding early action in an ETS(1)

Early action can broadly be defined as those GHG emissions reductions (activities or projects) that are undertaken by entities before the ETS starts. Among the numerous issues regarding designing of an ETS the early actions are one of the issues often and intensively discussed, in particular from stakeholders of energy and industry sectors. There is wide range of activities that could potentially be considered as early action such as energy efficiency and fuel switch projects. Options for addressing early action in the allocation include awarding additional allowances that are set-aside for this purpose to entities that can proof such early action or awarding additional allowances on top of the pre-determined cap. Such provisions are especially needed in case grandfathering is used as allocation method. With auctioning or benchmark-based allocation, such provisions are not needed because entities automatically benefit from their early action by having to buy less allowances.

(1) Based on, among others, World Resources Institute, 2009: Options for addressing early action GHG reductions and offsets in US Federal cap and trade policy Working Paper.

Also, grandfathering offers weaker carbon leakage protection than the output based allocation discussed below, as the allocation per unit of output will decrease with expanded output and can therefore be seen as penalizing growth and lowering the competitiveness of growing firms. Furthermore, grandfathering may result in windfall profits, as some historically high emitting firms may have low-cost mitigation options. When these mitigation options are exploited, these firms will have a lower compliance obligation but the level of free allocation is unchanged, thereby resulting in windfall profits. Windfall profits will also occur if sectors can pass on the costs of allowances because they have limited competition. Finally, early mitigation actions may be penalized if these occurred before the baseline period used to determine free allocation.

2. Free allocation – fixed sector benchmarking

The fixed sector benchmarking approach distributes free allowances based on the performance of an emitter compared to a given benchmark level of emissions intensity and the historical activity level, e.g. output, throughput or input. The main attraction of benchmarking is that it rewards early action and does not delay abatement activities, as firms with a lower emissions intensity receive a larger share of their emissions in the form of free allowances. When defining benchmarks, ideally the same benchmarks should apply for comparable products (i.e. the benchmarks should not be differentiated by technology) in order not to provide a disincentive for cleaner technologies. However, for a transition phase or in cases where production processes differ widely in GHG emission intensity, e.g. due to the raw material availability or for other reasons (e.g. gas versus coal based power production, primary versus secondary steel production), differentiated benchmarks might be more suitable. **Using historical activity levels provide an incentive for firms to decrease output in order to meet emission targets in the short term.** Firms or sectors that are not significantly trade exposed may thus raise prices leading to lower demand and stimulate abatement via lower production.

A disadvantage of the benchmarking approach is that price increases by firms that are not exposed to international competition may lead to windfall profits. Another disadvantage is the substantial data requirements for defining the appropriate benchmark. In addition, as allocation is based on a historical activity level, the fixed sector benchmarking provides weaker leakage protection than output based allocation. Also, price signal distortions may arise if benchmarks are not based upon sector or product outputs but rather reflect inputs such as fuel use. Lastly, the transition into the ETS is more challenging under this approach than grandfathering, as firms with relatively high emissions intensity will face significant carbon costs right from the start of the ETS.

3. Free allocation – output based allocation

Output based allocation is similar to fixed sector benchmarking, except that the amount of free allocation is based on a firm's current activity level rather than the historical activity level. Output based allocation provides the strongest leakage protection as free allocation levels will increase with expanded output. At the same time incentives to reduce emissions are preserved as decreasing emissions do not reduce the amount of free allowances.

The main disadvantage of output based allocation is that it could lead to a situation where the free allocation increases the size of the overall cap over time (if there are no limits to the amount of free allocation that is given out), and therefore reducing certainty on the environmental outcome of the ETS. Where the output is designed such that free allocation remains within the cap, the level of free allocation to firms will be uncertain and/or volumes of allowances that will be auctioned are uncertain. **An output based allocation thus needs to be very carefully designed with a close link to the cap setting.** Another disadvantage is that output based allocation may decrease demand-side abatement incentives as firms are incentivized to maintain or even increase their output. Product prices do not reflect the carbon price as much as other allocation methods (explaining also why output based allocation is a good protection against leakage) and as such, product substitution is no longer directly incentivised. Lastly, the administrative effort under an output based approach is substantial as benchmarks need to be determined and outputs need to be defined on a more regular basis than with fixed benchmarks.

4. Auctioning

Auctioning is the process of distributing allowances where an auction is used to determine the price of the allowances. It is a relatively simple and transparent mechanism. Auctioning allows for good price discovery in the ETS and delivers a strong incentive for mitigation, as participants must pay for their allowances. There is also no potential for windfall gains under auctioning, because all allowances a firm uses for compliance have to be bought and thus represent actual carbon costs. **Furthermore, allowance auctions raise revenue for the government which can be used to cut distortionary taxes in other parts of the economy, provide compensation to disadvantage households that are adversely impacted by the ETS or fund other projects such as emission reduction activities.** Also, as the approach is relatively simple, it is less sensitive to lobbying by sectors with the aim to support associated firms. As early movers will have to buy less allowances at the auction, they are rewarded for any early action to reduce emissions. The main disadvantage is that auctioning does not provide protection against carbon leakage and, if introduced at the start, might not support an easy transition into an ETS resulting in significant opposition. Sectors exposed to international competition may have the incentive to relocate their activities to jurisdictions without emission limits (carbon leakage). Also, there may be concerns on the ability of small firms to access the auctions.

A summary of the features of these allocation methods, the extent to which they fulfil the various policy objectives related to the allocation and an overview of data requirements is provided in Table 1.

Table 1: Summary of allocation methods

Objectives	Grandfathering	Fixed sector benchmarking	Output-based allocation	Auctioning
Managing transition to ETS	Partial	Partial	Partial	No
Reducing risk of carbon leakage	Partial	Partial	Yes	No
Raising revenue	No	No	No	Yes
Preserving incentives for cost-effective abatement	Partial	Partial	Partial	Yes
Data requirements	**Grandfathering**	**Fixed sector benchmarking**	**Output-based allocation**	**Auctioning**
Historical emissions	Yes	Maybe	Maybe	No
Historical output	Maybe	Yes	Maybe	No
Emissions benchmark	No	Yes	Yes	No
Actual output	No	No	Yes	No

Source: PMR and ICAP (2016). Emissions Trading in Practice: A Handbook on Design and Implementation, page 68.

New entrants, increase in output levels and closures

In the design of an allocation methodology, the treatment of new entrants, increases in output levels and closures need to be considered. **Treatment of new installations and capacity extensions within the allocation (and also the cap-setting) is an important issue especially for countries with emerging economies and growing energy demand such as Mexico.** On the one hand, investments in new and necessary capacities need to be encouraged and should not face unnecessary barriers. On the other hand, new installations should be as GHG efficient as possible and the allocation rules for new capacities ideally incentivize this.

The treatment of new entrants as well as closures is relatively simple under auctioning or benchmarking approaches. Auctioning automatically accommodates new entrants as they are treated like other existing firms under the ETS. Closure rules and allocation for firms expanding production levels are not needed under an auctioning approach.

Under an output based allocation approach, free allocation follows output directly and output expansions are automatically accommodated. Also, new entrants are treated in a similar manner as incumbents that increase production levels. Similarly, due to the link between free allocation and output, specific closure rules under output based allocation are not necessary.

With grandfathering and a fixed sector benchmarking approach, these issues are more complex and rules are required for the treatment of closures of installations or installations that significantly reduce or increase production compared to the production on which the allocation was based. Often this is done in the form of a new entrants reserves out of which additional allocation can be provided. In the case of benchmarking, the allocation for new entrants can be based on the benchmark in combination with the expected production (in turn based on capacity and an assumed capacity utilization factor). In the case of grandfathering, the actual expected emissions can be part of the allocation calculation for new entrants. In most ETSs with a grandfathering or fixed sector benchmarking approach, allowances are no longer freely allocated to plants that have ceased operation.

1.1 International examples of allocation approaches

The following table provides an overview of ETSs around the world and the method of allowance allocation. It can be observed that most systems use a form of free allocation, while a small number uses a combination of free allocation and auctioning. Only RGGI uses 100% auctioning to distribute allowances.

Table 2: Allowance allocation in practice

ETS	Free allocation versus auction	Free allocation recipients	Free allocation type
EU (phase I and II)	Mixed, minor share auctioned	Power generators, manufacturing industry	Mixed, large share of grandfathering, increasing share of benchmarking
EU (phase III and beyond)	Mixed, large and increasing percentage auctioned	Manufacturing Industry and aviation	Fixed sector benchmarking
Switzerland	Mixed	Manufacturing Industry	Fixed sector benchmarking
RGGI	100% auction	None	N/A
Tokyo	100% free allocation	All	Grandfathering based on entity-specific baseline
California	Mixed, increasing percentage auctioned	Electric distribution utilities and natural gas suppliers on behalf of ratepayers; emissions-intensive and trade-exposed industrial activities	OBA—with output and sector-specific emissions-intensity benchmarks, some grandfathering, very few sectors (industry); based on long-term procurement plans (electricity); historical data (natural gas)
Québec	Mixed, most auctioned—increasing with time	Emissions-intensive trade exposed (EITE) activities	Output-based benchmarking
Kazakhstan	100% free allocation	All	Grandfathering
Republic of Korea	100% free allocation	All	Grandfathering (for most sectors), benchmarking (for cement, refinery, domestic aviation)

Source: PMR and ICAP (2016). Emissions Trading in Practice: A Handbook on Design and Implementation, page 68.

The basic rationale for the choice of allocation method becomes apparent in the table. **Most ETSs start with free allocation to allow for easy transitioning into the ETS with increasing shares of auctioning over time (e.g. the EU, California, Quebec).** The EU and also RGGI apply full auctioning to the electricity sector, which is a sector not exposed to international competition.

The box below illustrates thoughts and choices associated with allocation design in the EU ETS.

Box 2: History of allocation in the EU ETS(2)

During the first two phases, most of the allowances in the EU ETS were freely allocated based on historical GHG emissions (grandfathering). While Member States could auction up to 5% of their cap during the first phase (2005-07) and up to 10% in Phase II (2008-12), this option was not widely used: in phase II, only 4% of allowances were auctioned. This allocation approach faced a lot of opposition. Installation felt they were not awarded for action already taken, the differences between Member States were regarded as distorting competition and the power sector was accused of gaining windfall profits by passing on carbon costs despite having received the allowances for free (windfall profits). As a result, the allocation methodology for phase III (2013-20) changed radically. The power sector does not receive free allocation anymore in phase III, meaning that about half of the allowances in the EU ETS are auctioned in phase III. Free allocation in Phase III continues to be used for industrial sectors but this approach follows harmonized EU rules based on benchmarks and historical production levels. Most free allocation is on the basis of product benchmarks, which for each product represents a value equivalent to the average emissions performance of the best 10% performing installations in the EU. The benchmarks have been developed in 2007-2009 via a series of preparatory studies, first outlining key benchmarking principles (e.g. the "one product – one benchmark" principle) followed by detailed sectors studies, resulting in the determination of 52 product benchmarks in the relevant EU regulation. For products not covered by a product benchmark, fall back approaches based on heat, fuel or process emission benchmarks are used to determine free allocation. Sectors on the carbon leakage list (covering over 90% of the industrial emissions) receive free allocation of up to 100% of the benchmarks, whereas sectors not on the leakage list receive a declining share of free allocation over time. The approach will be continued in phase IV (2021-30), but with declining benchmarks to reflect technological progress and the decreasing emission targets over time.

(2) The study on benchmarking principles referred to as well as the sector by sector benchmark studies can be found here: https://ec.europa.eu/clima/policies/ets/allowances_en#tab-0-2

2

Considerations for the development of product benchmarks for free allocation in Mexico

2. Considerations for the development of product benchmarks for free allocation in Mexico

The overview of allocation approaches in the previous sections addresses a variety of options and challenges associated with the allocation of allowances to the participants of an emission trading scheme. Choices that should be addressed by politics and stakeholders when designing an ETS in consideration of agreed overarching goals and principles as well as potential cross-cutting social and economic effects of an ETS and its design elements. The allocation method is just one of many important elements of an ETS and several questions should be discussed before product benchmarks are determined: What is the overall purpose of free allocation? Which effect does carbon leakage potentially have? Which other elements exist to avoid carbon leakage and how do they compare to free allocation? Which sectors should receive free allocation at all? Are product benchmarks the appropriate instrument to determine free allocation?

Only when such questions are discussed and answered follows the potentially cumbersome task of developing the actual benchmark values. This study shall shed light on this task and the associated principles and choices – rather from a sector perspective than from a policy development view. The overview of allocation approaches above nevertheless helps to frame the closer look at product benchmark approaches and to derive the principles of benchmark setting discussed hereunder.

1

Consideration 1: Benchmark level

With free allocation being an instrument to facilitate industry's transition to carbon costs and to avoid carbon leakage, the applied benchmarks can nevertheless signal a certain level of ambition for an industry sector: a possible way to set the benchmark level is to use the emission intensity of the top-ten installations of a sector/product group (EU ETS example). This means that the ten best percent installations of a sector benefit from free allocation exceeding actual emissions, while the other 90 percent have to purchase allowances or reduce emissions to avoid carbon costs. All kinds of alternative approaches are thinkable and depend mainly on the political goal and the availability and quality of data. In California for instance, the best-in-class value is compared with the average value, multiplied by 0.9, to determine the benchmark value. These approaches need a reliable, accurate and consistent database to lead to robust results.

This consideration also gives reason to look into other regulatory fields that directly or indirectly affect the emissions of an industrial facility. Do for instance thresholds on air pollutants exist, that make technologies necessary which also have a positive or negative effect on GHG emissions? Do environmental permit laws require new installations to adopt state-of-the-art technologies by requiring best-in-class efficiency levels? In case such kind of requirements do exist, they could inform the benchmark determination process by analyzing interactions and starting points for the quantification of ambitious emission intensity levels.

2

Consideration 2: Need for differentiation within sectors

In product benchmarking, the way a product is defined is an important issue. Various ways to account for manufacturers' different circumstances are possible and found in other benchmarking examples:

- Different benchmarks for different technologies producing the same product, e.g. steel production in a basic oxygen furnace vs. electric arc furnace.
- Different benchmarks for existing and new plants.
- Different benchmarks depending on the type of fuel used in the production of a product, e.g. electricity generation based on natural gas vs. coal.
- Other differentiations on the basis of plant age, plant size, raw material quality and climatic circumstances.

There can be reasons why differentiation is justified, e.g. to avoid undue burden in the transition phase (example: electricity generation based on coal vs. gas in the first two phases of the EU ETS) or in accepting that plant operators in high-investment technologies are not able to react to carbon costs in the short or medium term (example again: BOF vs. EAF for steel production). Apart from that, benchmarks should rather not differentiate too much, since this would remove incentives for companies to select the most cost-effective emission reduction options available ("One product, one benchmark" principle).

3

Consideration 3: Number of products to distinguish

Related to the previous consideration, but with its own characteristic questions, is the definition of which products at all shall get their own benchmark. To determine which products should be distinguished within a sector, the following issues should be analyzed:

- Difference in emission intensity between the products with similar application. In case of systematic differences, products could be grouped into aggregated product groups with the same benchmark (e.g. grey vs. white cement clinker, float glass vs. bottle glass).
- Intermediate products: When intermediate products are traded between ETS participants, the complexity of calculating the allocation for installations can be reduced by determining individual benchmarks for those intermediate products (e.g. clinker vs. cement; coke and sintered ore as intermediates in the steel production process, cf. EU ETS).
- The number of installations producing a certain product: if there are too few installations, a benchmark is difficult to determine.
- Availability of verifiable data: Non-availability, low number of plants, may result in the choice to apply an alternative allocation approach or invent heat-based benchmark/allocation.
- Administrative issues: Existing structures for the determination of products and product groups can help to enhance clarity in the definition of product boundaries and facilitate verification. E.g. statistical classification systems like NACE (EU) and NAICS (US) were applied in those regions to define applicability of benchmarks.

Box 3: Fall-back approaches for products without benchmark

What if, in the context of the previous considerations, certain products are decided not to get a product specific benchmark? In the EU ETS, this is solved by alternative ways to calculate free allocation, so called fall-back approaches:

- A heat production benchmark (i.e. tCO_2/unit of heat produced) for combustion of fuel activities where an intermediate heat carrier (e.g. hot water, steam) is produced that can be measured and monitored;
- A fuel mix benchmark (i.e. tCO_2/GJ of fuel used) for combustion of fuel activities where the heat or mechanical energy produced cannot be measures and monitored (e.g. furnaces);
- Grandfathering for non-fuel related process emissions.

Those fall-back approaches lead to further methodical and administrative complexity in the data collection, boundary setting and allocation process, why the rationale should be analyzed under cost-effectiveness considerations.

4

Consideration 4: Cross-sectoral issues

There are instances in which emissions occur at (and have to be reported and paid for by) one installation, while another (in most cases nearby) installation receives the free allocation. Depending on more detailed rules and guidance (to be developed) regarding free allocation, possible cross-boundary effects stemming from

- Cross-boundary heat flows;
- Waste gases;
- Substitution between electricity and fuel;

Have to be considered in the determination of product benchmarks in order to ensure consistency and avoid double counting of emissions/allowances.

5

Consideration 5: Consistency between allocation and reporting

While the former considerations are of a systematic type when preparing the allocation design of an ETS, the question of the overall fit between free allocation on the one hand and monitoring and reporting of emissions on the other, in a way that supports the general goals of an ETS. As one important general goal of an ETS design in this context, we understand the

> *"Incentive for participants to reduce emissions, without causing undue burden for domestic industry."*

The purpose of free allocation is the latter, namely avoiding disproportionate burden for domestic industry, as long as significant differences between carbon constraints in other jurisdictions prevail. The former goal – incentivizing emission reductions – consists of several aspects, one of them being rather technical details of monitoring & reporting (cf. Box 4, for illustration).

Box 4: Reporting of biomass under RENE - total carbon approach

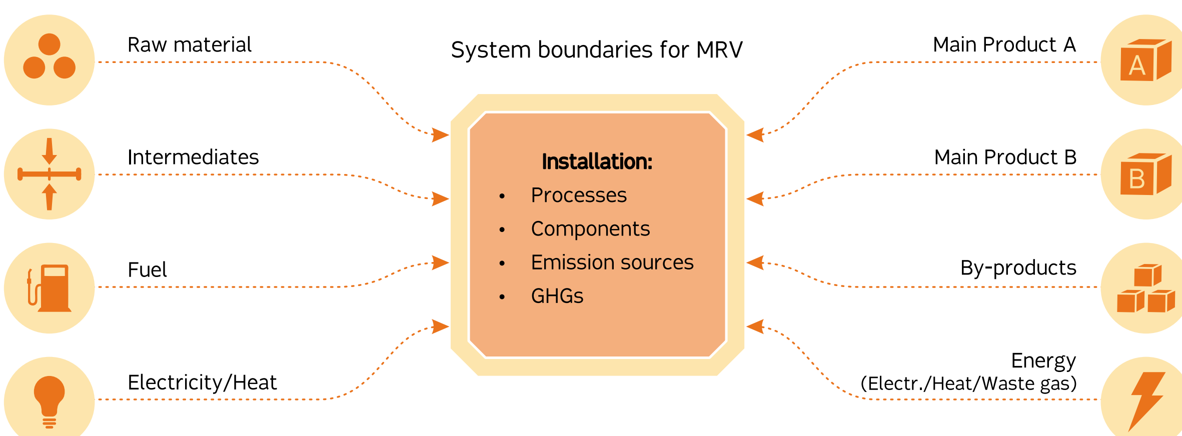
When reporting emissions under the existing national emissions reporting scheme (RENE), which forms the basis also for reporting under the pilot ETS, combustion emissions are determined by multiplying the activity rates (amount of fuel) with default emission factors provided in the Ministry's calculation tool. This is common practice also in other reporting schemes/ETS, at least for installations/source streams below a certain emissions threshold. However, the RENE scheme's default emission factors represent a total carbon approach, i.e. that biogenic carbon content is treated as if it was fossil carbon. The resulting effect under an emission trading scheme is that any incentive for plant operators to switch from fossil to biomass fuels is removed. Quite the contrary: a shift from natural gas to wooden biomass (as fuel in a rotary kiln for instance) would lead to an increase in reported emissions – and with this more allowances to surrender - , despite being considered as climate friendly measure.

This is primarily a matter of monitoring & reporting and the accordant guidelines and regulations. However, there are two decisive elements of interrelation between reporting and benchmarks:

1. A product benchmark is generally speaking the relation between production-related emissions and the quantity of the product in question. When determining the benchmark, emissions data are therefore needed. It makes sense to use data that are already available, as far as possible. The available emissions data from RENE and reporting under the pilot ETS are of the kind explained above – based on total carbon instead of net (=of fossil origin) carbon. A benchmark composed of such data would therefore be higher than comparable product benchmarks in other jurisdictions and would further entrench the method of treating biogenic carbon like fossil carbon. Should, on the other hand, a separate data collection be performed just for the determination of the benchmark, would this increase the administrative efforts for both authorities and companies and indicate that inconsistencies exist in the first place.
2. In the scenario that in-itself-consistent benchmarks are determined based on a separate data collection and an empiric approach (e.g. top-10-percent, best-in-class), without adapting monitoring and reporting methods, inconsistencies would prevail between the allocation side and the reporting side. This could lead to situations where best-in-class installations would still face carbon costs in case they use biomass fuels – contradictory to the actual design/purpose of a benchmark approach.

The definition of consistent system boundaries for monitoring & reporting and for the determination and application of product benchmarks is the underlying precondition for capturing the actual goals of introducing an ETS.

Figure 1: System boundaries for GHG reporting and benchmark application



Source: Author's own work.

3

Sector-specific discussion

3. Sector-specific discussion

In this section, the design of a benchmark-based allocation scheme shall be discussed along the above-introduced considerations for an example of the steel sector. To this end, a web research was done and this gives us a preliminary idea to allow for a sector-specific discussion, but the below analysis is far from being comprehensive or complete. The purpose is rather to illustrate a systematic approach to develop product benchmarks and to identify questions and tasks to be tackled in follow-up work.

3.1 A benchmark example for the Steel sector

The following discussion of benchmark-specific consideration is kept short, since it is based on publicly available data on the sector in Mexico and on the authors' own experience in the EU-ETS.

Mexico has a large steel sector with all necessary production and processing steps of steel's value chain. According to the steel association's data[3], 16 Electric Arc Furnace (EAF) and two Blast Furnace plants produce some 20 million tons of raw steel per year. Downstream processing takes place in numerous rolling mills and foundries across the country.

1

Consideration 1: Benchmark level

The number of steel plants alone – at least for EAF plants – gives reason to assume that sufficiently reliable and representative (and anonymous) data can be made available to derive a benchmark from real industry data.

For illustration, the following table shows benchmark values from other ETS:

Table 3: Benchmark values for EAF steel plants in the EU ETS and California Cap and Trade

Example	Value	Approach	Comment
EU ETS 2013-20	Benchmark: 283 $kgCO_2/t$ EAF carbon steel (<8% metallic alloying elements)	Best 10-percent of EAF plants across Europe	This benchmark includes indirect emissions from electricity consumption. When applying the benchmark for the calculation of free allocation, it has to be adjusted for electricity consumption.
EU ETS 2013-20	Benchmark: 352 $kgCO_2/t$ EAF high alloy steel (>8% metallic alloying elements)	Best 10-percent of EAF plants across Europe	This benchmark includes indirect emissions from electricity consumption. When applying the benchmark for the calculation of free allocation, it has to be adjusted for electricity consumption.
California	Benchmark: 187 $kgCO_2/t$ [4] EAF steel	N.A.	

Source: European Comission, 2011, Directorate-General Climate Action. "Guidance Document N°9 on the harmonized free allocation methodology for the EU ETS post 2012"; California Air Resources Board (CARB). "Regulation for the California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms".

(3) See CANACERO. Steel in Mexico (https://www.canacero.org.mx/en/aceroenmexico.php).

(4) This value is converted from 0.170 allowances/short ton as stated in table 9-1 of Article 5: CALIFORNIA CAP ON GREENHOUSE GAS EMISSIONS AND MARKET-BASED COMPLIANCE MECHANISMS

2

Consideration 2: Need for differentiation within sectors

Because of the steel sector's variety of activities and technologies, a differentiation within the sector might be necessary. In Europe, six different benchmarks account for different steel qualities[(5)], for the fact that upstream products (sintered ore, coke in the case of Basic Oxygen Furnace (BOF) process) may be traded individually and not necessarily be produced in the same plant where the actual steel production (EAF/BOF) takes place, and separately covering iron casting. Similarly in the Californian scheme: One benchmark for steel from EAFs, one for iron pipes from foundries and five different benchmarks for different products from rolling mills are defining the free allocation in the state's steel sector[(6)].

In Mexico – as in other ETS – it would be necessary to differentiate between steel from the EAF and the BOF route. The technologies and the accordant product specific emissions are so different, that the application of a benchmark derived from EAF plant data to BOF steel would not be appropriate.

3

Consideration 3: Number of products to distinguish

Associated with the previous paragraph is the necessity to differentiate between different products. It is obvious that the steel sector covers very different products, processes and plants, which is the reason for the above mentioned differentiation in other ETS.

The emission intensity of raw steel, hot and cold rolled steel sheets and tubes do for sure differ systematically, so that separate benchmarks, depending on the number of plants and availability/quality of data, might make sense.

Likewise, a product benchmark based on real industry data for steel from BOF plants seems not realistic due to the low basic population: a benchmark curve cannot be drawn for two plants. Anonymity of data would not be ensured and the mere claim and validity of a benchmark being representative of a certain level (being it average or top-ten level) of performance in the sector would be weakened.

4

Consideration 4: Cross-sectoral issues

Cross-sectoral considerations can be of particular relevance in the steel sector. In the EU-ETS for instance, waste gases from steel production are used in the power sector, where no free allocation is provided. Therefore, measures are adopted to adjust free allocation to steel plants in a way that accounts for the fact that emissions from waste gas combustion may not occur at the steel plant, while maintaining an incentive to make use of the waste gas anyway. As already mentioned in the previous section, such considerations should be discussed at an advanced stage of development of the future ETS design in Mexico.

(5) See EU Commission Decision of 27 April 2011 determining transitional Union-wide rules for harmonised free allocation […], Annex I (https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32011D0278).

(6) See Regulation for the California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms, §95891, Table 9-1.

5

Consideration 5: Consistency between allocation and reporting

Consistency between allocation and reporting is an issue to be specifically paid attention to in the steel sector. Not only because of the potential complexity of steel plants, but especially due to different levels of integration of steel sector installations. Integrated steel plants in the EU-ETS for example receive free allocation on the basis of at least three product benchmarks: for the production of coke-oven coke, sintered iron ore and hot metal/liquid iron. This means that for data collection underlying the benchmark analysis (with the purpose of drafting a benchmark curve and identifying the top-ten-percent value), emissions have to be allocated to those (intermediate) products in the first place. This made data collection in Europe a cumbersome exercise. Before defining the benchmark approach in Mexico, the systematic of emissions reporting should be analyzed having in mind possible differentiation between products and technologies and the necessary tasks to collect comparable and reliable data from plant operators.

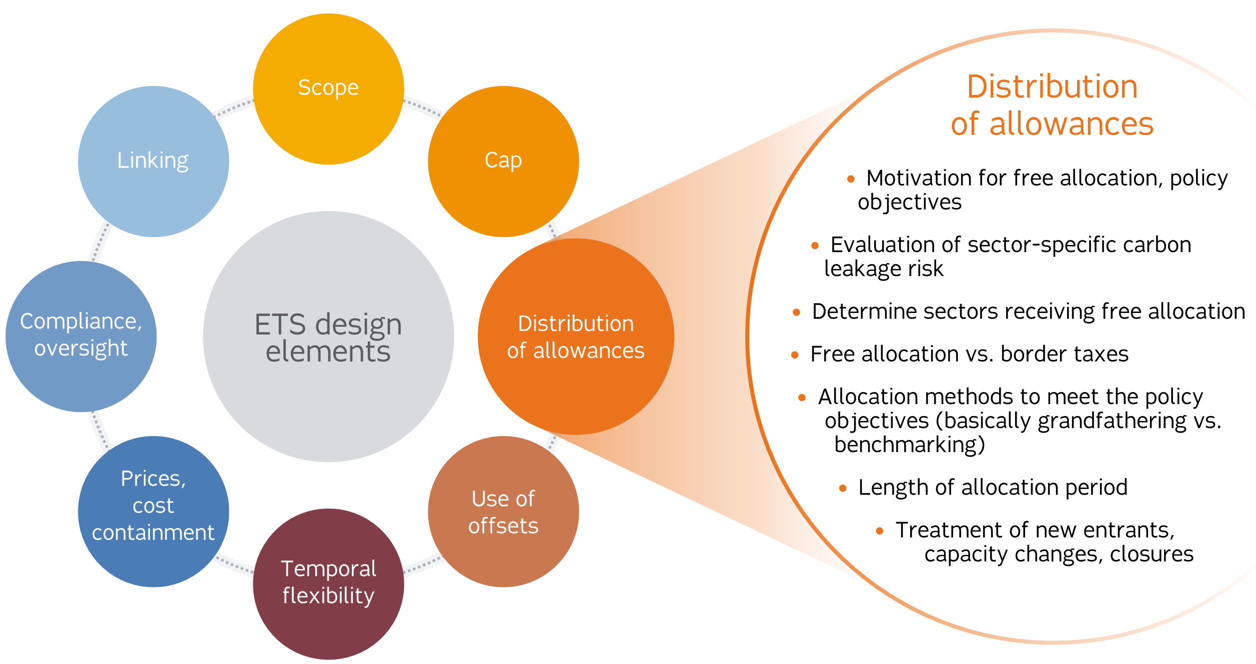
4

Conclusions and Next Steps

4. Conclusions and Next Steps

A conclusive discussion of benchmark approaches cannot reasonably be done without considering the other design elements and the overall policy goals of a planned emissions trading scheme. This is becoming particularly obvious in the previous sections where the link between methods applied for monitoring and reporting and the determination and application of benchmarks is highlighted as part of the principles to be considered ("Consideration 5: Consistency between allocation and reporting"). Unsurprisingly, this aspect is prepended in the following suggested list of tasks and considerations for policy makers in Mexico when it comes to the preparation a benchmark-based system of free allocation.

Figure 2: Interaction and consistency of ETS design elements[7]



Source: Author's own work, based on list of „ETS Design in 10 steps", p.5, Partnership for Market Readiness (PMR) and International Carbon Action Partnership (ICAP), 2016, Emissions Trading in Practice: a Handbook on Design and Implementation. World Bank, Washington, DC.

The diagram above illustrates how the distribution of allowances is just one design element among several of an emissions trading scheme. The interaction between those design elements is manifold and should be analyzed under a political, methodical and economic perspective with the aim to achieve a consistent overall design.

In the context of distribution of allowances, the topics listed in the box on the right will have to be discussed and analyzed, resulting in the necessary laws, regulations and official guidance to start the process of benchmark development. As put forward by the previous sections, this process will consist of the following steps.

(7) Based on list of „ETS Design in 10 steps", p.5, Partnership for Market Readiness (PMR) and International Carbon Action Partnership (ICAP). 2016. Emissions Trading in Practice: a Handbook on Design and Implementation. World Bank, Washington, DC.

Step 0: Analyze monitoring & reporting methods for consistency with policy goals

The sources and effects of possible inconsistencies between reporting and allocation should be revised.

Goal	Technical analysis, legal provisions to revise monitoring & reporting methods
Involvement	SEMARNAT, maybe additional technical/methodical expertise

While the former step is technically not part of the actual benchmark development process (and therefore numbered "0"), it seems to be of substantial importance for any follow-up tasks especially – but not only – associated with benchmark-based allocation.

Step 1: Define general approach to benchmark levels

This is closely related to the policy goals of ETS in general and free allocation in particular: When a company receives free allocation, what effects shall be achieved? Scarcity (e.g. with a best-in-class or top-ten approach), implying a certain pressure for firms to reduce specific emissions? Or a more generous allocation (e.g. based on average specific emissions in a sector) which mainly aims at limiting carbon costs and therefore the risk of carbon leakage)? Take into account:

- The outcomes from the sector-specific carbon leakage analysis
- Carbon constraints in countries/jurisdictions with which significant trade takes place or which are likely to be partners for linking in the future
- National GHG reduction path and cap for ETS installations
- The competition for distribution: Under a fixed ETS budget, the higher free allocation, the less is left for auctioning.
- Modelling of the approximate amount of overall free allocation at different benchmark levels
- Vintage of activity levels to which benchmarks are to be applied (basically historical vs. current production level)
- Availability of technical solutions in a sector to reduce specific emissions

Associated with these considerations is the question whether benchmarks shall be based on real industry data (collection of production data and accordant emissions) at all. In the case of poor availabily of such data, for a transitional period or when the political will is to apply generous benchmarks anyway, default values from technical studies or other systems might be deemed adequate at least for a certain period.

Goal	Legal provisions defining the benchmark level, based on thorough analysis and clear policy objectives.
Involvement	Related ministries, research institute, consultant

Step 2: Sector-specific benchmark studies

The goal of this rather comprehensive task is to treat and analyze all sector-specific questions in the context of benchmark determination for each sector for which free allocation is envisaged:

- The rationale and need for differentiation between technologies, plant age and size, fuel type, climatic circumstances etc. (cf. consideration 2).
- Determination of actual products (and intermediate products) for which benchmarks shall be applied, depending on considerations noted above under consideration 3.
- Estimation of approximate levels of specific emissions associated with the production of the defined benchmark products to inform modelling and policy decisions.
- Discussion of suitable approaches of allocation for products/processes where a benchmark shall not be developed (because of the low relevance of a product, for instance, or the finding that verifiable data are not available, cf. example of fallback-approaches in the EU-ETS as described in Box 3).
- Analyses of potential cross-boundary effects of relevance for allocation (cf. consideration 4).

Part of those aspects could perhaps be treated together with the carbon leakage risk, which will also have to be studied on a sector-specific basis in an earlier phase.

Goal	Basis for decision-making and legal preparations for developing and applying product-benchmarks
Involvement	SEMARNAT, consultant, stakeholders from ETS sectors

Step 3: Implementation phase – data collection

A well-structured and targeted data collection procedure aims at acquiring the necessary data to calculate benchmarks and is based on the outcomes from the previous steps and an accordant regulatory legitimization. The latter requires companies to provide necessary data in an accurate and reliable manner. As appropriate, activity and emission data have to be verified externally before being submitted to the central agency (to be determined/created under the SEMARNAT) administrating the ETS in the country. Confidentiality has to be ensured, since companies are generally very sensitive when it comes to handing out production data. Finally, product benchmarks are published.

Goal	Determination of product benchmark values
Involvement	SEMARNAT, plant operators to collect and report data, maybe verifier.

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Its contents were developed under the coordination of the Ministry for the Environment and Natural Resources (Secretaría de Medio Ambiente y Recursos Naturales, SEMARNAT), and the project "Preparation of an Emissions Trading System in Mexico" (SiCEM) of the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. This project is part of the International Climate Initiative (IKI). The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) supports this initiative on the basis of a decision adopted by the German Bundestag.

Editorial design and creative direction by:
Edgar Javier González Castillo

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Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

Friedrich-Ebert-Alle 36+40
53113 Bonn, Deutschland
T +49 228 44 60-0
F +49 228 44 60-17 66

Dag Hammarskjöld-Weg 1-5
65760 Eschborn, Deutschland
T +49 61 96 79 0
F +49 61 96 79 11 15
E info@giz.de
I www.giz.de

Project:
Preparation of an Emissions Trading
System in Mexico (SiCEM)

Av. Insurgentes Sur No. 826, PH
03100 Col. del Valle, CDMX México
E comercio.emisiones-MX@giz.de
E emissions.trading-MX@giz.de

Secretaría de Medio Ambiente y Recursos
Naturales (SEMARNAT)
Avenida Ejército Nacional 223, piso 19
Del. Miguel Hidalgo, Col. Anáhuac
11320 Ciudad de México
E mexico.ets@semarnat.gob.mx

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