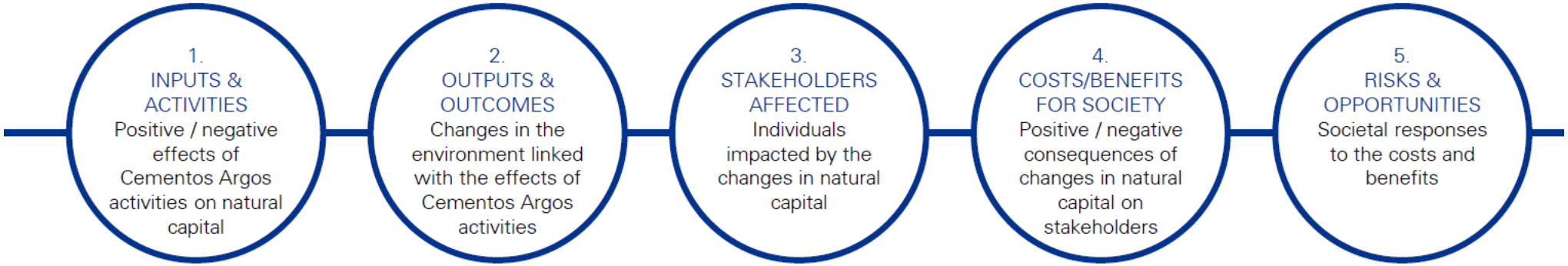
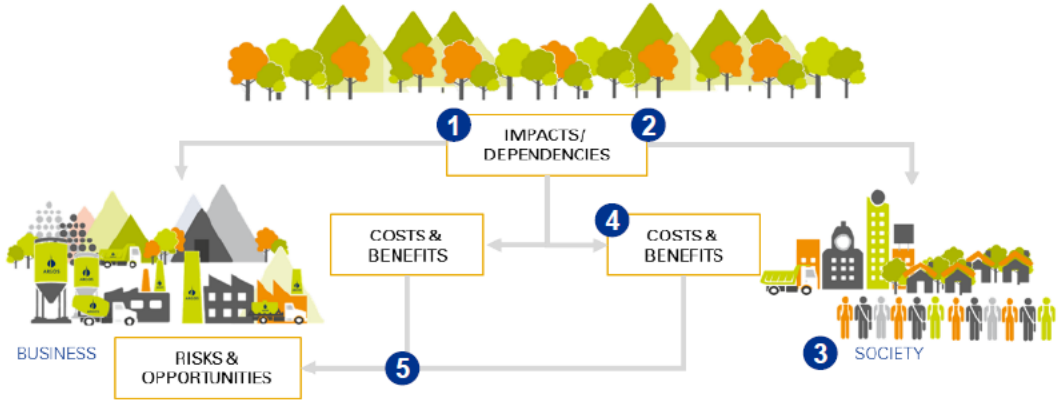
ARGOS' ASSUMPTIONS FOR ENVIRONMENTAL EXTERNALITIES

Greenhouse Gas Emissions

APPROACH REVIEW

The impact of Cementos Argos on the environment was analyzed using the approach described in the Natural Capital Protocol:





Representation of the environmental impact value chain

GHG EMISSIONS

As a large cement company, GHG emissions are one of the main externalities for Cementos Argos, who developed mitigation and adaptation strategies to better manage related risks and opportunities (e.g. innovative processes and products). Indeed, GHG emissions contribute to the effects of climate change such as rise in sea level, extreme weather events, water scarcity, or biodiversity losses. This could negatively impact the operations of the company, but also the society (e.g. effects on human health, property value, ecosystems, agricultural production).

EXAMPLES OF RISKS OF INTERNALIZATION AND OPPORTUNITIES FOR REDUCING IMPACT

Risks	*Examples*	*Opportunities*
Regulations	Income losses associated with international agreements or carbon taxes (e.g. potential tax on CO2 emissions in Colombia).	Improve in energy efficiency Increase substitution of fossil fuels (e.g. use of biomass) Use alternative materials Further develop innovative low-carbon products
Market dynamics	Operations and supply chain might be impacted by climate change and natural events (e.g. flooding, sourcing of raw materials, etc.).	
Stakeholder actions	Mandatory reports of CO_2 emissions may generate higher pressure from stakeholders for further actions to mitigate and compensate.	

GHG EMISSIONS – MONTETIZATION APPROACH

MONETIZATION APPROACH

Data type	Internal input data	✖	External input data	=	Monetized output
Calculation	Cementos Argos GHG emissions	✖	Social cost of carbon	=	Monetized GHG emissions

SCOPE

- Scope 1 & scope 2 GHG emissions across all operations.
- Scope 3 GHG emissions (suppliers) were not included because not material (scope 1 & scope 2 represent 91% of all GHG emissions).

ASSUMPTIONS & LIMITATIONS

- The impact of GHG emissions is monetized using the social cost of carbon (SCC), which reflects the cost of the damage generated by GHG emissions over their lifetime for society.
- The EPA SCC estimates used (see table) consider changes in net agricultural productivity, human health, property damages from increased flood risk and value of ecosystem services due to climate change. However, estimates vary based on the discount rate, which determines the present value of future damages of climate change.
- A discount rate of 4% has been chosen to reflect the future impact of climate change, which is in line with other frontrunners in the sector.
- Further details on the SCC are provided in appendix 3.

Annual Social Cost of Carbon Values: 2010 - 2030 (2007$/metric ton CO2)

Discount rate	5%	3%	2,5%	3%
Year	Avg	Avg	Avg	95th
2010	10	31	50	86
2011	11	32	51	90
2012	11	33	53	93
2013	11	34	54	97
2014	11	35	55	101
2015	11	36	56	105
2016	11	38	57	108
2017	11	39	59	112
2018	12	40	60	116
2019	12	41	61	120
2020	12	42	62	123

EPA (2015). *Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866*

ADDITIONAL INFORMATION

ARGOS

GHG EMISSIONS

Cementos Argos and KPMG developed the Integrated Profit & Loss (IP&L) statement which will be included in the integrated annual report 2016. One of the key elements in the IP&L is the cost of carbon dioxide emissions (CO2). This cost can be calculated in several ways, for example by using market price, marginal abatement costs and/or the social cost of carbon (SCC).

The logic around including the cost of carbon within the IP&L is because an emitted tonne of carbon today will have a (financial) impact on society and humans in the future. Since Cementos Argos emits a significant amount of CO2emissions, it is important to include this element.

The cost of CO2is not limitless; there is a point at which the cost of abating a tonne of carbon outweighs the cost of the impact that same tonne will have in the future.

Therefore, it is important to choose a proper carbon-price which estimates the social cost of carbon. A significant amount of scientific research has been done to calculate the cost of carbon, however the outcomes vary significantly[2].

Further, adjustments to the calculation's inputs, such as the discount rate used and fluctuating estimates about climate sensitivity, produce dramatically different estimates.

Key considerations

- What is the aim of including CO_2 into my IP&L?
- What should the outcome reflect?
- What are other companies (in your sector) doing and what price do they use?

Carbon versus carbon dioxide

"Carbon pricing" normally refers to a tax or tradable permit per tonne of CO_2 emissions, which internalizes the external (or social) costs to the emitter with the emitting activity. While it is common to refer to the pollutant as "carbon," we are actually interested in CO_2, and the distinction is important.

A molecule of CO_2 is three-elevenths carbon by molecular weight. So a tonne of CO_2 contains 0.27 tonnes of carbon. If a tax of USD 10 per tonne is placed on CO_2, this corresponds to a tax of USD 10 on 0.27 tonnes of carbon, or USD 37 per tonne of carbon.[2]

1) R. Tol, "Estimates of the damage costs of climate change. Part I: benchmark estimates," Environmental and Resource Economics 21 (2002): 47-73; R. Tol, "Estimates of the damage costs of climate change. Part II: dynamic estimates," Environmental and Resource Economics 21 (2002): 135-160.
2) A practical guide to the economics of carbon pricing, University of Calgary, 2016

APPROACHES ON CARBON PRICING

ARGOS USES THE SCC ESTIMATES OF THE EPA.

	Social Cost of carbon (SCC)	Marginal Abatement Cost (MAC)	Carbon market prices
Description	▪ Values carbon by taking into account expected future societal costs arising from the impacts of climate change ▪ SCC can include a discount rate to reflect future costs into present value ▪ The SCC is marginal, reflecting how much cost increase is associated with release of an additional tonne of CO_2	▪ It is the real financial investment cost to reduce emissions by a given amount, at a given point in time, typically by investing in abatement technology ▪ In theory, it should seek to abate emissions from all activities up to the point at which the MAC is equal to the SCC	▪ It is based on laws or regulations that would limit or "cap" carbon emissions such as the European Trading System (ETS) ▪ The resulting interactions between demand and supply of allowances in the market determines the price of one allowance, also known as the carbon price.
Pros & cons	▪ **Pro:** it reflects the social costs from CO_2 emissions, therefore fulfills the needs of expressing costs to society which are not reflected in the current P&L ▪ **Con:** it is highly contingent on assumptions: e.g. discount rate, emission scenarios, equity weighting.	▪ **Pro:** it reflects real investment costs to reduce carbon emissions ▪ **Con:** it does not measure a company's impact/externality on society, showing instead the cost to the company of reducing that impact at a point in time given prevailing technology.	▪ **Pro:** it reflects the real costs currently imposed by laws and regulations ▪ **Con:** it currently does not reflect the value of a company's impact on society as a result of GHG emissions because of market imperfections and therefore underestimates the 'real' societal costs significantly

HOW THE DISCOUNT RATE WAS SELECTED:

One of the most important factors influencing SCC estimates is the discount rate. A large portion of climate change damages are expected to occur many decades into the future, and the present value of those damages (the value at present of damages that occur in the future) is highly dependent on the discount rate.

The EPA proposes 4 estimations of the SCC, based on different discountrates:

Discount rate	Description
3%, 95th	▪ Represents higher-than-expected impacts from temperature change further out in the tails of the SCC distribution
2.5%	▪ Included to incorporate the concern that interest rates are highly uncertain over time
3%	▪ Consistent with estimates provided in the economics literature and guidance for the consumption rate of interest ▪ 3% roughly corresponds to the after-tax riskless interest rate
5%	▪ May be justified by the high interest rates that many consumers use to smooth consumption across periods

Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866, EPA, Feb 2010 - https://www.whitehouse.gov/sites/default/files/omb/inforeg/for-agencies/Social-Cost-of-Carbon-for-RIA.pdf

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2021	12	42	63	126
2022	13	43	64	129
2023	13	44	65	132
2024	13	45	66	135
2025	14	46	68	138
2026	14	47	69	141
2027	15	48	70	143
2028	15	49	71	146
2029	15	49	72	149
2030	16	50	73	152

ARGOS' USES A DISCOUNT RATE OF 3%.

All values are updated annually with macroeconomic variables such as inflation chain and exchange rate.