

Valuation Framework for True Price Assessment of Agri- food Products

May 2021

ECHTE
EERLIJKE
PRIJS



Valuation Framework for True Price Assessment of Agri-food Products

Version 1 - May 2021

Authors:

Pietro Galgani^{1,2}

Geert Woltjer³

Reinier de Adelhart Toorop¹

Adrian de Groot Ruiz¹

Acknowledgements: Evelien den Olde⁴, Dirk Schoenmaker⁵, Pierre Berntsen⁶, Walter Vermeulen⁷, Alfons Oude Lansink⁴, Ruud Hoosemans⁴, Gohar Nuhoff-Isakhanyan³, Willy Baltussen³, Bavo van den Idsert⁸, Emmanouela Varoucha¹, Rosan Harmens⁹

Acknowledgements: TKI TU en AF

ECHTE
EERLIJKE
PRIJ\$

Dit project ontvangt financiële steun van de Topsector Agri & Food en de Topsector Tuinbouw & Uitgangsmaterialen. Binnen de Topsector Agri & Food werken bedrijfsleven, kennisinstellingen en de overheid samen aan innovaties voor veilig en gezond voedsel voor 9 miljard mensen in een veerkrachtige wereld. Binnen de Topsector Tuinbouw en Uitgangsmaterialen werken bedrijfsleven, kennisinstellingen en de overheid samen aan innovaties op het gebied van duurzame productie van gezond en veilig voedsel en de ontwikkeling van een gezonde, groene leefomgeving.

Deze rapportage maakt deel uit van de PPS AF18051/ TU18104 "echte en eerlijke prijs voor duurzame producten.

Cover photo by Philip Myrtoorp on Unsplash



¹ True Price, Haarlemmerplein 2, 1013 HS Amsterdam, www.trueprice.org

² Corresponding author: pietro@trueprice.org

³ Wageningen Economic Research

⁴ Wageningen University

⁵ Rotterdam School of Management, Erasmus University Rotterdam

⁶ ABN AMRO

⁷ Copernicus Institute of Sustainable Development, Utrecht University

⁸ Formerly Bionext

⁹ Formerly True Price

Relation to other components of the true price methodology for agri-food products

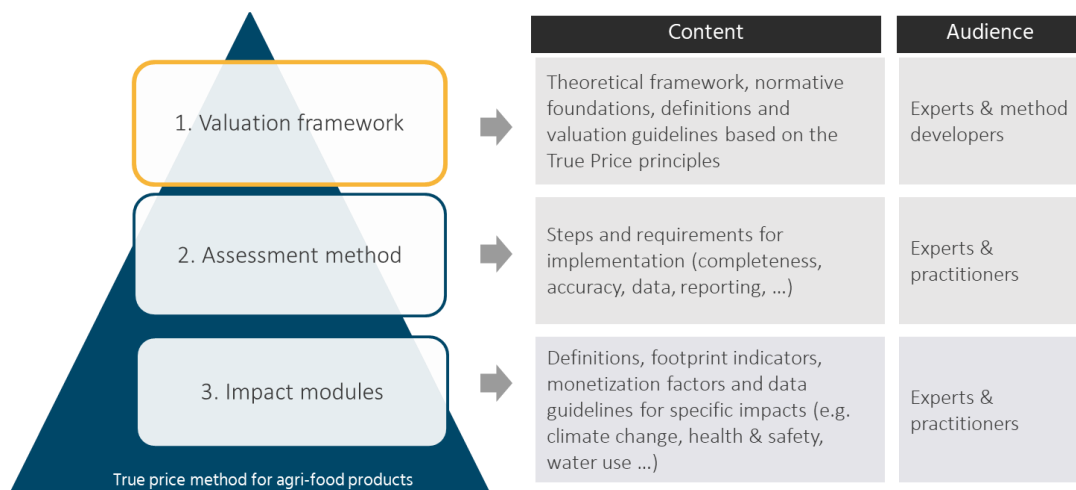
*This **Valuation framework for true pricing of agri-food products** was developed within the PPS True and Fair Price for agricultural, horticulture and food products.*

It contains the core ideas of a true pricing valuation framework: principles and a justification for selecting social and environmental impacts to take into account in a true price assessment and the basis for the development of monetisation factors for these impacts.

*It is complemented by an **Assessment Method for True Pricing of Agri-Food products** which contains modelling guidance and requirements for scoping, data and reporting, and **Natural, Social and Human Capital method modules** containing the specific indicators and monetisation factors to be used to quantify and monetize each impact (Figure 1).*

Together, these document present a method that can be used for true pricing of agri-food products, and potentially other products as well.

Figure 1: Components of the true price methodology for agri-food products



Contents

Relation to other components of the true price methodology for agri-food products	2
Executive summary	4
1. Introduction	5
2. What is the true price?	6
2.1 The true price	6
2.2 Use and interpretation of the true price	8
3. The rights-based foundations	9
4. Which social and environmental impacts to include in a true price?	11
4.1 Footprint indicators	12
4.2 Addressing positive externalities	13
5. What is the monetary value of an impact?	14
5.1 The concept of remediation cost	14
5.2 Calculating the remediation cost	15
5.2.1 Types of costs	15
5.2.2 Guiding principles to select types of costs	15
6. Limitations of the valuation framework and items for further research	19
7. Conclusions	20
8. Glossary	21
9. References	22
Annex I List of impacts and definitions	24
Annex II: The right-based approach to true pricing in the context of other economic paradigms for external costs accounting	33

Executive summary

In the Dutch agri-food sector there is a need for a methodology to account for the external costs of societal impacts (be it environmental or social) in the value chain of an agricultural product. Using quantitative sustainability indicators for food products can, amongst other things, help the management of such impacts and the improvement of their sustainability. The true price is one of these indicators that can contribute to more sustainable production and consumption.

True pricing is the process of calculating 'true prices' and it entails the quantification of externalities and their expression in monetary terms in a way that is comparable to a product's market price. A monetisation approach requires a common foundation and framework that can be applied to environmental as well as social impacts of a product. This document provided definitions and a framework for developing monetisation factors for societal impacts of food- and agri-products in a structured and consistent way. The framework is generic and can be applied also to other products

True pricing starts with the acknowledgement of basic rights, Human Rights, labour rights and other generally accepted rights, for current and future generations, their link to sustainability, and the corresponding responsibility of economic actors (businesses, consumers, investors, government) to respect these rights. The true price is based on this right-based approach. The *true price gap* is the sum of social and environmental costs as the consequence of violations of basic rights. These are called *unsustainable externalities*. So the true price gap is zero if a product is sustainable from a rights perspective. Only some positive externalities are included in the true price gap, in so far as they neutralize specific negative externalities. The *true price* is a virtual buying price that adds the true price gap to the market price.

The right-based approach again provides the basis for choosing between valuation approaches for social and environmental impacts in a way that is transparent and builds upon internationally accepted rights. A valuation paradigm is proposed based on the costs required to remediate the unsustainable impacts of a product. Remediation for the purpose of true pricing is defined as a set of activities that make the environment or the stakeholders (workers, their dependants, communities, future generations) that are harmed by violations of basic rights at least equally well off as they would have been if that violation of rights didn't occur. Remediation costs are operationalized in terms of four types of cost: restoration cost, compensation cost, prevention cost and retribution cost. One or more of these types of costs are relevant for different types of damages caused to people and the environment and are combined to derive the *remediation cost of an impact*. Guidelines on the way that damages should be remediated are provided based on criteria such as (ir)reversibility, (lack of) severity, or existence of legal violations for each impact.

Finally, limitations of the framework are raised regarding the use of rights to select impacts to take into account, the use of remediation cost for valuation and regarding measurement and valuation of non-economic effects in general.

1. Introduction

Food products are associated with both positive aspects, as one cannot live without food and production of food may have positive effects on the landscape, greenhouse gas sequestration, habitat for insects or birds, and more, as well as negative aspects, since the production and consumption cause negative impacts on people and the environment.

Using quantitative and qualitative sustainability indicators for food products can help companies, including farmers, to manage these impacts and improve their sustainability, support consumers in making better food choices, and aid governments in making effective policies and monitoring progress. The true price is one of the quantitative sustainability indicators that can contribute to more sustainable production and consumption.

True pricing, the process of calculating true prices, starts from the observation that there are negative externalities, whose costs are not included in the market price of products. Examples of such effects are climate change, air pollution, potentially unsafe labour conditions and more. True pricing entails their quantification and their expression in monetary terms in a way that is comparable to a product's market price. The process to express them in monetary terms is called monetisation. The true price aims to show what the price of a product would be if the costs of societal impacts (be it environmental or social) would be taken into account on top of the market price.¹⁰

Wageningen Economic Research and True Price¹¹ highlighted the need for a widely accepted methodology for true pricing in the Dutch agri-food sector (see De Groot Ruiz et al., 2018). A Public-Private Partnership “Echte en Eerlijke Prijs voor duurzame producten” (True and Fair Price for Sustainable Products, 2019-2022) was initiated by Wageningen Economic Research, True Price, Bionext, the Dutch government and various value chain businesses and investors to develop a true pricing methodology for the agri-food sector in The Netherlands. Within this partnership, this methodology document has been developed.

This document, the **Valuation Framework for True Price Assessment of Agri-food Products**, contains the general guiding principles for true pricing in the agri-food sector. The guiding principles allow to select relevant social and environmental impacts, and select a monetisation approach for these impacts in a comparable and consistent way. Valuing the impacts in monetary terms is a central and distinctive aspect of true pricing. This inevitably comes with different value choices. Furthermore, a monetisation approach requires a common foundation and framework that can be applied to environmental as well as social impacts. The approach highlighted here follows the Principles for True Pricing (True Price Foundation, 2020)¹² which have been applied for the development of the Monetisation Factors for True Pricing (True Price, 2020).

With this document, a list of social and environmental impacts in scope for true pricing and principles to select appropriate impact-specific monetisation factors have been developed. General requirements in terms of data, completeness and accuracy are specified in the **Assessment Method for True Pricing of Agri-food products**. The indicators and methods to be used to quantify and monetize each impact are part of **Natural, Human and Social Capital method modules** to be delivered within this project. Chapter 2 first discusses the definition of true prices and presents the rights-based approach to true pricing. In Chapter 3, it is explained which social and environmental impact should be included in a true price, including the distinction between positive and negative impacts. Chapter 4 elaborates how impacts can be monetized in true pricing in a comparable and consistent way. Chapter 5 presents the limitations and items for further

¹⁰ True Pricing focusses on negative societal impacts. Positive societal impacts are often also of strategic importance. See page 9 for a brief discussion of how they fit in the true price framework.

¹¹ The organization based in the Netherlands called True Price is referred to using capital initials, to distinguish it from the concept of true price.

¹² Until publication, a draft version is available upon request

research. In Annex I, a list of impacts to take into account in true pricing is presented, while Annex II discusses why a rights-based approach has been chosen instead of a welfare theoretic approach. Definitions are highlighted in tables and in the glossary at the end of this report.

Readers are invited to refer to the **Assessment Method for True Pricing of Agri-Food products** and separate **Natural, Social and Human Capital modules** for information on how the framework is operationalized and guidance on how to carry out a true price assessment using this valuation framework

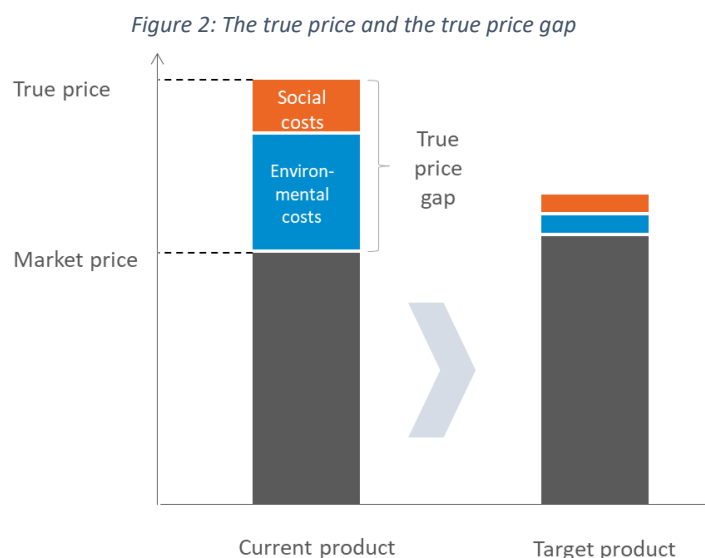
2. What is the true price?

This chapter aims to provide a better understanding of true pricing, its definition, purposes, and principles. It discusses what the true price is, its use and interpretation, and the rights-based approach that is underlying it.

True cost accounting and true pricing are young fields of research and practice. Not many methodologies exist worldwide to assess externalities at product level which rely on a clear valuation framework and cover a large number of social and environmental themes. The approach presented here builds on existing knowledge from the fields of corporate responsibility, economics, sustainability science and life cycle assessment, and at the same time it is innovative in many forms.

2.1 The true price

The true price is a way of accounting for negative consequences of production and consumption at the product level, expressed as costs in monetary terms. The sum of environmental and social costs is called the true price gap. The true price of a product is defined as the sum of the market price and the true price gap (Figure 2). The lowest the true price gap, the least social and environmental costs a product has.



In order to be practically able to calculate true prices, three important choices need to be made.

1. What are the externalities in scope?
2. With which indicators can we measure these externalities?
3. How are they monetised?

The indicators for each externality (point 2) are covered in-depth in the different **Natural, Human and Social Capital method modules** that accompany the present document. These choices are more technical rather than normative. The other two points, what externalities to include and what valuation approach to

use, are more normative and the core of this document. They are briefly presented below, and in more detail in chapters 3 and 4 respectively.

First, as the true price is a sustainability indicator, calculating it requires defining what can be considered sustainable (and unsustainable) in the economy as a guide to select what should be included in the calculation of a true price of a product.

The true price method takes a rights-based approach to do so. In essence, a product is considered sustainable if in the production and consumption the basic rights of all, including future generations, are respected. Internationally defined rights are taken as a starting point in defining what are called *unsustainable* externalities of production and consumption¹³. These are the impacts that should be taken into account in the true price gap. Rights that are considered are basic rights of all people specified by international conventions. This includes Human Rights, fundamental labour rights, and environmental rights.¹⁴ The people that hold these rights belong to both current and future generations. True pricing is based on the normative idea that the rights of each of the stakeholders should be respected by market participants and the economy in order to reach sustainability. See later in this section for more discussion. Annex II additionally compares the rights-based approach to alternatives such as a welfare-theoretic approach to include externalities in pricing using the cardinal utility perspective or abatement costs. Chapter 3 uses the rights-based approach to answer the question which social and environmental impacts are in scope in the true price.

Second, the calculation of the true price gap requires monetising quantitative social and environmental indicators. In this method, the valuation of a product’s unsustainable external costs is based on the costs required to remediate the negative societal impacts of a product. Respecting rights also means that each stakeholder whose rights are violated has the right to receive remedy. While it is preferable to avoid negative unsustainable externalities from occurring instead of remediating them afterwards, in the current economy remediation is needed to ensure that the rights of all people are respected. Nonetheless, when externalities are avoided in the first place, this translates in a lower remediation cost for negative unsustainable externalities and a lower true price gap. Chapter 4 discusses remediation and what it entails in more detail.

Taking this perspective, true pricing makes market prices, social costs and environmental costs comparable to each other, to the extent that they are all expressed in monetary units and all represent a cost: the market price is the cost to buy the product for a buyer and the true price gap is the cost to remediate the damage associated with its production or consumption. Consequently, the true price as the sum of the market price and the true price gap is the price a buyer would have to pay for a product if the cost of remediating its unsustainable externalities would be added on top of its price.

In the true price method, the following definitions are used.

Externality	A societal cost or benefit that affects a party who did not choose to incur this cost or benefit. An external cost is a negative externality and an external benefit is a positive externality.
Unsustainable externality	The consequences of differences between the current production method and a situation where no generally accepted rights for current or future generations would be violated, for parties who did not chose to incur these consequences. An unsustainable externality is not necessarily an externality in the economic sense of the word and the word unsustainable has a very specific interpretation in being the violation of a basic right.

¹³ In other documents unsustainable externalities are referred to as unsustainable external effects or unsustainable impacts.

¹⁴ In further developing the method, other rights can be added to this list, assuming they are sufficiently well accepted globally, e.g., through international conventions.

True price gap	The true price gap of a product is the sum of all the remediation costs of all unsustainable externalities caused by the production and consumption of that product.
True price	The true price of a product is the sum of the market price and the true price gap of a product.

2.2 Use and interpretation of the true price

The **true price gap** is the sum of the social and environmental costs of a product, provided they can be seen as *unsustainable* from the perspective of generally accepted rights. The **true price** is a virtual buying price that adds the true price gap to the market price.

The true price can be interpreted as a virtual price showing what a current buyer would have to pay if the cost of remediating all the unsustainable externalities would be added to the price of a product. The true price (gap) is valuable for consumers, companies and governments and can be used for multiple purposes.¹⁵

- It provides a **straightforward sustainability indicator** for consumers and purchasers that is to some extent comparable with the market price and facilitates choosing between products based on their sustainability.
- By identifying and ranking the negative impacts by which the true price gap is calculated, it can guide companies and governments in **prioritizing improvement efforts**.
- It allows for the **comparison** of the benefits of sustainability interventions on products, in terms of reduced social and environmental impacts in a unit that is comparable with their implementation costs.

The true price includes the remediation cost of impacts that can be related to violations of rights of present and future generations, and therefore it should not be interpreted as the equilibrium price of a product if all externalities would be part of the market price, as you could define from a welfare economics perspective. Based on the definition of unsustainable externalities above, within true pricing, there is no specific attention to how market prices are set, e.g., how taxes and subsidies contribute to this. Externalities and market distortions caused by market power, taxation or subsidies are not included in the true price gap. Additionally, the true price does not specify what would be a fair market price¹⁶ or what would be the equilibrium market price of a sustainable product.¹⁷ Positive externalities are included only in some cases¹⁸. The reasons for developing a rights-based approach for true pricing rather than one rooted in welfare economics are explained in Annex II. They include avoiding netting positive and negative externalities, avoiding unfair trade-offs and avoiding making assumptions on the substitutability of natural capital for other capitals.

One of the benefits of a true price based on remediation cost is that it can potentially be more than just an accounting tool. It could be actionable, paid by a buyer, since it represent negative effects looking at the 'cost of action' (remediation) rather than the 'cost of inaction' (damage). The true price gap shows a virtual price that you could in theory pay to remediate the negative externalities of a product and buy a product in a way that is consistent with the respect of generally accepted rights. Some shops in The Netherlands are piloting this approach by asking their customers to pay part of the true price gap (Bijlo, 2020). Even if

¹⁵ In the vision paper 'A roadmap for true pricing' (True Price, 2019), different opportunities that true pricing creates for different stakeholders are elaborated in more detail.

¹⁶ See the discussion on the Fair Price within this Public-private partnership for discussion about this topic.

¹⁷ The true price is calculated as a 'snapshot', adding the costs of the current unsustainable externalities of a given production system to the market price. If these costs would really have to be paid, it would in some cases be more efficient to change the production and consumption systems such that these costs would be reduced. Therefore, the true price in a sustainable equilibrium will be different from the true price in the current market system.

¹⁸ See also section 4.2 Addressing positive externalities

prevention is better than remediation to internalize externalities, once a product has been produced, any negative effect incurred cannot be prevented anymore. True pricing could become a tool for internalizing these externalities by financing their remediation, if the infrastructure would exist so that the true price gap could be paid and the funds raised could be used to remediate the considered negative externalities. In the future, voluntary payment of the true price gap could be an additional way for consumers, companies and governments to address unsustainable externalities in value chains. In theory, true pricing could be used to create a level playing field on a larger scale; a market-based solution or basis for taxation to stimulate the prevention and remediation of unsustainable externalities¹⁹. It has to be mentioned that such a taxation would be different from a Pigouvian tax because it is not a payment for external cost based on preference, but a payment for remediation costs²⁰.

The true price is based on the idea that the economic actors collectively have a responsibility to either produce and consume sustainable products, or to remediate all unsustainable negative impacts. However, the true price is agnostic to how the responsibility is shared among the economic actors (e.g., whether consumers would need to pay extra, or producers would need to pay for the remediation at the expense of their profit margins, or other).

3. The rights-based foundations

As laid out above, the approach to true pricing presented in this framework builds on Human Rights, labour rights, environmental rights and other generally accepted rights. Rights are taken as a starting point for normative choices in this valuation framework, because they are almost universally agreed to at the international level .

The rights-based approach to true pricing starts from two points: (i) the well-recognized link that exists between rights and sustainability, which is explicit in many international conventions and declaration (**Box 1** discusses how this link is acknowledged in literature), and (ii) the fact that respecting rights means avoiding violations and providing remedy when these are observed (UN, 2011).

The innovation of the rights-based approach to true pricing is to build a product-level valuation framework from these two starting points. Assuming that a sustainable society is a society in which everyone's rights are respected, including those of future generations, a sustainable product is a product for which no rights are violated, or, if this occurs, the impacts of the violations of rights are remediated. This is the reason why every right that is violated is regarded as contributing to an *unsustainable impact* and accounted for in the true price gap. Environmental impacts that go against international goals for sustainable development are included as they are considered to affect the rights of future generations. Other negative or positive external effects of production or consumption that are not linked to the violation of a generally accepted right are not included in the true price.

The responsibility for businesses to respect Human Rights is well accepted and specified both by the UN Guiding Principles on Business and Human Rights (UN, 2011) and the OECD Guidelines for Multinational Enterprises (OECD, 2011). These documents also specify the responsibility of businesses to remediate all right violations that occur in a value chain. The rights-based approach to true pricing links this responsibility to the Brundtland definition of sustainable development: "sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own

¹⁹ If negative externalities would be taxed at their true price gap, then this incentivizes more sustainable production and consumption as it may make it cheaper to prevent the unsustainable external costs to happen instead of paying the remediation costs as taxes.

²⁰ As with the Pigouvian tax, the equilibrium tax will be different from the true price gap that is calculated because when the tax would be implemented it is in most cases to change production methods instead of paying the high remediation costs.

needs” (WCED, 1987) and proposes to extend the duty to respect rights also to those of future generations. Furthermore this extended responsibility is not only attributed to businesses, but to all market actors

Box 1: The rights-based approach to sustainability in literature

The rights-based approach to sustainability in literature

The literature on rights and sustainability suggests that there exists a reciprocal relationship between (human) rights and (environmental) sustainability (UNDP, 1998, p.7; OHCHR-UNEP, 2012; Bosselman, 2016; Nagpal, 2014).

According to Bosselman (2016), principles of sustainability inform rights (as soft or hard laws) - like how societal ideas have informed laws and rights related to justice, equality, and freedom (Bosselman, 2016). Similarly, the level of (environmental) sustainability (in a society) affects the capacity of people and their environment to reap the potential benefits of (human) rights. The Joint Report on the UN Conference on the Human Environment, for example, states that "These rights [The right to life, the right to the enjoyment of the highest attainable standard of health, the right to adequate food] that are listed are internationally guaranteed, but cannot be enjoyed in a degraded environment. Thus, efforts to promote and achieve a green economy can enhance not only the sustainability of natural capital but assist in the realization of human rights by reducing environmental degradation" (OHCHR-UNEP, 2012, p. 24). The United Nations Development Programme (UNDP) stated that "Human rights and sustainable human development are interdependent and mutually reinforcing. Development is unsustainable where the rule of law and equity do not exist; where ethnic, religious or sexual discrimination are rampant; where there are restrictions on free speech, free association and the media; or where large numbers of people live in abject and degrading poverty." The same message underlies many other internationally recognized documents (See for example, UNEP, 2015, p.1; Earth Charter International, pillar 7; Knox, 2015, p.8¹).

On the other hand, it has been observed that development (and therefore sustainable development) is a rights-based concept (Nagpal, 2014) and achieving sustainability requires rights to be respected (Bosselman, 2016; Kosoy et al., 2012, p.3). Nagpal (2014) observes that "Concerns surrounding development policies and their economic and ecological impact are human rights issues" and that "It makes perfect sense to link human rights to sustainable development: the right to life cannot be realized without basic rights to safe water, air and land. A human rights approach allows the quality of life of all people to be a central part of decision making." The Earth Charter, for example states, "Adopt patterns of production, consumption, and reproduction that safeguard Earth's regenerative capacities, human rights, and community well-being." Similarly, various other internationally recognized organizations acknowledge this link (see e.g. UNDP, 1998 p.5 & p.19; IDRC, 2013, p.1 as cited in Choondassery, 2017). The Bruntland Commission's Our Common Future report, which offered the first UN definition of sustainable development stated that "All human beings have the fundamental right to an environment adequate for their health and well-being" and the Stockholm Declaration states that "man's natural and self-made environment is "essential to his well-being and to the enjoyment of basic human rights and the right to life itself". The UN OHCHR has created a summary table that links the 17 SDGs to more than 20 international human rights instrument (UN OHCHR n.d.).

(businesses, consumers, investors, governments).

As we have seen, there are two key normative choices that need to be made to determine a framework for true pricing. The next chapter focusses on how to determine which impacts should be included in a true price. Chapter 4 lays out how the remediation cost of impacts can be assessed.

4. Which social and environmental impacts to include in a true price?

This chapter defines unsustainable externalities of production and consumption of agri-food products in the context of true pricing and in the context of the rights-based approach that was discussed in Chapter 2. It serves as a framework to derive a list of social and environmental impacts that are to be considered in a true price calculation.

An unsustainable externality of a product is a realised impact due to or causing a breach of one or more basic rights caused by the production and consumption of that product. The rights that are applicable to true pricing include (but are not limited to) the following:

- i. **Human rights.** These are the rights of any individual as stated in the International Bill of Human Rights (UN 1948), such as the rights to life, liberty and personal security, to freedom from slavery, torture or cruel, inhumane or degrading treatment or punishment, to rest and leisure, to a standard of living adequate for health and well-being, to education and more.
- ii. **Fundamental labour rights.** These are the rights stated in the ILO Eight Fundamental Conventions²¹, such as the rights to freely chosen work, to fair wages, to a safe and healthy work environment, to unionize, to social security, to freedom from discrimination and more.
- iii. **Environmental rights.** These stem from the right to a healthy environment and natural resources, which is recognised in regional UN agreements and most national constitutions²². Respecting the environmental rights of individuals and communities requires safeguarding the quality of air, water and soil, natural resources, ecosystems, habitats and the stability of the climate. In addition, it requires meeting the environmental goals defined in international conventions, declarations, agreements and documents, including but not limited to the Stockholm Declaration of the UN Conference on the Human Environment, the Sustainable Development Goals and the Paris Agreement, and in line with the principles of sustainable development and intergenerational equity defined in Our Common Future (UN 1972, 2015a and 2015b; WCED 1987)
- iv. **Other generally accepted rights** that may be added to this list in the future, such as animal rights.

These rights are applicable to both current and future generations and they provide the starting point for defining a set of responsibilities for economic actors that benefit from the consumption and use of products. When these responsibilities are not met, social and environmental impacts of products arise, which are to be measured and monetized in a true price assessment. Annex II discusses the right-based approach to true pricing in the context of other economic paradigms for true price accounting.

Social impacts of products	Impacts on people and communities caused by production and consumption. In the context of a true price gap assessment, social impacts are unsustainable externalities related to breaches of human rights and labour rights.
Environmental impacts of products	Impacts on the environment, people and communities caused by production and consumption. In the context of a true price gap assessment, environmental impacts are unsustainable externalities related to the breaches of environmental rights.

Example: Underpayment. Everyone has the right to fair and decent remuneration (according to the Article 23.3 of the International Bill of Human Rights, UN, 1948). A company has the responsibility to respect rights and, as the main party that can provide it, has the responsibility to pay its employees fair and decent remuneration. When the company does not pay this to its employees, a right is violated, and

²¹ International Labour Organisation. *Eight Fundamental Conventions*. See: <http://libguides.ilo.org/c.php?g=657806&p=4649148>

²² According to UNEP, at the time of writing the present document, "155 countries have binding legal obligations to respect, protect and fulfil the right to a healthy environment" (UNEP, n.d.)

this causes damage to the employees, compared with the situation that the product would have been produced sustainably, due to a lack of decent income. Therefore, the product that is produced by the company is not deemed to be sustainable and its true price gap includes underpayment.

Example: Contribution to Climate change. Everyone, including future generations, have a right to a safe, clean, healthy and sustainable environment. This right informs the climate change-related ambitions stated in several United Nations declarations, conventions and documents including The Kyoto Protocol (UN 1998), the Sustainable Development Goal 13 (UN 2015a), The Paris Agreement (UN 2015b), The Framework Principles on Human Rights and the Environment (UN 2018), Our Common Future (WCED 1987), and others. At the moment, the economy emits more than is required to limit climate change to internationally agreed safe levels (the Paris targets). This means that all economic actors collectively fall short, therefore all emissions of greenhouse gases due to the production and consumption of a product are considered as unsustainable externalities and included in the true price gap. In theory, another option would be to derive greenhouse gas (GHG) emission targets for each product and only consider emissions above these in the true price gap. For some products this would imply that greenhouse gas sequestration would be required. However, this is not considered feasible because it would imply that one has a complete overview over how the climate target will be accomplished over time.

By revising international rights, declarations, agreements and conventions that are relevant for the social and environmental impacts of businesses, a list of well-accepted social and environmental responsibilities that can be attributed to products and a corresponding set impacts that are to be included in a true price assessment can be derived. The proposed list is found in Annex I of this document.

The resulting list of impacts to be considered for a true price assessment is in line with the lists used in commonly used environmental and social Life Cycle Assessment frameworks, with relevant adjustments to take into account the rights perspective or sustainability aspects that are not (yet) part of these frameworks.

4.1 Footprint indicators

Each impact is quantified through one or more measurable *footprint indicators*, specified in the **Natural, Human and Social Capital method modules** of the true price methodology for agri-food products. In each true price assessment of a product, footprint indicators are quantified for each relevant part of the product lifecycle (production of agricultural inputs, farming activities, food processing, transport, distribution, retail, if relevant consumption, etc).

Footprint indicators	Variables that quantify the actual social and environmental impacts that are in scope to calculate the true price of a product. Footprint indicators must be calculated in such a manner that they can be monetized and compared meaningfully across different life cycle steps.
----------------------	--

The set of social and environmental footprint indicators to be quantified for calculating a true price is currently being developed. The choices made are presented in separate modules of the methodology. The resulting full list of footprint indicators can be added here at a later stage.

Quantifying footprint indicators requires solving important methodological choices, including complex issues such as allocation and dealing with incomplete or low quality data. A step-by-step guide and a set of requirements for scoping, modelling, data and reporting are developed in parallel to this framework and provided in a separate document, the **Assessment method for true pricing of agri-food products**. The key ideas are summarized here:

- More or less stringent requirements apply based on the desired goal of the true price calculation. It depends for example on whether the true price is used to make a comparison between products or not, and whether it is used to make public claims or not.

- In scoping, the key principle is that ideally all impacts of a product's lifecycle are measured, and if this is not possible no material impacts or parts of the value chain can be excluded.
- In modelling, life cycle assessment methods are followed.
- In data, the key idea is that the best available data should be used, and especially for the most material impacts and parts of the value chain. Depending on the application, more stringent data requirements apply. The data approach is inspired by the EU's Product Environmental Footprint requirements.
- In reporting, relevant information must be shared so that it is transparent how the true price is calculated and with which degree of data quality.

4.2 Addressing positive externalities

The true price looks at societal impacts of the current production system in an international rights framework. Positive externalities are only included in some cases in the true price. The underlying idea is that the true price should avoid netting positive and negative impacts, since these can be borne by different stakeholders. For a complete view of positive and negative externalities, it is recommended that the true price is accompanied by a similar metric focusing on positive effects ('true value').

Positive externalities of a value chain can only be included when calculating one indicator of the the true price gap, as long as they offset negative externalities *for the same indicator* (e.g. greenhouse gas emissions and carbon sequestration, water pollution and water purification, negative and positive effects on workers' health, etc.) somewhere else in the value chain. This means that for example carbon sequestration benefits can be subtracted from carbon emissions in other parts of the value chain, but not from the cost of underpayment or water pollution.

The food and agriculture system can have large positive externalities. However, from a rights perspective, positive effects should not be used to compensate for violation of rights.

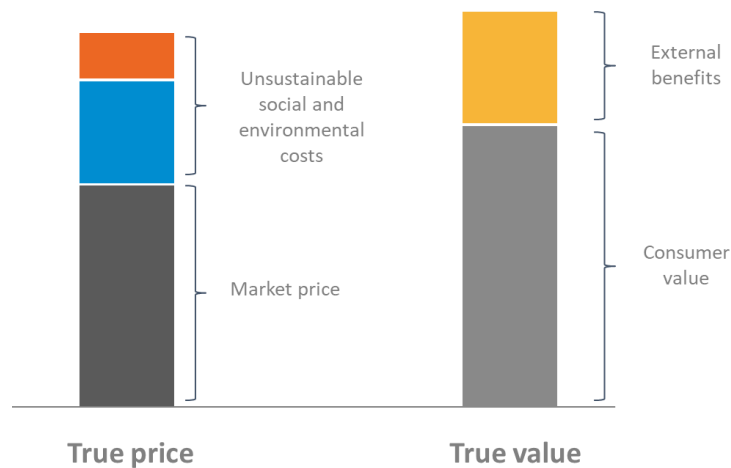
In particular, various stakeholders consider it not acceptable to net positive and negative impacts against each other. For example, a large positive impact in job creation, tax revenue or carbon sequestration should not be considered to compensate for the presence of child labour or forced labour in a supply chain.

Nonetheless, positive externalities of food and agricultural products are also important in decision making and should also be measured. For example, *in addition* to measuring the true price gap and any relevant positive externality, one can value other positive externalities based on approaches equivalent or similar to those used to measure the true price gap (since often a positive effect can be measured in the same way as a reduced negative effect). A measure of the value of all internal effects and remaining externalities (negative and positive) of a product based on their contribution has been called a measure of *true value* (3), which looks at the direct benefits for the buyer and positive externalities (De Groot Ruiz et al., 2018).

Important example of positive externalities of food that are mentioned frequently are food security and the role of fruits and vegetables in healthy diets. However, it is difficult to relate these impacts with specific products as it is the food supply of a group of people, or the composition of the food basket that are relevant. A specific module will be developed to discuss positive effects of healthy diets. As far as the dietary benefits of fruits and vegetables can be related to the products it is part of the true value rather than the true price.

An important difference between the true price and the true value is that businesses (and markets players) have a responsibility to meet all basic rights, whereas they have the freedom on determining how they create true value, which can be in many different ways.

Figure 3: True price and true value



More detail on this topic is provided in Annex II, which discusses the right-based approach to true pricing in the context of other economic paradigms for true price accounting.

5. What is the monetary value of an impact?

True Price’s right-based approach also provides the basis for choosing between valuation approaches..

Societal impacts can be monetized with many valuation approaches, including damage cost to society, abatement cost to society, prevention cost for firms, restoration cost for firms, etc. The selection of a valuation approach is a central choice for a valuation framework, as currently there is no generally accepted paradigm defining which of those methods is preferable for which application. In the context of a true price assessment, the concept of *remediation cost* is taken as guidance, as introduced in Chapter 2.

Even though under some perspective social and environmental impacts could be seen as intrinsically incomparable to each other, or not translatable into monetary values, true pricing proposes that doing so is valuable, so that hidden societal costs can become visible and weighted in decision making. This valuation framework offers a method to consistently value social and environmental effects in monetary units, in a way that is inspired by a Human Rights perspective.

5.1 The concept of remediation cost

*“In the UN Guiding Principles [for business and Human Rights], the term ‘remediation’ is used to refer to the process or act of providing remedy. At its core, the concept of remedy aims to restore individuals or groups that have been harmed by a business’s activities to the situation they would have been in had the impact not occurred. Where this is not possible, it can involve compensation or other forms of remedy that try to make amends for the harm caused”.*²³

Remediation for the purpose of true pricing is defined as a set of activities that make the stakeholders that are harmed by violations of basic rights equally well off as they would have been if the right violation didn’t occur. As we have seen, stakeholders include workers, their dependants, communities, but also future generations. The *remediation cost* of a right violation is the cost that should be incurred to remediate the harm caused. Since social and environmental impacts in true pricing are linked to breaches of rights, they can be monetized using remediation cost. By using a consistent definition of remediation cost that is

²³“Understanding remediation” from <https://www.businessrespecthumanrights.org/en/page/349/remediation-and-grievance-mechanisms>

applicable to both social and environmental impact, this framework makes social and environmental costs comparable.

As stated in the UN Principles on Business and Human Rights “remedy may include apologies, restitution, rehabilitation, financial or non-financial compensation and punitive sanctions (whether criminal or administrative, such as fines), as well as the prevention of harm through, for example, injunctions or guarantees of non-repetition.” (UN, 2011) These concepts are translated in a valuation framework for true pricing. The following chapter explains how.

5.2 Calculating the remediation cost

5.2.1 Types of costs

Remediation consists of a set of activities, and the required activities depend on the types of harm that occurs. Remediation is operationalized in terms of four types of activities: restoration, compensation, prevention and retribution. The costs to perform these activities can be estimated for each type of social or environmental impact. It is defined as the actual market price of that activity if a well-functioning market exists or the estimated price in case a well-functioning market does not exist. The costs to carry out these activities are called restoration cost, compensation cost, prevention cost and retribution cost.

- *Restoration cost*: The cost of bringing people’s health, wealth, circumstances and capabilities or environmental stocks and qualities to a situation comparable to that in which the social and environmental impacts of the considered product had not occurred.
- *Compensation cost*: The cost of compensating affected people for economic and/or non-economic damage caused by the social and environmental unsustainable impacts of producing or consuming a product. In valuation literature this is also called damage cost. Non-economic damage should be valued using the most suitable stated and revealed preference valuation techniques for the effect that is being valued.
- *Prevention cost of re-occurrence*: The cost that would allow to invest in measures that avoid, avert or prevent the social and environmental impacts of a product in the future. This refers to the prevention of future situations to occur, rather than to prevention of the impact that caused the damage under study. It should be included on top of restoration or compensation.
- *Retribution cost*: The cost to pay for certain violations of generally accepted rights, estimated by looking at legal sanctions, or fines. These should only be included to the extent that no penalties have been already paid for these violations. Retribution cost is reflected in the definition of remedy given above, and can be seen as an additional cost to pay when higher societal values, such as justice, are violated, on top of the actual costs of compensating for or restoring the damage.

The use of sanctions as a valuation method is an innovation and due care should be taken to operationalize it consistently. The same holds for the use of prevention cost of re-occurrence in combination with restoration or compensation costs.

5.2.2 Guiding principles to select types of costs

These four types of costs are combined according to specific principles as *remediation cost of an impact*. For each of the impacts in scope for true pricing, a choice for the type of remediation to be included should be made. Which remediation activities are relevant depends on what types of damages is caused to people and the environment by the considered unsustainable impact. Damage can be reversible or irreversible. Environmental impacts are deemed to lead to severe damage when they affect planetary boundaries that are considered high risk or increasing risk (Stockholm Resilience Centre, 2020). Social impacts are deemed to lead to severe damage to people if they can be linked to *serious violations of human rights* of specific individuals (Geneva Academy, 2014).

For each impact to be remediated, either one between restoration and compensation cost is applied, and for some specific types of damage these are accompanied by a cost for prevention of re-occurrence and a retribution cost. The following principles are defined:

1. Severe damage to people or communities is **restored** if technically feasible.
2. Non-severe damage to people or communities is **restored** if technically feasible and at a lower cost than potential compensation.
3. Environmental impact that lead or can lead to severe, irreversible damage to people or communities is **restored** if technically feasible.
4. Environmental impact that leads to non-severe damage is **restored** if technically feasible and at a lower cost than potential compensation.
5. Damage to people or communities is **compensated** if it is not restored according to 1-4.
6. Severe and irreversible damage to people or communities is **prevented from re-occurring**.
7. Damages which constitutes violations of legal or well-accepted obligations are **retributed**.

Types of costs can be combined without double counting since they are all different components of the cost to remediate damage that has already been caused by a product's unsustainable impacts.

Table 1 summarizes the overview of the costs, the types of damage they apply to, and a proposed operationalization (relevant valuation approaches) for social and environmental impacts.

From here, coming to a more specific selection of valuation approaches and corresponding data to monetize indicators requires a tailored approach for each impact. Complexities involved include the choice of the right valuation techniques and data sources to best estimate remediation cost components as defined here. This selection is done following the most recent scientific insights on each topic and is meant to be revised over time with a transparent process. These choices are not in scope of this document, which focuses on the overall framework and principles. They are covered in the **Natural, Human and Social Capital method modules**.

Applying these guiding principles leads to the development of a set of *monetisation factors* which correspond to the set of *footprint indicators* required for a true price assessment.

Monetisation factor	Estimate of the remediation cost of the impacts measured by the footprint indicators. In some cases, monetisation factors may be country-dependent and different for the same impact for different parts of the product lifecycle (for example, if some damage cost coefficients are proportional to local income levels and the damage occurs in different countries).
---------------------	---

In each true price assessment, after footprint indicators are measured for all parts of a supply chain, monetisation factors are multiplied by the footprint indicators to determine the contribution to the true price gap²⁴.

²⁴ For impacts where monetisation factors are country-dependent, aggregation across supply chain steps can only be done after monetisation

Type of cost	Description	Applicable damage	Environmental cost operationalization	Social cost operationalization
<i>Restoration cost</i>	The cost of bringing people’s health, wealth, circumstances and capabilities or environmental stocks and qualities to a situation comparable to that in which the social and environmental impacts of the considered product had not occurred.	Reversible and severe Reversible and non-severe (if cheaper than compensation)	Abatement cost, Replacement cost	Healthcare costs, Reintegration & education cost,
<i>Compensation cost</i>	The cost of compensating affected people for economic and/or non-economic damage caused by the social and environmental unsustainable impacts of producing or consuming a product. In valuation literature this is also called damage cost.	Irreversible Reversible and non-severe (if cheaper than restoration)	Damage cost (stated/observed/ revealed preference)	Damage cost (stated/observed/ revealed preference) Income and wage gaps
<i>Prevention of re-occurrence cost</i>	The cost that would allow to invest in measures that avoid, avert or prevent the social and environmental impacts of a product in the future. This refers to the prevention of future situations to occur, rather than to prevention of the impact that caused the damage under study.	Irreversible and severe (on top of compensation or restoration)	Cost of averting measures	Cost of averting measures
<i>Retribution cost</i>	The cost to pay for certain violations of generally accepted rights, estimated by looking at legal sanctions, or fines.	Violations of legal or well accepted obligations (on top of compensation, restoration, prevention)	e.g. Legal sanctions	e.g. Legal sanctions

0 *Table 1 Overview of remediation cost types, when to apply them and how they can be operationalized*

1

Below, examples of how these principles are applied in practice to define the remediation cost of underpayment and contribution to climate change are given.

Example: underpayment. The damage caused by underpayment consists of economic damage to employees receiving a payment below a decent living wage, which severely impacts the ability of workers and their families to meet minimum requirements for a decent living. Furthermore, if legal minimum wage standards are not met, this is also a legal violation. Therefore, remediation of underpayment consists of three cost components: compensation cost, because the damage cannot be reversed but can be compensated, prevention cost, because the damage is considered severe and irreversible, and retribution cost for underpayment in violation of the legal minimum wage. In practice, other types of damage can occur as well, but these are not included in the scope for monetizing the effect.

Three monetisation factors are developed. Firstly, compensation cost is measured as the estimated wage gap between prevailing wages and decent living wages, as paying this would compensate the affected employees to the extent that they are equally well off as in a situation in which underpayment had not occurred. Interest can be added to compensate for the time delay in receiving the wage. Secondly, prevention cost is added, as the cost of audits that would have to be introduced to avoid the occurrence of underpayment in a supply chain. Finally, retribution, the cost of sanctions, is counted on top of the compensation cost in the case that wages do not meet the legal minimum. Retribution costs are estimated using a penalty factor based on a weighted average of legal sanctions for underpayment across various countries for the violation of not paying a sufficient wage to employees²⁵.

Example: contribution to climate change. For contribution to climate change, the first type of damage is an increase of GHG concentration in the atmosphere, which in turn can lead to a risk that people lose health or income because of desertification, extreme weather events, rising sea levels, etc. Research indicates that the Earth has already transgressed the planetary boundary. It is now approaching several Earth system thresholds²⁶ implying that current emissions will lead to potential long-term damage. As a result, the (potential) harm is assessed as severe. Because the harm is considered severe, restoration cost should be chosen over compensation cost if technically feasible.

Abatement measures can decrease the GHG concentration in the atmosphere, and therefore can be used to offset the effects of past emissions. Therefore, it is technically feasible for a polluter to restore the damage caused. As a result, restoration cost is used, and operationalized through the cost of abatement measures. Because the damage is reversible, no additional costs for prevention-of-reoccurrence are required.

Marginal abatement cost is used as monetisation factor, as the most appropriate estimate of restoration cost. The marginal abatement cost represents the market price if there would be a full scale market for abatement measures.

This approach assumes there is no residual damage that would need to be compensated if GHG concentration in the atmosphere is restored. In practice, some forms of damage to people and the environment still occur even if the GHG concentration would be restored, but these are left out of scope.

The examples above are intended to illustrate how the valuation framework can be applied in practice to determine what constitutes the remediation cost for very different impacts.

²⁵These retribution costs estimated using a penalty factor are based on legal sanctions irrespective of probability of detection

²⁶ Stockholm Resilience Centre (n.d.). The nine planetary boundaries. Available at: <https://www.stockholmresilience.org/research/planetary-boundaries/planetary-boundaries/about-the-research/the-nine-planetary-boundaries.html>

In Annex II a discussion of how this approach to valuation relates to other existing methods is presented.

The **Assessment Method for True Pricing of Agri-Food products** and **Natural, Social and Human Capital method modules** that accompany this valuation framework provide concrete guidance on how this framework is used to carry out a true price assessment for specific products.

6. Limitations of the valuation framework and items for further research.

As mentioned above, true cost accounting is a young field and this framework, although building on existing knowledge and frameworks, is innovative in many ways. Very few or no methodologies exist worldwide to assess externalities at product level which cover a large number of social and environmental themes as this one and rely on a clear valuation framework. Although the right-based approach offers a useful valuation framework for true pricing, it comes with limitations.

If we look at welfare as a multi-dimensional concept, the respect of rights is only one dimension. Choosing this as the main perspective, reduces focus on other dimensions, such as well-being and equitable distribution of resources and opportunities, which will not be covered in the true price method as long as they don't overlap with the respect of rights. This simplifies the assessment while keeping it consistent by proposing a criterion for exclusion. However, as a result, not all information that is relevant to all decision makers is included. For example, positive effects are not included in the rights-based true price, as are externalities caused by government subsidies, while they may be relevant for social decision making. Similarly, some of true pricing's externalities, such as living wage and living income gaps, may not even be considered externalities by other paradigms or external cost methodologies. This problem can be mitigated by not looking at the true price in isolation, but also look at other indicators of welfare. The rights-based true price as an information tool is most useful if (i) the true price could be paid as a transaction price or (ii) the remediation costs are considered a good reflection of the severity of the violation of rights.

The rights-based true pricing approach doesn't fit into the standard welfare theoretic approach that is based on preferences or at least evaluation of well-being. Remediation costs are not relevant in welfare economics. Additionally, the rights-based approach requires new specific definitions of terms, especially that of unsustainable externality and remediation cost, that may be confusing for some specialists.

It has not been discussed in depth how the framework related to other approaches that have been proposed, and how it relates to the discourse in sustainability sciences and welfare economics beyond what is discussed here and in Annexes I and II. These are items for further research.

Market prices may already incorporate penalties paid and environmental taxes that are used to restore damage caused by violation of international rights. These taxes and penalties are already included in the market prices and counting them in the true price gap should be avoided. This problem is at this moment not addressed by the framework.

The right-based framework suffers also from some limitations that hold for all valuation frameworks. These are especially true if it is used just as a mere information tool (without any reference to the payment of true prices). The first and foremost one is that it puts a price on things that are often considered to be priceless – such as the value of a human life, or the value of nature – so as to make them comparable. Although this is required to make hidden costs more visible and to take more informed decisions, it remains a controversial thing to do for some. Secondly, to make decisions one has to aggregate multiple effects on individuals. However, aggregating individual preferences is problematic, as it requires value judgements about how preferences of some people relate to those of others and discounting. This is called the aggregation problem, and it is discussed in Annex 2. The rights-based true price is designed to attenuate this problem, as the range of impacts to be aggregated is smaller and positive and negative effects are not subtracted from each other. However, the problem is still present to some extent if the true price gap is

used as a mere information tool to compare different products without reference to using true pricing for remediation. Next to that, since well-functioning markets for the remediation of social and environmental externalities do not exist, true prices defined based on this notion are estimations rather than actual prices. This is a common problem for the valuation of non-market goods and holds for other valuation frameworks as well. Being a sustainability indicator at product level, the true price gap also has the limitation that it can downplay social and environmental impacts which are very large in a specific ecosystem or for a specific community, just because they become small when attributed to a single product. Therefore it often favours high efficiency production. This is a limitation deriving from reliance on Life Cycle Assessment.

Lastly, there are limitations that are inherent to the application of a measurement framework. Like any method, there are a number of value judgements to be made when operationalizing the framework. Which impacts are sufficiently robustly justified by rights, how should they be translated into measurable indicators for production and consumption activities, which hypothetical reference to take to measure them (e.g. what constitutes a product that does not breach any right of present and future generations), which damage is 'severe' or not and 'reversible' or not, and which monetisation factors are chosen from the literature (e.g., if the method indicates that 'damage cost' is to be used, and there are multiple studies that provide different values). Supporting documentation (e.g., the method modules) provide our best attempt to justify choices, but those can never be fully objective. It is important that these choices are refined and improved over time with participation of experts and stakeholders.

7. Conclusions

In the Dutch agri-food sector, there is a need for a widely accepted methodology to account for the external costs (environmental and social) of products.

True pricing is the process of calculating true prices and it entails the quantification of unsustainable externalities and their expression in monetary terms in a way that is comparable to a product's market price, through a monetisation process. A monetisation approach requires a common foundation and framework that can be applied to environmental as well as social impacts of a product. This document provided definitions and a framework for developing a set of indicators and monetisation factors for societal impacts (social and environmental) of food- and agricultural products in a structured and consistent way.

The starting point of the framework are generally accepted rights for current and future generations, the link between rights and sustainability, and a shared responsibility of economic actors (businesses, consumers, investors, government) to respect these rights. The true price gap is the sum of social and environmental costs of a product to remediate *unsustainable externalities* from the perspective of basic rights. The right-based approach provides the basis for choosing between valuation approaches for social and environmental impacts in a way that is coherent and builds upon internationally accepted rights. In this method, valuation is based on the costs required to remediate the negative societal impacts of a product. Positive externalities are only included in the true price gap in some specific cases. For a complete picture of the impact of a product, the true value of a product, that assesses its external benefits, is needed alongside its true price.

In the proposed framework, the true price gap represents the remediation cost of negative social and environmental impacts, and the true price can be seen as a virtual buying price that adds the true price gap to the market price.

8. Glossary

True price	The true price of a product is the sum of the market price and the true price gap of that product. It reflects the price a buyer would have to pay for a product if the cost of remediating its unsustainable externalities would be added on top of its market price.
True price gap	The true price gap of a product is the sum of all remediation costs of all unsustainable externalities caused by the production and consumption of that product.
Externality	A societal cost or benefit that affects a party who did not choose to incur this cost or benefit. A societal cost is a negative externality and a societal benefit is a positive externality.
Unsustainable externality	The consequences of difference between the current production method and a situation where no generally accepted rights for current or future generations would be violated, for parties that did not choose to incur those consequences. An unsustainable externality is not necessarily an externality in the economic sense of the word and the word unsustainable has a very specific interpretation in being the violation of international rights.
Social impacts of products	Impact on people and communities caused by production and consumption of a product. In the context of a true price gap assessment, social impacts are unsustainable externalities related to breaches of human rights and labour rights.
Environmental impacts of products	Impacts on the environment, and indirectly on people and communities, caused by production and consumption of a product. In the context of a true price gap assessment, environmental impacts are unsustainable externalities related to the breaches of environmental rights and human rights.
Footprint indicators	Variables that quantify the actual social and environmental impacts that are in scope to calculate the true price of a product. Footprint indicators must be calculated in such a manner that they can be monetized and they can be compared meaningfully across different life cycle steps.
Monetisation factor	Estimate of the remediation cost of the impacts measured by the footprint indicators. In some cases, different monetisation factors may be country-dependent and be different for the same impact for different parts of the product lifecycle (for example, if some damage cost coefficients are proportional to local income levels and the damage occurs in different countries).

9. References

Bijlo, E. (2020). Deze supermarkt rekent 'echte prijzen': je betaalt ook voor klimaatbelasting, landgebruik en onderbetaling. (This supermarket charges 'true prices': you pay also for climate impacts, land use and underpayment) Trouw, 6 December 2020. Available at <https://www.trouw.nl/duurzaamheid-natuur/deze-supermarkt-rekent-echte-prijzen-je-betaalt-ook-voor-klimaatbelasting-landgebruik-en-onderbetaling~bcdffb55/>

Bosselmann, K. (2016). The principle of sustainability: transforming law and governance. Second Edition, Routledge.

Choondassery, Y. (2017). Right-based Approach: The Hub of Sustainable Development. Discourse and Communication for Sustainable Education, 8(2), 17-23.

Earth Charter International. (2000). The Earth Charter. Available at: <https://earthcharter.org/discover/the-earth-charter/>

de Groot Ruiz, A., Baltussen, W., de Adelhart Toorop, R., van den Elzen, F., Janssen, B., van Keeken, R., Logatcheva, K., Martinius, E., & Martinius, T. (2018). Op weg naar de echte prijs, echte waarde en echte winst van voedsel. No. 2018-016. Wageningen Economic Research.

Knox, J. H. (2014). Report of the Independent Expert on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment: Mission to Costa Rica. United Nations Human Rights Council, A/HRC/25/53 Add, 1.

Kosoy, N., Brown, P. G., Bosselmann, K., Duraïappah, A., Mackey, B., Martinez-Alier, J., Rogers, D., & Thomson, R. (2012). Pillars for a flourishing Earth: planetary boundaries, economic growth delusion and green economy. Current Opinion in Environmental Sustainability, 4(1), 74-79.

Nagpal, R. (2013). Human Rights Approach to Sustainable Development. OIDA International Journal of Sustainable Development, 6(07), 29-40.

OECD (2011), OECD Guidelines for Multinational Enterprises, OECD Publishing. <http://dx.doi.org/10.1787/9789264115415-en>

OHCHR-UNEP (2012). Human Rights and the Environment Rio+20: Joint Report OHCHR and UNEP. Available at: <https://wedocs.unep.org/handle/20.500.11822/9970>

UN (2011). Guiding Principles on Business and Human Rights: Implementing the UN "Protect, Respect and Remedy" Framework. Report of the Special Representative of the Secretary General on the issue of human rights and transnational corporations and other business enterprises.

UN OHCHR (n.d.). Summary table on the linkages between the SDGs and relevant international human rights instruments. Available at: https://www.ohchr.org/Documents/Issues/MDGs/Post2015/SDG_HR_Table.pdf and via "Human Rights and the 2030 Agenda for Sustainable Development." Available at: <https://www.ohchr.org/en/issues/SDGS/pages/the2030agenda.aspx>

Stockholm Declaration (1972). Declaration of the United Nations conference on the human environment

True Price (2019).). A roadmap for true pricing. Available at: <https://trueprice.org/vision-paper-a-roadmap-for-true-pricing/>

True Price (2020). Monetisation Factors for True Pricing. Version 2020.1. Available at: <https://trueprice.org/monetisation-factors-for-true-pricing/>

True Price Foundation (2020). Principles for true pricing. Available at: <https://trueprice.org/principles-for-true-pricing/>

UN (1948). International Bill of Human Rights.

UN. (1998). The Kyoto Protocol.

United Nations (2015a). Sustainable development goals.

United Nations (2015b). Paris Agreement.

UNDP (United Nations Development Programme) (1998). Integrating human rights with sustainable human development: A UNDP policy document. The United Nations Development Programme. One United Nations Plaza, New York.

UNEP (2015) Climate change and Human Rights. In collaboration with Columbia Law School. Nairobi.

UNEP (n.d.). Advancing environmental rights - Bringing environmental protection nearer to the people. Available at: <https://www.unep.org/explore-topics/environmental-rights-and-governance/what-we-do/advancing-environmental-rights> (Accessed: 16 March 2021)

World Commission on Environment and Development (1987). Our Common Future, via: <https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf>

Annex I List of impacts and definitions

The starting point for defining the impacts to consider in the true price gap is a responsibility of businesses related to basic rights of people. In this framework, this responsibility is extended to link to the rights of future generations and sustainable development, and it is considered shared between all economic actors (including businesses, governments, consumers and investors).

When this is not met in a supply chain, that creates an unsustainable externality, which should be accounted as part of the true price gap of related products.

The proposed list of impacts for the assessment of true prices can be found in this annex.

The list is based on the *Preliminary list of rights relevant to true pricing* and the *Preliminary list of impacts in scope for true pricing* presented in Annexes B and C of the True Price Principles (True Price Foundation, 2020), which explains the steps to go from international documents related to rights and sustainable development to this list of impacts. The approach is also summarized here.

Well-accepted business responsibilities deriving from the UN Guiding Principles on Business and Human Rights are translated into specific responsibilities by the OECD Guidelines for Multinational Enterprises, a set of recommendations addressed by governments (both OECD and non-OECD) to multinational enterprises providing “principles and standards of good practice consistent with applicable laws and internationally recognised standards”.

Environmental rights stem from the right to a healthy environment and natural resources, which is recognized in regional U.N. agreements and most national constitutions. In turns, the many environmental goals defined in international conventions, declarations, agreements and documents and the principles of sustainable development and inter-generational equity are also used to define a set of responsibilities for businesses, markets and products consistent with the true price vision. These responsibilities are used as a basis to define an additional right to have access to the natural resources of the earth for current and future generations.

From the resulting set of responsibilities, social and environmental impacts are defined to be a mutually exclusive and collectively exhaustive list of aspects of production and consumption systems that can deviate from these responsibilities.

The list is applicable to any product, sector and country. This allows true prices in the agri-food sectors can be assessed in a comparable way with true prices in other sectors.

A set of footprint indicators to measure these social and environmental impacts is being developed in separate **Natural, Human and Social Capital method modules** and can be included at a later stage. Life Cycle Assessment, which is the scientific standard for product-level sustainability assessment, is taken as a reference in defining environmental, and to some extent social impacts.

List of impacts relevant for true pricing

Environmental impacts	Social impacts
Contribution to climate change	Child labour
Air pollution	Forced labour
Water pollution	Gender discrimination

Soil pollution	Underpayment in the value chain
Land use	Lack of social security
Land transformation	Excessive and underpaid overtime
Fossil fuel depletion	Insufficient income
(Other) non-renewable material depletion	Occurrence of harassment
Scarce water use	Lack of freedom of association
Soil degradation	Negative effects of employee health & safety
Overuse of other renewable resources	Negative effects of community health & safety
	Animal welfare below standards
	Breach of indigenous rights
	Breach of land rights
	Occurrence of corruption
	Tax evasion
	Deliberate misinformation/lack of transparency
	Negative effects of consumer health & safety
	Breaches of privacy

Definitions

Environmental impacts

The set of environmental impacts is based on the Principles for True Pricing (True Price Foundation, 2020, Annex C) and largely in line with Life Cycle Assessment (LCA). An environmental impact as defined here can correspond to one or more impacts assessment mid-point indicator as defined in LCA (see e.g. Huijbregts et al. 2016). If deviations are made, this is to align with the rights perspective and/or to add impacts that are not yet developed in life cycle assessment. .

Environmental impacts in scope for true pricing	Definition
Contribution to climate change	Contribution to climate change from emissions of greenhouse gases (carbon dioxide, methane, nitrous oxide and others). Emissions of greenhouse gases increase their atmospheric concentration (ppb), which increases the radiative forcing capacity and consequently increases the global mean temperature (IPCC, 2007). According to the IPCC (2018), global warming increases climate-related risk associated with enduring and irreversible changes of natural and human systems. Climate-related risks include extreme warm temperatures; increases in frequency, intensity, and amount of heavy precipitation; ocean acidification; and droughts and precipitation deficits. Ultimately climate change results in economic damage, political instability due to hunger and freshwater scarcity (Raleigh & Urdal, 2007), damage to human health – e.g., malnutrition and increased risk of diseases such as malaria and diarrhea – and damage to ecosystems (Huijbregts et al. 2016).
Air pollution	Impacts caused by emissions to air other than climate change, namely ozone layer depletion, acidification, photochemical oxidant formation, particulate matter formation, nitrogen deposition from emissions to air, terrestrial and aquatic ecotoxicity and human toxicity from toxic emissions to air, as defined in LCA methodologies.
Water pollution	Emissions to water contributing to ecotoxicity and human toxicity, as well as eutrophication of marine- and freshwater. Eutrophication occurs due to the runoff and discharge of nutrients, for example from leaching of plant nutrients into soil, marine and freshwater bodies and the subsequent rise in nutrient levels, i.e. of phosphorus (P) and nitrogen (N).

Soil pollution	Eco- and human toxicity caused by emissions to soil. Soil pollution occurs due to the runoff and discharge of contaminants, for example heavy metals.
Land occupation	Land occupation represents the decreased availability of land for purposes other than the current one, through land occupancy. Land occupation by agriculture displaces habitats and ecosystems and therefore leads to biodiversity loss and loss of ecosystem services (Milà i Canals et al., 2007; Alkemade et al., 2009; De Groot et al., 2012).
Land transformation	Land transformation represents changes in land-cover that can affect ecosystem services and the climate system. This impact includes the number of natural ecosystems – i.e. (tropical) forest, woodland, grassland, and (inland and coastal) wetland - that are transformed in a certain period of time. Land transformation reduces the size of habitats and ecosystems and therefore leads to biodiversity loss and loss of ecosystem services.
Fossil fuel depletion	The consequence of the primary extraction of fossil fuels linked to fuel use, energy use and to produce other inputs, such as mineral fertilizer. Extraction of crude oil, hard coal and natural gas bears external societal costs because the stock of these materials is reduced for present and future generations. (Huijbregts et al., 2016). In this method, fossil fuel depletion is considered separately from the depletion of other non-renewable materials in line with LCA methodologies.
(Other) non-renewable material depletion	The consequence of the primary extraction of scarce, non-renewable resources besides fossil fuels, such as minerals. These bear external societal costs because the stock of these materials is reduced for present and future generations
Scarce water use	Concerns the use of blue water in such a way that the water is evaporated, incorporated into products, transferred to other watersheds or disposed into the sea, in areas where water is scarce (Falkenmark and Rockstrom, 2004). Water that is used as such is not available anymore in the watershed of origin for humans nor for ecosystems (Huijbregts et al., 2016). Scarcity of water depends on the watershed of origin and the geographical context (WWF, 2020).
Soil degradation	Soil degradation is defined as the physical, chemical and biological decline in soil quality driven by productive activities, like excessive use of irrigation or unbalanced use of fertilisers, and it can manifest itself in multiple ways, for example as loss of nutrients, loss of organic matter, increased soil erosion (from water or wind), soil compaction, waterlogging and salinization (Lal, 2009). Soil quality is the capacity of a soil to have the desired soil functions sufficiently available under varying conditions for a combination of objectives such as food production, an efficient nutrient cycle and the preservation of biodiversity (Hanegraaf et al. 2019).
Overuse of other renewable resources	Overexploitation of other natural or renewable resources, such as overfishing, is the situation where more of the species is removed than can be replenished by natural processes. In this context the concept of optimum sustainable yield is relevant. This is maximum yield that a renewable resource can generate over an infinite period of time. When more of the resource is harvested the population will decline. Concerns the relative loss of resources due to factors that are not included in the impacts described above, such as soil degradation and water use.

Social impacts

The set of social impacts is based on the Principles for True Pricing (True Price Foundation, 2020, Annex C) and largely in line with labour rights, Human Rights and corporate responsibility standards for business and

existing social LCA frameworks (UNEP 2009, ISO 2010, SAI 2014, CHRB 2018, Van der Velden en Vogtlander, 2017, Benoit-Norris et al. 2012, Croes & Vermeulen 2015).

Social impacts in scope for true pricing	Definition
Child labour	Child labour is work that deprives children of their childhood, their potential and their dignity, and is harmful to physical and mental development. Whether participation of children in work is deemed child labour depends on age, local regulation on minimum working age and minimum age for light work, nature of the work and the work relation, as specified by international institutions such as ILO (1999; 2019a) and UNICEF (2014) (See also ISO 2010). In its most extreme forms, child labour involves children being enslaved, separated from their families, exposed to serious hazards and illnesses and/or left to fend for themselves on the streets of large cities (Goedkoop, Idrane, and de Beer, 2018).
Forced labour	Forced labour concerns all physical and psychological damage from work or service that is claimed under threat of punishment and for which the person concerned has not volunteered. Forced labour includes practices such as the use of compulsory prison labour by private business entities, debt bondage, indentured servitude and human trafficking (ILO, 2019b).
Gender discrimination	Gender discrimination concerns the effect of discriminating, nullifying or impairing equality of opportunity or treatment based on sex. Gender discrimination includes insufficient provision of maternity leave and benefits, different pay for the same work between male and female employees and different opportunities to access higher pay job based on sex.
Underpayment in the value chain	Underpayment occurs when the actual wages of employees over standard working hours, including financial wages and some forms of in-kind compensation, lie below the legal minimum wage or a decent living wage. Underpayment in the value chain can also include underpayment of child labourers and forced labourers. It excludes underpaid overtime, which is included under 'Excessive and underpaid overtime'.
Lack of social security	Negative effects of lack of social security (where this is obliged by law). Social security includes protection against certain life risks and social needs, such as guaranteed income security and health protection. It is provisioned through cash or in-kind transfers, intended to ensure access to medical care and health services as well as income security through one's life, particularly in the event of illness, unemployment, employment injury, maternity, family responsibilities, invalidity, loss of the family breadwinner, as well as during retirement and old age (ILO, 2019c).
Excessive and underpaid overtime	Overtime hours worked by employees that are carried out in violation of legal regulations or compensated below legal requirements. It does not include underpayment, the gap between liveable and actual wages, for standard working hours.
Insufficient income	Smallholder farmers (and other small entrepreneurs with personal liability) in the value chain that have an income below the so-called living income (necessary for a decent standard of living). This impact differs from underpayment in the value chain because it only focusses on the income of self-employed smallholder farmers and entrepreneurs.

Occurrence of harassment	Negative effects of workplace harassment, including verbal and non-verbal, sexual and non-sexual. The term of "harassment" encompasses any act, conduct, statement or request which is unwelcome to a protected person and could, in all the circumstances, reasonably be regarded as harassing behaviour of a discriminatory, offensive, humiliating, intimidating or violent nature or an intrusion of privacy. This impact includes bullying/mobbing and sexual harassment (ILO, 2013a).
Lack of freedom of association	Workers that are not given the right of freedom of association: the extent to which workers have the right to establish and to join organisations of their choice without prior authorisation, to promote and defend their interests, and to negotiate collectively with other parties. They should be able to do this freely, without interference by other parties or the state, and should not be discriminated against as a result of union membership. The right to organise includes the right of workers to strike and the rights of organisations to draw up constitutions and rules, to freely elect representatives, to organise activities without restriction and to formulate programmes (UNEP, 2009).
Negative effects on employee health & safety	Impact on workers' health and safety at work: the extent to which working in the value chain negatively affects the safety and overall health status of the workers. The term health, in relation to work, indicates not merely the incidence of disease or infirmity, but also includes the physical and mental elements affecting health, which are directly related to safety and hygiene at work (ISO 2010, Goedkoop et al., 2018). Safety is understood as the extent to which working under defined conditions reduces safety of employees. This includes fatal and non-fatal incidents, the application of prevention measures and management practices and the incidence of occupational diseases.
Negative effects on community health & safety	Impact on health and safety of people other than people working in the value chain due to activities carried out in the value chain. The extent to which the production of a product and the final product itself increases negative impacts on the health and safety of the local community, with particular attention to vulnerable groups such as indigenous peoples and women. Incidents can include actual damage, adverse impacts, and risks to community health and safety.
Animal welfare below standards	Negative effects on animal welfare. According to OIE's Terrestrial Animal Health Code, an animal is in a good state of welfare if it is "healthy, comfortable, well nourished, safe, able to express innate behaviour, and if it is not suffering from unpleasant states such as pain, fear, and distress" (OIE, 2004). Negative effects on animal welfare thus include thirst, hunger, and malnutrition; discomfort; pain, injury, and disease; abnormal behaviour; and fear and distress.
Breach of indigenous rights	Impact on indigenous peoples when their rights are not recognized. Indigenous rights are a subset of land rights and entail the rights of groups of indigenous peoples and communities over land and resources. These include, but are not limited to, the same rights described under 'Breach of land right.'
Breach of land rights	Negative effects on people of land acquisition carried out in violation of existing land (tenure) rights. The impact on land rights entails rights over land that are clearly defined, long-term, enforceable, appropriately transferable, and socially and legally legitimate, regarding ownership of and as access to land. Land rights include, but are not limited to, possession rights, use rights, and rental, freehold, customary, individual and collective tenure arrangements. The bundle of tenure rights can include the rights of access, withdrawal, management, exclusion, and alienation (Tagliarino,

	2016). Land tenure insecurity exists when an individual or group is not confident that they have rights to a piece of land on a long-term basis, protected from dispossession by outside sources. This impact excludes land rights of indigenous peoples, which are included under 'Breach of indigenous rights.'
Occurrence of corruption	Negative effects of corruption by value chain actors. Corruption includes, but is not limited to, bribery and extortion. The bypassing of health and safety requirements falls under the impact's employee- and consumer health and safety.
Tax evasion	Negative effects of tax evasion by value chain actors. Tax evasion is a form of fraudulent conduct that includes, but is not limited to, a situation in which an actor in the value chain deliberately avoids paying a true tax liability.
Deliberate misinformation/lack of transparency	Deliberate provision of false or inaccurate information, or a lack of transparency that may result in negative effects on actors involved. Measured as the extent to which a stakeholder's transparency enables consumers and workers to make informed choices. Certification standards, labels and special indices that provide information about performance regarding social responsibility can be used to assess the impact (see for example Goedkoop et al. (2018) on 'Responsible communication').
Negative effects of consumer health & safety	Undesired negative effects of the considered product on consumer health or safety. The extent to which the product, under defined circumstances (target market, intake) contributes to a measurable increase in the risk of disease, related to Disability-Adjusted Life Years (DALYs) as defined by WHO (Goedkoop et al., 2018; WHO, 2019).
Breaches of privacy	Breaches of privacy (e.g. the collection, use or dissemination of privacy-sensitive data without the authorization of the interested person) that may (indirectly) reduce the well-being of actors involved. Similar to Goedkoop et al. (2018), private data is defined as any information relating to an identified or identifiable natural person ('data subject'). An identifiable person is one who can be identified, directly or indirectly, in particular by reference to an identification number or to one or more factors specific to his physical, physiological, mental, economic, cultural or social identity. The EU General Data Protection Regulation's definition of personal information includes a person's name, identification number, location data or online identifier; racial or ethnic origin; political opinions; religious or philosophical beliefs; trade-union membership; health or sex life; biometric or genetic data; and criminal offence data (European Parliament, 2016).

References to annex I

- Alkemade, R., Van Oorschot, M., Miles, L., Nellemann, C., Bakkenes, M., & Ten Brink, B. (2009). GLOBIO3: a framework to investigate options for reducing global terrestrial biodiversity loss. *Ecosystems*, 12(3), 374-390.
- Benoit-Norris, C., Cavan, D. A., & Norris, G. (2012). Identifying social impacts in product supply chains: overview and application of the social hotspot database. *Sustainability*, 4(9), 1946-1965.
- CHRB (2018) Corporate Human Rights Benchmark 2018 Methodology. Section D: Performance – Corporate Human Rights Practices
- Croes, P. R., & Vermeulen, W. J. V. (2015). Life Cycle Assessment by Transfer of Preventive Costs in the Supply Chain of Products. A first draft of the Oiconomy system. *J. Cleaner Prod.*, 102, 178–187
- Croezen, H., Bergsma, G., Clemens, A., Sevenster, M., & Tulleners, B. (2011). Biodiversity and Land Use. A Search for Suitable Indicators for Policy Use. Final report. CE Delft, Delft.
- De Groot, R., Brander, L., Van Der Ploeg, S., Costanza, R., Bernard, F., Braat, L., Christie, M., Crossman, N., Ghermandi, A., Hein, L., Hussain, S., Kumar, P., McVittie, A., Portela, R., Rodriguez, L.C., ten Brink, P., & van Beukering, P. (2012). Global estimates of the value of ecosystems and their services in monetary units. *Ecosystem services*, 1(1), 50-61.
- European Parliament. (2016). GDPR Regulation (EU) 2016/679. Retrieved from: <https://publications.europa.eu/en/publication-detail/-/publication/3e485e15-11bd-11e6-ba9a-01aa75ed71a1/language-en>
- Falkenmark, M. and Rockstrom, J. (2004). Balancing Water for Humans and Nature. The New Approach in Ecohydrology, Earthscan, London.
- Goedkoop, M. J., Indrane, D., de Beer, I. M. (2018). Product Social Impact Assessment Handbook – 2018. Amersfoort, September 1st, 2018.
- Hanegraaf, M.C., H.G.M. van den Elsen, J.J. de Haan & S.M. Visser (2019). Systematiek voor bodemkwaliteitsbeoordeling van landbouwgronden in Nederland. Wageningen Research, Rapport WPR-795. 34 blz. ; 1 fig; 2 tab; 23 ref. Available at: <https://doi.org/10.18174/498307>
- Huijbregts, M. A. J., Steinmann, Z. J. N., Elshout, P. M. F., Stam, G., Verones, F., Vieira, M. D. M., ... & Van Zelm, R. (2016). ReCiPe 2016: A harmonized life cycle impact assessment method at midpoint and endpoint level Report I: Characterization.
- ILO. (1999). Worst Forms of Child Labour Convention, 1999 (No. 182). Retrieved from: https://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_ILO_CODE:C182
- ILO. (2013a). Code of Conduct and Guidelines to Prevent and Address Sexual Harassment in Workplaces. Retrieved from: https://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/---ilo-colombo/documents/publication/wcms_525537.pdf
- ILO. (2019a). What is child labour? International Labour organization. Retrieved from: <https://www.ilo.org/ipec/facts/lang--en/index.htm>
- ILO. (2019b). Eliminating Forced Labour: Handbook for Parliamentarians No. 30. Retrieved from: https://www.ilo.org/wcmsp5/groups/public/---ed_norm/---ipec/documents/publication/wcms_723507.pdf

- ILO. (2019c). International Labour Standards on Social Security. Retrieved from: <https://www.ilo.org/global/standards/subjects-covered-by-international-labour-standards/social-security/lang--en/index.htm>
- IPCC. (2007). Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- IPCC. (2018). Summary for Policymakers. In: Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [V. Masson-Delmotte, P. Zhai, H. O. Pörtner, D. Roberts, J. Skea, P. R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J. B. R. Matthews, Y. Chen, X. Zhou, M. I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, T. Waterfield (eds.)]. World Meteorological Organization, Geneva, Switzerland, 32 pp
- ISO. (2010). ISO 26000:2010 Guidance on social responsibility
- Johnson, J. M. F., Franzluebbers, A. J., Weyers, S. L., & Reicosky, D. C. (2007). Agricultural opportunities to mitigate greenhouse gas emissions. *Environmental pollution*, 150(1), 107-124.
- Kumar, P. (2010). *TEEB: the economics of ecosystems and biodiversity: ecological and economic foundations*. London, UK and Washington, DC: Routledge.
- Lal, R. (2009). Soils and world food security. *Soil & Tillage Research*, 102, 1–4
- Milà i Canals, L., Romanya, J., & Cowell, S. J. (2007). Method for assessing impacts on life support functions (LSF) related to the use of 'fertile land' in Life Cycle Assessment (LCA). *Journal of Cleaner Production*, 15(15), 1426-1440.
- OIE (World Organisation for Animal Health). (2004). Global conference on animal welfare: an OIE initiative. Paris, 23–25 February 2004. Retrieved from: http://www.oie.int/fileadmin/Home/eng/Conferences_Events/docs/pdf/proceedings.pdf
- Raleigh, C., & Urdal, H. (2007). Climate change, environmental degradation and armed conflict. *Political Geography*, 26, 674–694. <https://doi.org/10.1016/j.polgeo.2007.06.005>
- Social Accountability International (2014). *Social Accountability 8000 International Standard*
- Tagliarino, N. K. (2016). *Encroaching on land and livelihoods: How national expropriation laws measure up against international standards*. World Resources Institute working paper.
- True Price Foundation. (2020). *Principles for True Pricing*. Retrieved from: www.trueprice.org
- United Nations (UN) (1992). *Convention on Biological Diversity*. Retrieved from: <https://www.cbd.int/doc/legal/cbd-en.pdf>
- UNEP. (2009). *Guidelines for Social Lifecycle Assessment of Products*. Paris.
- UNICEF. (2014). *Child Labour and UNICEF in Action: Children at the Centre*. New York: UNICEF. Retrieved from: https://www.unicef.org/protection/files/Child_Labour_and_UNICEF_in_Action.pdf
- van der Velden, N. M., & Vogtländer, J. G. (2017). Monetisation of external socio-economic costs of industrial production: A social-LCA-based case of clothing production. *Journal of Cleaner Production*, 153, 320-330.

WHO. (2019). Health statistics and information systems, Metrics: Disability-Adjusted Life Year (DALY). Retrieved from: https://www.who.int/healthinfo/global_burden_disease/metrics_daly/en/

WWF (World Wildlife Fund). (2020). Water Risk Filter - Introduction. Retrieved from: <https://waterriskfilter.panda.org/en/Explore/Introduction>

Annex II: The right-based approach to true pricing in the context of other economic paradigms for external costs accounting

Introduction

Realizing a sustainable economy is considered a very important societal goal by policy makers and businesses alike (see e.g. Pearce, Markandya and Barbier, 2013; WEF, 2015). This is also exemplified by the UN Sustainable Development Goals (SDGs), which are adopted by all major governments (UN, 2015).

Economists have argued that internalizing externalities is a necessary condition to realize a sustainable economy (see e.g. EEA, 2011; World Bank, 2020). Governments, and increasingly businesses are looking into ways to internalize externalities (see e.g. EEA 1999; EEA 2011; World Bank, 2020, WBCSD, 2010; WBCSD 2018).

Although the concept of externalities is very old and dates to Pigou (1920) and Marshal (1920), it is relatively recent that practitioners and scientists try to come with comprehensive methods to estimate the actual size of the externalities. In the true pricing methodology developed in this paper, it has been chosen to use an approach based on the remediation cost of violated rights instead of a Pigouvian welfare theoretic approach. The arguments for this are discussed in this annex.

In this annex, we provide a brief overview of the scientific foundations of the right-based approach. It starts with an overview of the key concepts, an identification of current paradigms to measure externalities and a brief summary of their (relative) advantages and key limitations. Consequently, a theoretical summary of the foundations of a right-based approach for true pricing follows. The last section is a discussion on how the right-based approach addresses the aggregation problem, how it relates to existing paradigms, on how it deals with positive externalities and on its limitations.

Key concepts

Externalities

Externalities, or external effects, can be defined as:

Def. 1 An external effect is a societal cost or benefit that affects a party who did not choose to incur this cost or benefit. (Buchanan and Stubblebine, 1962)

A negative external effect, based on this, can be defined as:

Def. 2 A negative external effect is a negative societal effect that affects a party who did not choose to incur this negative effect.

Economic activities with external effects typically affect different individuals in different ways: there are losers and winners. Hence, measuring externalities requires measuring different effects over different individuals.

The problem of aggregation

A key challenge with measuring different external effects over different individuals is the aggregation of these effects. To make decisions one has to aggregate multiple effects on individuals to some degree, as knowing all effects on all individuals is impossible and not useful to inform decision making. However, as welfare economists have pointed out for long, aggregating individual preferences is highly problematic (Ara, 1959; Fisher, 1987).

The seminal work of Von Neumann and Morgenstern has shown that for an individual with rational preferences, a quantitative valuation function (or utility function) exists that represents its preferences (Von Neumann Morgenstern, 1953). However, such valuation functions cannot be just added to yield a collective valuation function or social welfare function, as individual valuation functions are not unique

(Von Neumann Morgenstern, 1953). The underlying problem with aggregating preferences -also in more sophisticated ways - is that interpersonal comparisons of utility have proven elusive. Arrow proved that in fact there is no way to aggregate individual preferences in a consistent manner to yield a welfare function (Arrow, 1950).

Various approaches have been adopted to nonetheless measure and value externalities (or more broadly changes in non-market or public goods), mostly in the context of informing public policy. The following section covers three of these paradigms: the cardinal utility paradigm, the abatement paradigm and shadow pricing paradigm.

Current paradigms

Cardinal utility paradigm

The first paradigm looks at societal preferences based on the notion of *cardinal utility* (see e.g. Dasgupta and Pearce, 1979, p.25; Van Praag, 1989). This approach assumes that individual people have preferences that can be represented on a fixed numerical scale and can be compared and added across people. It can most concretely be conceived in a manner that people experience 'utils,' a numerical unit of pleasure or satisfaction that is the same among individuals. This enables the creation of a social welfare function that is the sum of the individual utilities under the assumption of utilitarianism: that state of the world is better if the sum of the utilities is higher. Based on cardinal utility, the damage costs of negative externalities can be assessed, which is the sum of the negative effects on individual utilities. In the same way, societal benefits can be measured. This approach is at the basis of societal cost-benefit analysis (Romijn and Renes, 2013), where a decision is beneficial from a societal point of view if the sum of all benefits is higher than the sum of all costs.²⁷

The cardinal utility paradigm has several advantages:

- It is a comprehensive approach and allows for the inclusion of both positive and negative impacts²⁸ in order to derive a social cost-benefit comparison.
- It uses a very intuitive selection criterium to determine which costs and benefits to include or not: it includes all (positive and negative) externalities occurring in value chains that (potentially) benefit or harm individuals' well-being (or utility).
- It is widely used and quite developed. The Dutch guidelines for drawing up a social cost-benefit analysis (MKBA) are based on the concept of societal welfare, which relies on this approach and the Environmental Priority Strategies (EPS) method and CE Delft, for example, uses a damage cost-based approach as the valuation framework for most of their environmental prices (Romijn and Renes, 2013; Steen, 2015; de Bruyn, Bijleveld, de Graaf, Schep, Schroten, and Vergeer, 2018).

Abatement paradigm

The second approach starts from the notion of abatement costs or benefits. First, it assumes a certain policy goal, such as zero emissions (Ellerman and Decaux, 1998, p.1; Klepper and Peterson, 2006, p.2). Then the abatement cost or benefit of an external effect are the extra or avoided cost society has to incur to realize the policy goal as a result of the external effect. For example, if there is a policy goal for a certain

²⁷ There is an interpretation under which Cost Benefit Analysis (CBA) is ordinal. If the Willingness to pay for gains and Willingness to accept for losses are measured, and there is a perfect transfer mechanism in which transfers will be made from those who gained to those who loose, then a CBA can have an ordinal basis. Such a perfect transfer mechanism is typically not feasible to realize. In practice, a transfer mechanism is neither analyzed nor implemented in CBA. Without a transfer mechanism, CBA is cardinal.

²⁸ An impact can be seen as change in same measurable dimension associated with an event during a given timeframe with relation to a reference scenario.

level of nitrogen dioxide, the abatement costs of a ton of NO₂ emissions are the costs of the most efficient actions required to restore or compensate the damage (see e.g. Becker, 2005).

The abatement paradigm has several advantages:

- It can be used to assess the cost of meeting policy targets (Pizzol et al., 2015).
- It is less controversial and provides more reliable estimates (compared to the cardinal utility paradigm) because it uses 'real' market prices for existing technological solutions to avoid, restore or control pollution (Jasinski et al., 2015; Howes, 2002).
- It is a suitable approach where data is not abundant (RFF, 2013), as you do not have to model very long impact pathways. To illustrate, as opposed to the cardinal utility paradigm, one does not need to map and quantify all types of damages that occur now or in the future²⁹.
- Similarly, it reduces the need to quantify preferences of people now and in the future, which reduces the influence of contingent valuation and discounting.
- It is consistent with the United Nations recommendations for environmental adjustments to the national accounts (Howes, 2002).

Shadow pricing paradigm

Combining damage and abatement costs, one can calculate what the 'optimal price' for negative externalities would be in the sense that the damage costs equal the abatement costs. This can then be called the shadow price (see e.g. Färe and Grosskopf, 1998; de Bruyn and Korteland³⁰, 2010; de Bruyn, Ahdour, Bijleveld, de Graaff, Schep, Schroten, Vergeer³¹, 2017).

Key challenges of existing paradigms

Even though cardinal utility, abatement and shadow pricing are commonly used for measuring externalities, these paradigms present a set of methodological problems.

Using cardinal utility for externalities has various problems:

- It assumes the existence of measurable units of utility ('utils') and their additivity among individuals. Modern economists consider this an outdated perspective (Köbberling, 2006). It can be a useful assumption for comparable impact, although its usefulness arguably breaks down when (i) comparing very different impacts (e.g. consumer surplus and harassment of women) and (ii) when comparing impacts of very different sizes - e.g. if a small increase in pleasure of many can outweigh the death of one.
- The netting of positive and negative impacts, such as child labor with profits, is considered problematic by stakeholders (see e.g. Sandel, 2012).
- For many types of social³² external costs such as child labour, discrimination or harassment, no cardinal utility methodologies have been developed, arguably for two reasons mentioned above.
- For environmental external costs, the assumption that natural capital can be fully substituted by other forms of capital is considered problematic (see e.g. Markandya and Pedroso-Galinato, 2007).
- Cardinal utility does not take into account whether externalities lead to injustice. Pollution in one place, for example, is considered beneficial from this perspective when the negative external costs of this pollution are fully offset by external benefits elsewhere.

²⁹ An impact pathway is a quantifiable chain of effects (and counterfactual effects in a reference scenario) linking a specific activity to its effect on society. For example, measuring the external cost of CO₂ based on cardinal utility requires understanding all the direct and indirect effects on society, while measuring it based on abatement requires understanding the cost to reduce CO₂ emissions.

³⁰ CE Delft shadow prices 2010

³¹ While CE delft used 'shadow prices' in their 2010 report, they changed this to 'environmental prices' in their 2017 report.

³² As opposed to 'environmental'

- Following on this, for externalities such as climate change, intergenerational equity is an issue. Cardinal utility requires a discount rate, which implies valuing future individuals less than current individuals. Discounting is a normative assumption that highly influences the outcomes of a measurement.
- Cardinal utility does not give guidance on the degree market actors are responsible or not for various externalities. Cardinal utility requires estimating all externalities – including indirect and positive externalities – which can lead to larger information cost and uncertainty in the estimates. This guidance is of great importance for true pricing, especially for scoping and setting boundaries – i.e. when determining which impacts to include, whether all possible impacts are included, whether to include positive impacts, and whether impacts are direct or indirect.
- In case cardinal utility is used to compare not policy decisions but actions by businesses or consumers, the marginal effect of each business or consumer decision has to be analysed (the marginal effect of an extra product). This is typically very difficult to measure and not in line with the most common ‘attributional’ Life Cycle Analysis.

Using abatement costs and benefits for externalities has a different set of problems:

- It requires the existence of policy goals, since abatement-cost based approaches assess the costs needed to reach a well-defined policy goal. This cannot be applied if such goals do not exist. It is furthermore highly dependent on which goals are chosen and therefore susceptible to policy inconsistencies (Pearce, 2003).³³ Different governments, for example, can have different or no goals related to carbon (CO₂) emissions, so abatement costs can vary based on (arbitrary) policy goals. However, one may also use the international rights as reference points to calculate abatement costs.
- Related to the point above, the paradigm does not provide guidance on which externalities to take into account or how to set policy goals. Either policy goals are taken as a given or the approach provides no guidance on desired level of externalities. This is problematic for reasons similar to those given above.
- In case governments do not actually take the actions required to realize the policy goals, it reduces to a type of cost-benefit analysis with all associated problems. If market players (businesses or consumers) want to use the abatement paradigm, they need to rely on governments actually realizing the policy goal.
- For many social externalities, there are no abatement cost estimates available³⁴.
- Similarly as for cardinal utility, when applying the abatement paradigm in the context of individual business or consumer preferences, it is difficult to establish the marginal effect of each decision.

Using shadow prices imports both the problems of cardinal utility as well as of abatement costs.

Theoretical foundations for right-based monetisation

The right-based monetisation paradigm used for true pricing has been developed to overcome the problems outlined above. It relies on four key assumptions.

First, it assumes that welfare consists of various dimensions. This means that there is not a single dimension, such as cardinal utility, that can cover all welfare aspects. This is in line with conceptions of welfare of i.a. Stiglitz’s Beyond GDP and the European Statistical Bureaus (Stiglitz, Fitoussi, and Durand, 2018; UNECE/Eurostat/OECD, 2013).

³³ While Pearce (2003) states this issue, he discusses it within the context of the choice of shadow price for carbon, which combines a damage cost-based with an abatement cost-based approach.

³⁴ This is partially related to the absence of well-defined, quantitative policies goals (for example in the case of many social impacts).

Second, it assumes that respect of universal rights is a welfare dimension (Sen, 1999). Other welfare dimensions can be for example well-being -which comes closer to a cardinal utility approach – and an equitable distribution of resources and opportunities.

The point of departure is that there is a set of generally accepted rights, or universal rights (UR):

Def. 3 People and communities, both current and future generations, have generally accepted rights.

Whether UR constitute a moral truth or a social convention is an open question, but they exist and they are regularly linked to sustainable development, among others through the Sustainable Development Goals (UN, 2015).³⁵ There can be some degree of discussion on what rights are included as UR. True pricing takes UR as specified by international conventions, such as Human Rights and fundamental labour rights, but also environmental rights, for both current and future generations.

The third key assumption is that governments and all market players (businesses, investors and consumers) have a responsibility to respect UR. This is in line with the OECD Guidelines for Multinational Enterprises and the UN Guiding Principles on Business and Human Rights (OECD, 2011; United Nations, 2011) for businesses, although the rights-based approach extends this responsibility to other market players such as consumers and investors. In the UN Guiding Principles, states have a stronger responsibility than businesses: they do not only need to respect but also actively protect human rights (United Nations, 2011).

The fourth and final key assumption is that the responsibility to respect UR consists of a responsibility of the above mentioned economic actors to take a set of remediating actions in the case of a breach of a right and that for each breach of UR at least one set of actions exists that remediates that breach. This is also in line with the OECD Guidelines for Multinational Enterprises and the UN Guiding Principles on Business and Human Rights (OECD, 2011; United Nations, 2011).

These assumptions enable the definition of unsustainable externalities:

Def. 4 Unsustainable externalities are negative consequences of breaching rights.

These assumptions also enable the definition of unsustainable external cost of an economic activity and a product:

Def. 5 The unsustainable external cost of an economic activity is the sum of the remediation costs of all unsustainable negative externalities associated with it.

Def. 6 The unsustainable external cost of a product is the sum of the unsustainable external costs of all activities associated to the production and consumption of the product.

The unsustainable external cost of a product is also called the true price gap:

Def. 6 The true price gap of a product is the unsustainable external cost of a product

Def. 7 The true price of a product is the market price plus the true price gap.

Therefore, the true price reflects the price a buyer would have to pay for a product if the cost of remediating its unsustainable negative externalities would be included in its price.

³⁵ The OHCHR (one of the organizations behind the SDGs) has created a [Summary table on the linkages between the SDGs and relevant international Human Rights instruments](#) that links the 1817 SDGs to more than 20 international human rights instruments. See also chapter 2 What is the true price? of the Valuation framework for true price assessment of agri-food products.

Discussion

How a right-based paradigm addresses the problem of aggregation

The right-based paradigm described above mitigates the problem of aggregation by (i) limiting its reach to a specific welfare dimension (respect of universal rights) and (ii) defining on that dimension a well-defined unit of measure (remediation costs) that does not rely on cardinal utility. In this way, it:

- Avoids netting positive and negative unsustainable externalities, and off-setting for example child labour with profit. Only negative externalities are included.
- Avoids promoting unfair trade-offs (creating benefits for some at the expense of others) that involve breaches of rights. Again, this is due to not including positive externalities.
- Avoids making assumptions on the substitutability of natural capital for other capitals. Any breach of rights should be included irrespective of whether the breach constitutes a negative effect on natural or social capital.
- Avoids a dependency on actual policy goals. As mentioned above, one of the limitations of abatement cost-based approaches is that differences in (arbitrary) policy goals can lead to varying abatement cost estimates. Moreover, if there are no policy goals, then no abatement cost can be established at all. While it may be argued that the right-based paradigm creates a dependency on rights, rights (as internationally acknowledged foundations) can be translated in internationally valid targets even when there are no policy goals set for particular impacts.
- Provides a clear scope of which external costs to take into account, namely unsustainable external costs (*Def. 5 and Def. 6*).
- Avoids interpersonal comparisons of utility. Since utility is not quantified, no groups or individuals with higher or lower levels of utility are compared. Note that this holds perfectly for the situation in which the true price gap is paid and used for compensation of the people whose rights are violated. One must, however, be aware that from an economic point of view direct compensation of people may result in inefficiencies and injustices elsewhere. In case the true price gap is used for transparency but not paid, then it suffers from a similar problem as cardinal utility or abatement costs without implementation. The problem is much attenuated as the range of impacts to be aggregated is smaller.

Other welfare dimensions and positive externalities: true price and true value

In the previous chapter it has been noted that welfare can be seen to have more than one dimension, such as collective well-being and an equitable distribution of resources and opportunities. To make sustainable decisions, the true price based on the right-based paradigm only offers a valuation approach for one welfare dimension, it provides information on what is required to respect UR. If one also wants to take other welfare aspects into account, such as well-being or equity, one requires carrying out valuation through additional dimensions. For example, *in addition* to measuring the true price, one can value all internal effects and remaining externalities (negative and positive) based on their contribution to well-being using a cardinal utility paradigm. This has been called a measure of true value (De Groot Ruiz et al., 2018). Such a combined approach allows using the strength of a cardinal utility paradigm (aggregating many positive and negative effects), while avoiding the most problematic interpersonal comparisons (offsetting rights-breaches with positive effects).

The true price shows the market price plus the unsustainable external costs, whereas the true value shows the internal plus the (net) external benefits of a product.

How a right-based paradigm relates to existing paradigms for accounting of externalities

Theoretical framework

When using the right-based approach to guide the quantification of the externalities of a product, the following elements emerge as notable compared to the other existing paradigms.

- First, the right-based paradigm focuses on negative externalities only (see section above). In addition, it focuses on a subset of negative externalities combined with violations of international rights, called *unsustainable* negative externalities, that are selected based on rights. This has the advantage that it gives a more objective and widely recognized criteria to determine what external costs to include. Also, because positive externalities and higher order effects are excluded, information requirements and uncertainty are reduced. On the other hand, it is more difficult to apply the paradigm for environmental criteria as environmental rights are less elaborated.
- Second, the right-based paradigm includes some external effects for which it is not entirely obvious that they are *external* effects in the classical sense, namely negative effects on people working in a value chain – i.e. underpayment, occupational health and safety incidents, denied freedom of association, discrimination, harassment, etc. These effects are part of the economic transactions behind a product and could be seen as *internal* costs. This difference in defining external effects is due to a different definition of 'free choice'. Classical approaches take a narrow view of 'free', whereas true pricing from a right-based perspective take a broader view. Under a narrow definition of a free choice, a worker chooses to work and accepts (the risk) of all these impacts. Underpayment arguably requires the broadest definition of a free choice, as some wage is better than no wage. The assumption made is that a free choice precludes people voluntarily agreeing to breaching their own rights. The inclusion of underpayment and effects on workers among the social costs of products is in line with more than one true cost accounting framework (Croes and Vermeulen, 2015, p.178; van der Velden and Vogtländer, 2017; Hall, 2019, p. 224).
- Last, a right-based paradigm takes a hypothetical sustainable product as a reference scenario for the measurement of social and environmental costs of a product. A sustainable product is defined as a hypothetical product for which no rights are violated during the production and consumption, including rights of future generations. This is because the unsustainable externalities it wants to measure are by definition zero in this case. A cardinal utility paradigm can be seen to take as reference a hypothetical scenario where the product has not been produced at all and no other product was bought instead. An abatement paradigm would take as reference a hypothetical scenario where policy goals are met.

Monetary valuation of social and environmental impacts

Besides comparing paradigms from a theoretical perspective, a comparison can be made looking at how they lead to the selection of valuation techniques for converting non-economic impacts into a monetary value. The proposed rights-based paradigms defines remediation cost as guiding concept. This is translated as a combination of compensation cost, restoration cost, prevention cost and retribution cost, depending on the type of impacts. This leads to the selection of a combination of valuation techniques which is largely in line with those used by other approaches quantifying externalities at the product level for compensation, restoration and prevention cost. Retribution costs are estimated through legal fines.

- Like the proposed valuation framework, other approaches to monetize externalities also use a combination of valuation techniques. However, the rights-based valuation framework proposes a transparent set of principles to select which technique should we used for which impact.
- Compensation cost represents damage cost, which is central in well-known and used valuation frameworks for environmental externalities such as e.g. CE Delft's Environmental Prices Handbook (de Bruyn et al., 2018), the Environmental Priority Strategies EPS (Steen, 2015), ExternE (Peter and Rainer, 2015), Social Cost of Carbon (EPA, 2017), STEPWISE method (Weidema, 2003; Weidema, Hauschild and Jollie, 2007).
- Restoration cost and prevention cost are both typically quantified by cost-based approaches, such as the Eco-costs approach (TU Delft, 2020), the Oiconomy Framework (Croes and Vermeulen, 2015), the Sustainability Price (Hall, 2019) or the abatement cost of carbon (Kuik, Brander, and Richard, 2009, recommended also by de Bruyn et al., 2018).

- Retribution cost, or penalties, are introduced as an innovation as one of the components to value external effects that occur in violation of legal obligations. Retribution cost are the cost to pay sanctions imposed by governments for certain violations of legal or internationally imposed requirements.

Limitations of the right-based paradigm

Although the right-based paradigm offers a useful valuation approach for true pricing, it also has limitations.

- It requires a selection of UR and their translation into measurable indicators for production and consumption activities.
- It covers only one welfare dimension, namely respect of rights. This implies that when only the true price is used for decision making other important consequences of production and consumption decisions are not taken into account. For example, distorting taxes and subsidies, positive externalities and negative consequences for income distribution that don't violate rights are not taken into account.
- It is only relevant as a decision tool if (i) the true price gap is paid and used to finance measures to reduce the violations of rights or (ii) the remediation costs are a good reflection of the damage and the injustice caused by the externalities.
- It requires an operational definition of full remediation of a negative externality.
- It requires a set of choices on what actual remediation costs to take into account: the actual marginal remediation costs, the remediation costs in a well-functioning market for a part of the external costs, or the remediation costs (in equilibrium) if all external costs are remediated. (Other paradigms require similar choices.)
- To cover all UR a broad interpretation of a free choice is required to ensure all labour-related rights breaches are externalities.
- Like any method, there are a number of value judgements. E.g., which impacts are sufficiently robustly justified by rights, when harm is 'severe' or not, and which monetisation factors are chosen from the literature (e.g., if the method indicates that 'damage cost' is to be used, and there are multiple studies that provide different values). Supporting documentation (e.g., the principles for true pricing and monetisation factors for true pricing) provide our best attempt to justify choices, but those can never be fully objective.
- As noted above, in case the true price gap is used for transparency but not paid, then it suffers from a similar problem as cardinal utility or abatement costs without implementation. The problem is much attenuated as the range of impacts to be aggregated is much smaller but it is still present.

This valuation framework for agri-food products and the Principles for True Pricing (True Price foundation, 2020) propose a methodology to address these challenges.

Conclusion

The right-based paradigm used for true pricing has been developed to overcome the main issues associated with the existing paradigms for measuring externalities: cardinal utility and abatement cost. It defines respect of rights as a measurable dimension of welfare and values externalities based on the concept of remediation cost. As such, it does not rely on cardinal utility or policy goals. The true price based on this paradigm only includes negative externalities that do not respect a set of Universal rights of current and future generations, defined on the basis of international conventions, and added to that includes effects of violation of rights that are not external costs in the economic meaning of the word. Applying a broad interpretation of free choice it includes all labour-related rights among the externalities to be accounted for in a true price. It also prescribes principles to choose which valuation technique to apply to which

impacts which is largely in line with existing monetisation frameworks for accounting of externalities at the product level.

While this paper argues that the right-based paradigm is the most relevant approach to true pricing, it also highlights its limitations. The right-based paradigm requires a selection of universal rights and their translation into measurable indicators for production and consumption activities, an operational definition of full remediation of a negative externality and a set of choices on what actual remediation costs to take into account. The accompanying valuation framework proposes a first way to address these requirements.

References to Annex II

- Ara, K. (1959). The aggregation problem in input-output analysis. *Econometrica: Journal of the Econometric Society*, 257-262.
- Arrow, K. J. (1950). A difficulty in the concept of social welfare. *Journal of political economy*, 58(4), 328-346.
- Becker, R. A. (2005). Air pollution abatement costs under the Clean Air Act: evidence from the PACE survey. *Journal of environmental economics and management*, 50(1), 144-169.
- Buchanan, J. M., & Stubblebine, W. C. (1962). Externality. In *Classic papers in natural resource economics* (pp. 138-154). Palgrave Macmillan, London.
- Croes, P. R., & Vermeulen, W. J. (2015). Comprehensive life cycle assessment by transferring of preventative costs in the supply chain of products. A first draft of the Oiconomy system. *Journal of Cleaner Production*, 102, 177-187.
- Dasgupta, A. K., & Pearce, D. W. (1972). *Cost-benefit analysis: theory and practice*. Macmillan International Higher Education.
- De Bruyn, S., Ahdour, S., Bijleveld, M., de Graaff, L., Schep, E., Schroten, A., & Vergeer, R. (2017). Handboek Milieuprijzen 2017: Methodische onderbouwing van kerngetallen gebruikt voor waardering van emissies en milieu-impacts. CE Delft, Delft. Available at: <https://cedelft.org/publicaties/1963/handboek-milieuprijzen-2016>
- De Bruyn, S., Bijleveld, M., de Graaf, L., Schep, E., Schroten, A., & Vergeer, A. (2018). Environmental Prices Handbook 2017: Methods and numbers for valuation of environmental impacts. CE Delft, Delft. Available at: <https://www.ce.nl/en/publications/2113/envionmental-prices-handbook-2017>
- De Bruyn, S., & Korteland, M. (2010). *Shadow Prices Handbook: Valuation and weighting of emissions and environmental impacts*. CE Delft, Delft.
- EEA (European Environment Agency) (1999). The 'Externality' of Agriculture in Europe: Towards Fair Efficient Pricing. EEA, Copenhagen.
- EEA (European Environment Agency) (2011). Internalisation of external costs. EEA, Copenhagen. Available at: <https://www.eea.europa.eu/data-and-maps/indicators/internalisation-of-external-costs-1>
- Ellerman, A. D., & Decaux, A. (1998). Analysis of post-Kyoto CO₂ emissions trading using marginal abatement curves. MIT.
- EPA (Environmental Protection Agency) (2017). The Social Cost of Carbon: Estimating the Benefits of Reducing Greenhouse Gas Emissions. Available at: https://19january2017snapshot.epa.gov/climatechange/social-cost-carbon_.html
- de Groot Ruiz, A., et al. (2018). Op weg naar de echte prijs, echte waarde en echte winst van voedsel. No. 2018-016. Wageningen Economic Research.

- Färe, R., & Grosskopf, S. (1998). Shadow pricing of good and bad commodities. *American Journal of Agricultural Economics*, 80(3), 584-590.
- Fisher, F.M. (1987). "aggregation problem." *The New Palgrave: A Dictionary of Economics*, v. 1, p.54. [pp. 53-55.]
- Hall, M. R. (2019). The Sustainability Price: expanding Environmental Life Cycle Costing to include the costs of poverty and climate change. *The International Journal of Life Cycle Assessment*, 24(2), 223-236.
- Howes, R. (2002). *Environmental Cost Accounting: An Introduction and Practical Guide*. London, Chartered Institute for Management Accountants (CIMA).
- Jasinski, D., Meredith, J., & Kirwan, K. (2015). A comprehensive review of full cost accounting methods and their applicability to the automotive industry. *Journal of Cleaner Production*, 108, 1123-1139.
- Klepper, G., & Peterson, S. (2006). Marginal abatement cost curves in general equilibrium: The influence of world energy prices. *Resource and Energy Economics*, 28(1), 1-23.
<https://www.econstor.eu/bitstream/10419/3418/1/13604.pdf>
- Köbberling, V. (2006). Strength of preference and cardinal utility. *Economic Theory*, 27(2), 375-391.
- Kuik, O., Brander, L., & Richard, T. (2009). Marginal abatement costs of greenhouse gas emissions: A meta-analysis. *Energy Policy*, 37(4), 1395-1403.
- Markandya, A., & Pedrosa-Galinato, S. (2007). How substitutable is natural capital? *Environmental and Resource Economics*, 37(1), 297-312.
- Marshall, A. (1920). *Principles of Economics*. Eighth Edition, 1982 reprint. MacMillan, London.
- Neumann, John von and Morgenstern, Oskar, *Theory of Games and Economic Behavior*. Princeton, NJ. Princeton University Press, 1953.
- OECD (2011). *OECD Guidelines for Multinational Enterprises*. OECD Publishing.
<http://dx.doi.org/10.1787/9789264115415-en>
- Pearce, D. (2003). The social cost of carbon and its policy implications. *Oxford review of economic policy*, 19(3), 362-384.
- Pearce, D., Markandya, A., & Barbier, E. (2013). *Blueprint 1: for a green economy*. Routledge.
- Peter, B., & Rainer, F. (2015). *ExternE – externalities of energy: Methodology 2005 update*. Directorate – General for Research and Innovation (European Commission). Available at:
<https://op.europa.eu/en/publication-detail/-/publication/b2b86b52-4f18-4b4e-a134-b1c81ad8a1b2>
- Pigou, A. (1920). *The economics of welfare*. Routledge.
- Pizzol, M., Weidema, B., Brandão, M., & Osset, P. (2015). Monetary valuation in life cycle assessment: a review. *Journal of cleaner production*, 86, 170-179.
- Pretty, J., Brett, C., Gee, D., Hine, R., Mason, C., Morison, J., ... & Dobbs, T. (2001). Policy challenges and priorities for internalizing the externalities of modern agriculture. *Journal of environmental planning and management*, 44(2), 263-283.
- RFF (Resources for the Future) (2013). Regulating Greenhouse Gases from Coal Power Plants under the Clean Air Act, RFF DP 13-05, February 2013. Available at: <http://www.rff.org/RFF/documents/RFF-DP-13-05.pdf>
- Romijn, G., and Renes, G. (2013). *Algemene leidraad voor maatschappelijke kosten-batenanalyse*. CPB/PBL, Den Haag.
- United Nations (2011). *Guiding Principles on Business and Human Rights: Implementing the UN "Protect, Respect and Remedy" Framework*.

Sandel, M.J. (2012). *What Money Can't Buy: The Moral Limits of Markets*. Farrar, Straus and Giroux.

Sen A. (1999). *Development as Freedom*. Oxford University Press.

Steen, B. (2015). The EPS 2015d impact assessment method – an overview. Swedish Life Cycle Center, Report number 2015:5. Available at:

<https://www.ivl.se/download/18.7e136029152c7d48c202bc2/1465979613730/The%20EPS%202015%20i mpact%20assessment%20method An%20overview SLC%20Report%202015 5.pdf>

Stiglitz, J., Fitoussi, J. and Durand, M. (2018). *Beyond GDP: Measuring What Counts for Economic and Social Performance*, OECD Publishing, Paris, <https://doi.org/10.1787/9789264307292-en>.

TU Delft (2020). The Model of the Eco-costs / Value Ratio (EVR). Available at:

<https://www.ecocostsvalue.com/>

UN (United Nations) (2015). Sustainable Development Goals. Available at:

<https://www.un.org/sustainabledevelopment/sustainable-development-goals/>

UNECE/Eurostat/OECD. (2013). Framework and suggested indicators to measure sustainable development. UNECE, Eurostat, OECD Task Force on Measuring Sustainable Development. Available at: https://www.unece.org/fileadmin/DAM/stats/documents/ece/ces/2013/SD_framework_and_indicators_final.pdf

Van Praag, B. (1989). Ordinal and cardinal utility: an integration of the two dimensions of the welfare concept (No. 2099-2018-3296).

Van der Velden, N. M., & Vogtländer, J. G. (2017). Monetisation of external socio-economic costs of industrial production: A social-LCA-based case of clothing production. *Journal of Cleaner Production*, 153, 320-330.

WBCSD (2010). Vision 2050 The New Agenda for Business. Available at:

<https://www.wbcsd.org/Overview/About-us/Vision2050>

WBCSD (2018). TRUE COST OF FOOD: Unpacking the value of the food system. Discussion paper. Geneva.

WEF (2015). Sustainability Policy. Available at:

http://www3.weforum.org/docs/WEF_Sustainability_Policy_EN.pdf

Weidema, B. P. (2003). Market information in life cycle assessment (Vol. 863, p. 365). Miljøstyrelsen.

Weidema, B. P., Hauschild, M. Z., & Jolliet, O. (2007). Preparing characterisation methods for endpoint impact assessment. Annex II in Weidema BP, Wesnæs M, Hermansen J, Kristensen T, Halberg N, Eder P, Delgado L (2008) Environmental improvement potentials of meat and dairy products. Sevilla: Institute for Prospective Technological Studies. (EUR 23491 EN).

The World Bank (2020). *Carbon Pricing Dashboard*. Available at:

<https://carbonpricingdashboard.worldbank.org/what-carbon-pricing>